

Museums and Sound: Design and Curating Strategies

Edited by: Raffaella Trocchianesi



museum materials discussions

Journal of Museum Studies

Vol 3/2- 2026

MMD - Museum, materials, discussion. Journal of Museum Studies is an open access academic journal in English, French, and Italian devoted to museology, museography, Cultural Heritage as well as research on audiences and fruition with an international outlook, addressing both the life of museum institutions and collections, and the latest challenges they face in their broad cultural and social dimension. MMD aims at promoting and enhancing the collaboration among researchers from the field of humanities, social sciences, architecture, and Digital Humanities through their complementary perspectives. It is addressed to scholars, students and professionals working in these specific disciplinary fields, but also readers interested in the current evolution of the debate on issues, methods and tools related to the material and immaterial aspects of museology in its relation to history and contemporaneity, and in connection with the progress of public welfare. All published articles are subjected to the double-blind peer-review process.

Editor-in-Chief:

Sandra Costa (Alma Mater Studiorum - Università di Bologna)

Associate Editors:

Anna Rosellini (ENSA Paris-Est, Université Gustave Eiffel)

Paola Cordera (Politecnico di Milano)

Editorial board:

Irene Di Pietro (Alma Mater Studiorum - Università di Bologna)

Federico M. Giorgi (Politecnico di Milano and Université Paris Cité)

Alessandro Paolo Lena (Alma Mater Studiorum - Università di Bologna)

Micol Riva (Politecnico di Milano)

Advisory board:

Javier Arnaldo (Atlas Museo, Museo del Prado)

Ruth Baumeister (Aarhus School of Architecture)

Paola Cordera (Department of Design, Politecnico di Milano)

Sandra Costa (Department of Arts, University of Bologna)

Alexander Damianisch (Director Center Focus Research, University of Applied Arts Vienna)

Emilie D'Orgeix (Directrice de recherche EPHE, Université PSL)

Giancarla Periti (Department of the History of Art, Toronto)

Marco Pizzo (Central Museum of the Risorgimento, Rome)

Dominique Poulot (Université Paris1)

Anna Rosellini (École d'architecture de la ville & des territoires Paris Est)

Naoki Sato (Tokyo University of the Arts)

Journal Manager:

Alessandro Paolo Lena

Graphic design:

Federico Maria Giorgi

Cover:

Migliore+Servetto Architects, Milan, *Chopin Muzeum*.

Photo by Marcin Czechowicz. Courtesy Migliore+Servetto Architects.

ISSN 3034-9699

<https://doi.org/10.60923/issn.3034-9699/v3-n2-2026>

Copyright © Authors 2026

CC BY 4.0 License

<https://creativecommons.org/licenses/by/4.0/>

MMD - Museum Materials and Discussions is published biannually.

All issues are available online at mmdjournal.unibo.it

Le opinioni espresse negli articoli
sono attribuite solo ai loro autori.

09

**Suono e allestimento narrativo:
approcci, strategie, strumenti di progetto**

Raffaella Trocchianesi

29

**The synesthetic power of sound in exhibition design:
From sound as trigger to sound as interpreter**

Marco Borsotti

49

**Sound as a means to enhance
visitors' engagement in museums**

Licia Calvi

63

**“How Sound Makes Me Feel”: Towards an Aurally
Diverse Practice of Sound Design in Museums**

Stefania Zardini Lacedelli, Marco Mason

103

**Sonificazione e Tecnologie Interattive
per il Welfare Culturale**

Antonio Camurri, Andrea Cera

sections.

119 Experience and Publics

Sounds Off: Silence and Sound Absence in Museums

Chiara Cecalupo

135 Digital Technologies for Cultural Heritage

**Digitization for an Ethnographic Musical
Instrument Collection**

Adilia Yip

159 Architecture and Displays

**Entwining sound, space and narratives.
Sound design approaches in exhibitions.**

Micol Riva

187 Behind the scenes

**The new sound tour of the Musée du Quai Branly -
Jacques Chirac, Paris. Interview with Eric de Visscher**

Louis Petitjean, Eric de Visscher

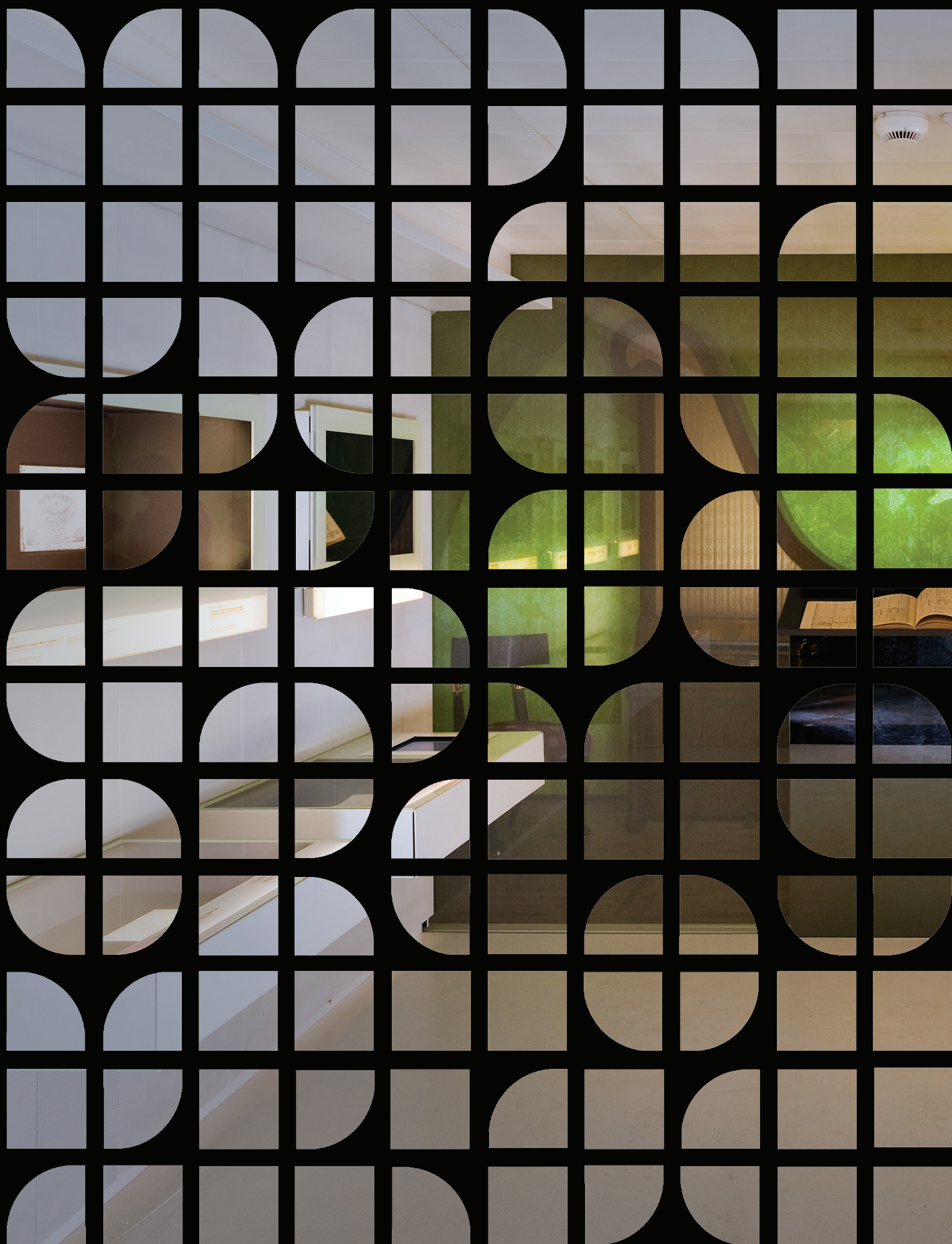
materials.

**207 Developing a typological matrix of Museum Sound
Sources to Enhance Design and Management**

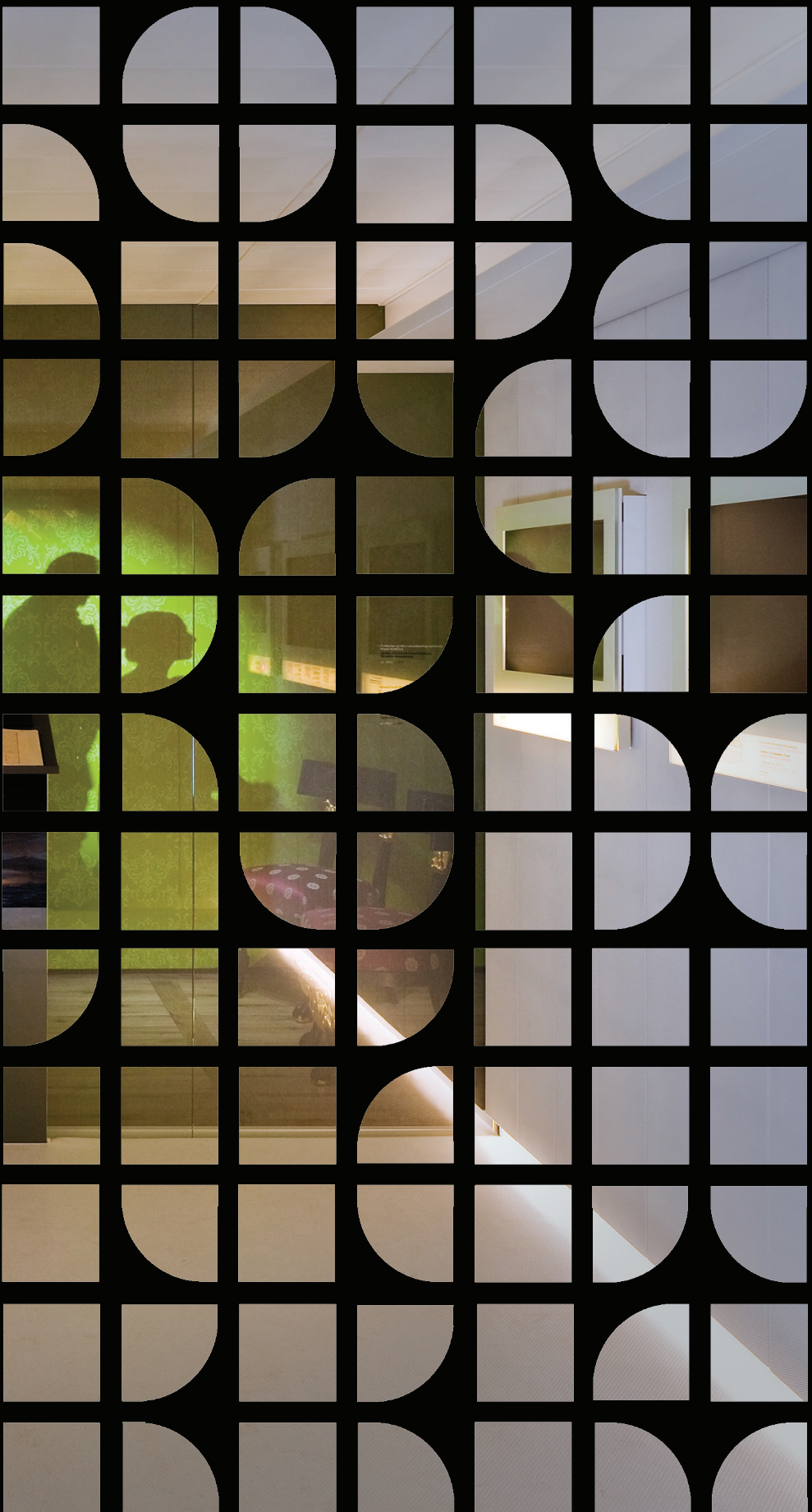
Yi Zhang

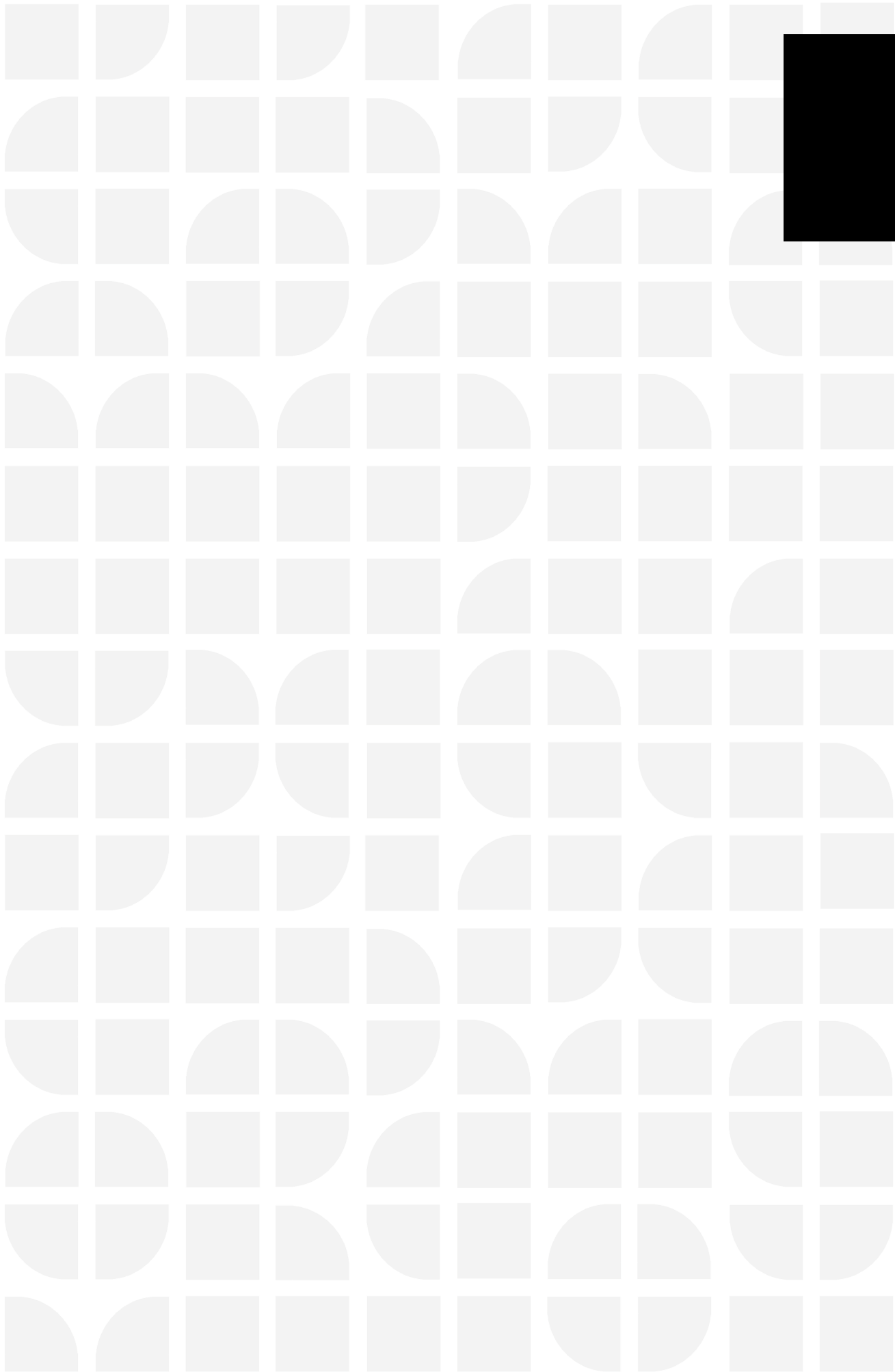
**229 Oltre l'accesso. Vocalità, ascolto e corpoliteracy come
critica istituzionale**

Cecilia Bima



dossier.





Suono e allestimento narrativo: approcci, strategie, strumenti di progetto

Raffaella Trocchianesi

Keywords:

Sound design, Exhibit design, Narrative, Design tools.

ABSTRACT:

Il presente contributo indaga il ruolo del sound design come materia progettuale strategica nell'ambito dell'allestimento narrativo per il patrimonio culturale. Partendo dal presupposto che il percorso espositivo costituisca una narrazione, la ricerca si interroga su come il suono possa contribuire alla concezione e alla costruzione di allestimenti, e su quali strumenti progettuali possano supportare i progettisti in questa integrazione. Nonostante una crescente attenzione al suono nella museologia e museografia contemporanea – testimoniata da pratiche professionali e studi accademici – la disciplina manca ancora di un frame teorico-metodologico strutturato che ne codifichi l'impiego progettuale. L'articolo propone una sistematizzazione del ruolo del suono lungo quattro dimensioni interconnesse: una dimensione spaziale, che definisce la geografia sensoriale dello spazio; una dimensione percettiva, che orienta il visitatore e ne stimola la sfera emotiva; una dimensione relazionale e mediale, che modula le interazioni; e una quarta dimensione connettiva, ipotizzata come spazio operativo e teorico in cui curatore e designer co-progettano il suono come dispositivo narrativo trasversale. Viene inoltre proposta una classificazione dei possibili livelli d'interazione sonora – passiva, reattiva, adattiva e dialogica – che descrive una progressione crescente di complessità relazionale tra visitatore e ambiente sonoro, fino alla co-creazione partecipativa. Per supportare tali approcci, lo studio introduce tre strumenti progettuali: la *Partitura sonoro-allestitiva*, che descrive in forma diagrammatica la drammaturgia sonora lungo il percorso espositivo; la *Tela delle narrazioni sonore*, che guida il progettista nella definizione di fruitore, esperienza d'ascolto e strategie narrative; e il *Sistema notazionale della narrazione sonora*, che traduce in rappresentazioni visive le strutture compositive del suono (linearità, stratificazione, contrasto, ritmo). Tali strumenti sono stati sottoposti a validazione empirica in un workshop progettuale presso l'ADI Design Museum di Milano. In conclusione, l'articolo muove verso una logica integrativa e interdisciplinare, che riconosce il sound design come variabile strutturale del progetto museale. La ricerca individua tre direzioni future: lo sviluppo di strumenti di analisi, progetto e valutazione dell'esperienza sonora; la ridefinizione dei percorsi formativi orientati verso nuovi profili professionali che non possono prescindere dal dialogo tra competenze umanistiche, progettuali e tecniche; e la riflessione sulla conservazione e l'aggiornamento degli allestimenti sonori in un'epoca di rapida obsolescenza tecnologica.

Raffaella Trocchianesi

Raffaella Trocchianesi: Architetto e Professore associato presso il dipartimento di Design del Politecnico di Milano. Insegna Design degli Interni e Exhibition Design presso la Scuola del Design. È coordinatrice del gruppo di ricerca e progetto *DeCH-Design for Cultural Heritage*. È direttore del Master *IDEA-Exhibition Design* e del corso di specializzazione *Design e Tecnologie Digitali per il Patrimonio Culturale Intangibile*. Svolge attività progettuale, didattica e di ricerca prevalentemente nell'ambito del design per la valorizzazione dei beni culturali in termini di allestimento, museografia, nuovi modelli di fruizione, narrazione e linguaggi per la cultura, relazione tra design Humanities e arti. È responsabile scientifico del progetto di ricerca *Sound Design and Cultural Heritage* relativo al ruolo narrativo del suono all'interno di percorsi espositivi e del progetto *Smart Lighting in Museums: an innovative light-sensing and adaptive control system for Palazzo Ducale in Mantua*.

CC BY 4.0 License

<https://creativecommons.org/licenses/by/4.0/>

©Raffaella Trocchianesi, 2026

<https://doi.org/10.60923/issn.3034-9699/26202>

Il suono come materia di progetto nell'allestimento narrativo

Nel contesto della valorizzazione del patrimonio culturale, i Sound Studies – e più nello specifico il Sound Design – rivestono un'importanza fondamentale nel plasmare e concepire nuove modalità di esperienza culturale, nell'arricchire le narrazioni e nel favorire il coinvolgimento del pubblico. In particolare – nell'ambito della costruzione curatoriale e allestitiva – le “sceneggiature” alla base del modello narrativo di un museo o di una mostra temporanea, possono trovare nella materia sonora una fondamentale espressione per nuovi linguaggi espositivi.

Negli ultimi dieci anni si registra una crescente attenzione al ruolo dell'elemento sonoro nella sfera museologica e museografica, come dimostrato dall'emergere di ambiti quali il *sound-driven design*,¹ la curatela del suono, la sound art e le pratiche di archiviazione sonora;² tuttavia, questa non è ancora materia del tutto disciplinata dal punto di vista scientifico-accademico, pur essendo significativi alcuni studi che verranno citati nella trattazione del presente contributo. Nel settore professionale, il sound design in ambito museografico è ampiamente praticato, senza però un *frame* strutturato né un protocollo che ne analizzino criticamente l'applicazione o ne codifichi l'impiego.

Questi aspetti mettono in luce come la componente uditiva sia sempre più riconosciuta come tema centrale nelle scienze umane e nella progettazione legata al patrimonio, in un'epoca segnata da una profonda trasformazione digitale. Parallelamente, un numero crescente di pro-

fessionisti integra il suono come elemento imprescindibile dei propri interventi, come emerge da numerose scelte progettuali che lo pongono al centro dell'opera complessiva. Studi professionali quali Studio Azzurro, NEO, Karmachina, Camera nebbia, Fuse, Dotdotdot – solo per citarne alcuni – impiegano il suono quale fondamentale “materia di progetto” integrata nella pratica allestitiva. I loro lavori si sostanziano in spazi ibridi dove la componente artistica svela nuovi linguaggi espressivi e di fruizione.

Si rivelano fondamentali alcuni studi sull'uso e sull'effetto del suono all'interno del museo.

In particolare, il lavoro di Candela e de Visscher,³ basato su un progetto di ricerca tra Royal College of Art e Victoria & Albert Museum, teorizza l'uso del sound design come strumento critico per comunicare storie museali in modo “polifonico”. Gli autori si basano sulle qualità del suono associate a *embodiment*, vocalità e memoria, proponendo un approccio che integra sound design, storia e museologia critica. Bubaris⁴ pone particolare enfasi sulle modalità con cui le qualità spazio-temporali dell'esperienza sonora possono contribuire a riconsiderare la distanza tra il visitatore e opere/oggetti/contenuti esposti. Cortez⁵ propone cinque categorie paradigmatiche per descrivere come i materiali sonori siano stati considerati dai musei in termini concettuali nel corso del tempo e per mappare le pratiche espositive che ne derivano: il suono come strumento didattico, il suono come atmosfera, il suono come artefatto, il suono come arte e il suono come curatela partecipativa. La stessa autrice studia come l'impiego

del suono in contesti museali possa essere considerato un eccezionale strumento per articolare un'idea di spazio come costruzione sociale.⁶

Riccò,⁷ nell'affrontare il complesso tema dell'*accessibilità museale*, indaga il ruolo del suono nella ridefinizione del concetto di fruizione culturale pensata e progettata per essere esperita su più di un canale di comunicazione mettendo al centro gli aspetti percettivi. Questo tema della percezione multisensoriale viene indagato anche da Levent (esperta di accessibilità e museologia) e Pascual-Leone (neuroscienziato) basando le pratiche allestitivo su solide basi cognitive ed esplorando come la plasticità cerebrale e la percezione incarnata (*embodiment*) possano orientare il design degli spazi espositivi.⁸

Se pure da angolazioni diverse, ne emerge che il racconto riguardante qualsiasi progetto allestitivo si avvale di strategie, strumenti e applicazioni che non possono eludere la dimensione sonora quale dispositivo narrativo in grado di generare e trasmettere significati inediti o di accentare specifici elementi della collezione o della "storia". Il compito del curatore e dell'exhibit designer dovrebbe tenere conto di una collaborazione multidisciplinare in cui il ruolo del suono entra in una strategia condivisa.⁹

Alcuni degli articoli del presente numero inquadrano il tema del sound partendo dal presupposto che il percorso museale/allestitivo è una narrazione. È proprio all'interno di questa cornice, di questo approccio curatoriale e progettuale, che s'inserisce la domanda di ricerca di questo saggio: in che modo il sound design

può contribuire alla concezione e alla costruzione di allestimenti narrativi e quali strumenti progettuali possono contribuire a questa integrazione? Strumenti che possano guidare il progettista alla creazione, allo sviluppo e alla gestione consapevole dell'elemento sonoro.

Si pensi alla funzione del suono nelle tre principali dimensioni attraverso le quali si articola la narrazione allestitiva:

Nella *dimensione spaziale* il suono contribuisce a definire la geografia percettiva dello spazio. Esso può assumere una consistenza diffusa, avvolgendo il visitatore in un paesaggio continuo che unifica le aree espositive; oppure puntuale, localizzando sorgenti che segnano soglie, transizioni o punti di interesse. Attraverso la sua interazione con i materiali – riverberando su superfici riflettenti o fonoassorbenti – il suono rivela, accentua o attenua la materialità del contenitore architettonico, rendendo lo spazio stesso parte attiva del racconto.

Nella *dimensione percettiva* il suono può orientare il visitatore nel percorso; non solo traccia direzioni, ma scandisce i tempi dell'esperienza. Inoltre, esso stimola direttamente la sfera emotiva e mnemonica costruendo una relazione empatica tra visitatore e racconto.

Nella *dimensione relazionale e mediale*, il suono può facilitare o supportare le interazioni, rendendole più intuitive; se dosato dinamicamente nello spazio, può potenziare il dialogo con gli elementi allestitivi e, di conseguenza, anche con i contenuti; può modulare la prossemica e favorire la condivisione.

Si può ipotizzare una quarta dimen-

sione, in grado di orchestrare le tre precedenti: una *dimensione connettiva* in cui le figure del curatore e del progettista dialogano e intervengono in modo interdisciplinare, al fine di proporre una fruizione integrata.

Infatti, le tre dimensioni sopra menzionate – spaziale, percettiva, relazionale-mediale – agiscono come piani distinti ma interconnessi. Tuttavia, senza una regia superiore, rischierebbero di rimanere separate: la dimensione spaziale definisce la fisica del luogo, quella percettiva l'esperienza sensoriale soggettiva, quella relazionale e mediale le dinamiche di interazione con i contenuti e tra visitatori. La quarta dimensione connettiva è l'ipotesi di un livello operativo e teorico capace di orchestrare le tre variabili in tempo reale, sia in fase di progettazione sia durante la fruizione. Essa non si aggiunge fisicamente alle altre, ma le mette in relazione attiva, trasformando il suono da elemento tecnico a fattore narrativo trasversale attraverso un'interazione interdisciplinare continuativa tra due figure generalmente separate: il curatore (che definisce la narrazione, i contenuti, le sequenze emotive) e il progettista (che definisce lo spazio, i materiali, l'illuminazione, e appunto il sound design). La quarta dimensione connettiva è lo spazio di lavoro condiviso in cui queste due figure non si limitano a scambiarsi informazioni, ma co-progettano ogni scelta sonora come parte integrante del racconto allestitivo.

Passando a esempi concreti: nella *dimensione spaziale*, il curatore decide che una certa sala deve trasmettere isolamento; il progettista interviene sul suono con un riverbero lungo e pochi riflessi. Nella

quarta dimensione, questa scelta viene discussa non come effetto tecnico, ma come segno narrativo: l'isolamento acustico diventa una punteggiatura della storia.

Nella *dimensione percettiva*, il suono orienta il visitatore. Curatore e progettista decidono insieme dove un suono puntuale segna una svolta tematica, e dove invece un suono diffuso accompagna una transizione. La quarta dimensione connettiva si occupa di garantire coerenza tra intenzione narrativa (curatoriale) e resa percettiva (progettuale).

Nella *dimensione relazionale e mediale*, il suono può modulare la prossemica. In questa quarta dimensione, si progetta per esempio un suono che si intensifica quando due visitatori si avvicinano allo stesso punto espositivo, favorendo la condivisione. Qui curatore e progettista dialogano su soglie, dinamiche e feedback, superando la tradizionale divisione tra contenuto e contenitore.

In sintesi, la quarta *dimensione connettiva* è lo spazio teorico e operativo in cui entrambi diventano coautori di un'esperienza integrata, dove il suono non racconta *accanto* alle cose, ma *con* le cose, attraverso le tre dimensioni orchestrate da un'unica regia.

Il ruolo del suono nel contesto allestitivo può essere considerato secondo un gradiente di interazione che va da un minimo a un massimo di coinvolgimento in termini di partecipazione da parte del visitatore. Integrando i contributi di Kaghat sull'audio adattivo e le evidenze emergenti da pratiche museali partecipative,¹⁰ si possono ipotizzare quattro livelli d'interazione sonora:

passiva, reattiva, adattiva e dialogica. Questa classificazione intende descrivere una progressione crescente di complessità relazionale tra visitatore e ambiente sonoro, dove il fruitore transita gradualmente dalla posizione di spettatore a quella di co-creatore:

Suono passivo: il suono c'è, ma non cambia; l'interazione è solo percettiva.

Si tratta di una modalità di fruizione in cui il visitatore è esposto a un ambiente acustico che non richiede alcuna azione per essere attivato o modificato. L'ascolto avviene prevalentemente in modalità *background*,¹¹ consentendo un'esperienza condivisa e accessibile a tutti, senza barriere tecnologiche o cognitive. Pur in assenza di interazione diretta, il suono passivo contribuisce alla costruzione dell'atmosfera, all'orientamento spaziale e alla dimensione collettiva dell'esperienza museale. In questa categoria rientrano sia il suono ambientale diffuso (*soundscape*), sia il silenzio progettato come dispositivo percettivo.

Suono reattivo: in questo caso il suono cambia in risposta a un'azione. Si tratta di inserire nell'allestimento dispositivi che si attivano e si trasformano in risposta diretta al movimento, alla prossimità o al gesto del visitatore. Si pensi, ad esempio, a una sala in cui – varcando una soglia – si dispiega un paesaggio sonoro legato all'opera osservata, oppure a un'installazione che modula la propria componente audio in base a come ci si avvicina o ci si muove attorno ad essa. In questo contesto, il suono reattivo assume il ruolo di facilitatore strategico: non si limita a fornire un riscontro funzionale, ma diventa un vero e proprio me-

diatore silenzioso dell'esperienza espositiva, rendendo intuitiva la relazione con lo spazio e con le opere: suggerendo percorsi, creando attese e favorendo l'esplorazione. Lontano da logiche didascaliche, questo approccio agisce sul piano sensoriale e relazionale, trasformando la visita in un'esperienza immersiva in cui il pubblico è parte attiva del racconto espositivo.

Suono adattivo: qui il suono cambia in base al comportamento del fruitore nel tempo (ad es. più ci si avvicina, più il volume di un dettaglio aumenta).

Il suono adattivo rappresenta un livello d'interazione più avanzato rispetto al suono reattivo, in quanto non si limita a rispondere a un singolo gesto o a un evento puntuale, ma evolve in relazione al comportamento prolungato del visitatore nello spazio e nel tempo. Mentre il suono reattivo reagisce a un'azione discreta (ad esempio, varcare una soglia o un movimento improvviso), il suono adattivo apprende, modula e trasforma continuamente le proprie caratteristiche (volume, timbro, spazializzazione, densità di eventi sonori) in base a parametri comportamentali dinamici come la durata della sosta, la traiettoria di avvicinamento, la velocità di spostamento o la ripetizione di determinati gesti. In questa prospettiva, il suono adattivo agisce come un supporto alla profondità dell'esperienza: non solo accompagna l'azione, ma ne rivela strati informativi progressivi, incoraggiando un'esplorazione più lenta, ripetuta o focalizzata. Ad esempio, in un allestimento archeologico, più un visitatore si avvicina a un reperto, più il suono amplifica dettagli acustici altrimenti impercettibili –

come il fruscio della pergamena, la risonanza di una cavità interna o il riverbero di un ambiente ricostruito – offrendo una prospettiva sonora variabile analoga a quella che si avrebbe osservando un oggetto con una lente d'ingrandimento.

Il suono adattivo si avvale degli studi sui sistemi audio-adattivi per ambienti museali¹² ed è stato utilizzato tanto nei sistemi di *user modeling* del progetto LISTEN,¹³ quanto in installazioni artistiche partecipative come quelle di Lupone e Galizia¹⁴ dove la posizione e il tempo di esposizione del pubblico determinano l'evoluzione del tessuto sonoro e l'applicazione di pianofoni e olofoni – quali strumenti per la spazializzazione del suono – può migrare dall'ambito artistico a quello progettuale.

Proprio dal punto di vista progettuale, il suono adattivo richiede sistemi di rilevazione più complessi (sensori di prossimità continui, tracking di traiettorie, analisi del tempo di esposizione) e una logica di controllo in grado di modulare i parametri sonori in modo fluido e non lineare.

In sintesi, mentre il suono reattivo risponde a un'azione, il suono adattivo risponde a un comportamento ed è in questa differenza che risiede la sua caratteristica di sostenere la profondità percettiva, la scoperta graduale e la relazione temporale tra visitatore, opera e spazio.

Suono dialogico: il suono diventa un agente della conversazione, materia di scambio e co-creazione tra fruitore e sistema espositivo.

Qui, il rapporto tra visitatore e ambiente sonoro si configura come uno scambio aperto e bidirezionale,¹⁵ in

cui il suono non si limita a rispondere a uno stimolo né ad adattarsi a un comportamento, ma partecipa attivamente alla costruzione dell'esperienza.

Il visitatore non attiva semplicemente contenuti preesistenti, bensì immette nel sistema materiali, scelte o azioni che ne modificano lo stato in modo contingente, spesso non interamente predeterminabile in fase progettuale. L'interazione cessa pertanto di essere reattiva (uno stimolo produce una risposta) o adattiva (il sistema si calibra sul comportamento implicito dell'utente) per divenire propriamente *dialogica*: il sistema sonoro propone e il visitatore risponde.

A differenza del livello adattivo – che modifica il suono in base a dati comportamentali raccolti implicitamente – il livello dialogico presuppone un'*agency* esplicita del visitatore, il quale può selezionare, manipolare, sovrapporre o persino generare materiali sonori che influenzano l'evoluzione del racconto.

L'atteggiamento progettuale dialogico può avvalersi di tre modalità di intervento sonoro da parte del pubblico.

Registrazione e immissione: quando il visitatore è invitato a *registrare* e *depositare* materiali sonori propri – una voce, un suono ambientale, un commento – che il sistema trattiene, trasforma o ricontestualizza all'interno del racconto espositivo, talvolta rendendoli disponibili per i fruitori successivi.

Scelta e composizione: in altri contesti il visitatore *compon*e attivamente il proprio paesaggio sonoro selezionando e sovrapponendo trac-

ce, strati narrativi o fonti documentarie preesistenti. Qui l'interazione non è reattiva (gesto-suono) ma dialogica perché il visitatore *scrive* una partitura momentanea che va ad "abitare" lo spazio.

Produzione, riproduzione e stratificazione: questa modalità prevede input di natura non sonora – traiettorie di movimento, scelte testuali, dati fisiologici – che vengono tradotti in tempo reale in materiale audio sintetizzato, generando un'esperienza irripetibile e strettamente ancorata alla presenza fisica e alle azioni del singolo visitatore. Naturalmente l'interazione può avvenire anche a livello collettivo, accumulando e stratificando contributi di più fruitori facendo dell'ambiente sonoro un deposito in continua evoluzione delle tracce lasciate dal pubblico.

Si pensi ai musei storici o di cultura immateriale, dove la componente di archiviazione della memoria individuale e collettiva determina un fattore identitario forte, rendendo il suono un vero e proprio strumento di "scrittura" collettiva.

Laddove le modalità sonore precedenti possono ancora essere progettate come "esperienze chiuse", il suono dialogico richiede al contrario l'apertura di *spazi di indeterminazione*: aree d'esperienza non completamente specificate in fase progettuale, ma che emergono in modo estemporaneo. Per il sound designer e il curatore, questo significa progettare non tanto un *testo sonoro*, quanto piuttosto una *grammatica di possibilità*.

Va detto, quindi, che l'approccio dialogico presuppone una condizione relazionale molto più comples-

sa in quanto conferisce al pubblico una sorta di corresponsabilità dei contenuti presenti nel museo. Questo comporta un cambio di postura progettuale. Si deve tenere conto, però, che questo tipo di apertura alla co-creazione può presentare aspetti critici e frizioni: il rischio di confusione percettiva e cognitiva; la questione dell'autorialità del contributo; gli aspetti di coerenza narrativa complessiva in un sistema così aperto e difficilmente controllabile; l'impiego di risorse tecnologiche e manutentive; la progettazione di un'interfaccia che non deve lasciare dubbi sulle modalità d'interazione.

È importante considerare questi quattro livelli non in un crescendo valoriale, ma come possibili atteggiamenti curatoriali e progettuali da dosare e impiegare tenendo conto di diverse variabili: contestuali, culturali, economiche e sociali.

Non si dimentichi inoltre il valore del silenzio quale "materia di progetto" – così come il "vuoto" nella gestione della composizione volumetrica in ambito architettonico non come assenza ma come presenza complementare al "pieno" – quale dispositivo percettivo a tutti gli effetti. Suono e silenzio, quindi, possono entrambi essere dosati – in caso di disabilità visiva, ad esempio – come orientamento: nel primo caso lasciando al fruitore la piena sensibilità percettiva di cogliere spontaneamente i segnali ambientali, nel secondo conferendo specifiche sonorità allo spazio, creando aree di fruizione diversificate.

È importante, quindi, parlare di silenzio progettato come dispositivo percettivo a tutti gli effetti, di silenzio come parte del continuum sono-

ro, ovvero del *sound/silence continuum*.¹⁶

Strumenti *design-driven* per la progettazione sonora nell'allestimento

La componente sonora è una delle variabili progettuali fondamentali per la narrazione espositiva. Il progettista ha il compito di organizzare e formalizzare la strategia e la modalità con cui questa narrazione diventa spazio fruibile. Lo spazio allestitivo, quindi, si pone come contesto ideale di sperimentazione dove verificare nuovi atteggiamenti progettuali e una pratica ad alto potenziale narrativo. L'allestimento si può intendere come la costruzione di un sistema comunicativo in grado di orientare, coinvolgere e guidare l'esperienza del pubblico. Il museo stesso "è una forma di comunicazione non verbale, che ha nei suoi oggetti le proprie specifiche parole".¹⁷ Una consapevole gestione del rapporto suono-silenzio potenzialmente facilita la differenziazione di percorsi dedicati a pubblici diversi esplorando dimensioni multisensoriali. Questo approccio comporta la progettazione di sistemi e dispositivi adattivi e responsivi, volti a creare nuove "immagini" della conoscenza, nuove gestualità e, soprattutto, nuovi comportamenti "abitativi" all'interno dello spazio museale.

A fronte di questa complessità narrativa e comunicativa, la progettazione espositiva necessita di nuovi strumenti che orientino progettista e curatore nella gestione e verifica del rapporto tra contenuto, sistema espositivo e spazio. Da un lato il curatore deve pensare a un modello narrativo basato su gerarchie, se-

quenze, relazioni tra opere, accenti e pause; dall'altro il progettista deve interpretare spazialmente questa "composizione coreografica" giocando con le variabili spazio-temporali, ma anche con elementi sensoriali quali forme, colori, finiture, luci e suoni volti a rendere il percorso di visita un'esperienza memorabile.

Prima di entrare nel merito degli strumenti progettuali relativi alla gestione del suono nell'allestimento, preme illustrare quello che ne ha costituito la matrice generativa: si tratta di uno strumento di tipo analitico-progettuale volto a rappresentare l'applicazione specifica (all'interno di un museo o di una mostra temporanea) delle variabili progettuali di cui è costituito l'allestimento. Stiamo parlando della *Partitura allestitiva*¹⁸ direttamente collegata all'infrastruttura narrativa di un'esposizione. Il concetto di *partitura* muove dalla necessità di scomporre l'impianto ostensivo nelle sue diverse parti attraverso una modalità di restituzione scrittografica (appunti, schizzi, immagini) e concettuale che consenta una visione sequenziale, contemporanea e parallela dei diversi livelli di cui è costituita un'esposizione.

Si configura una lettura orizzontale a più variabili in cui vengono isolati diversi aspetti:

- *l'articolazione dei contenuti*, cioè la logica e l'ordine con cui sono esposte le opere (le sezioni della mostra e il filo conduttore generalmente definito dalla curatela);
- *l'organizzazione spaziale*: fortemente condizionata dal contenitore architettonico nonché dalla sequenza dei contenuti e dal taglio curatoriale; essa determina

il piano dei percorsi e l'atteggiamento progettuale che caratterizza l'impianto allestitivo di massa;

– *gli artefatti e dispositivi allestitivi* inseriti nei vari ambienti che stabiliscono un'effettiva relazione con il visitatore quali mediatori tra questo e il bene culturale;

– *le azioni e le meccaniche di interazione* tra il visitatore e il bene e tra il visitatore e gli altri visitatori in grado di determinare il modello di fruizione (contemplativo, interattivo, performativo ecc.);

– *il linguaggio* con cui si comunicano i contenuti, il registro narrativo e la cifra stilistica che caratterizza il progetto allestitivo e che si manifesta sia nel sistema grafico-comunicativo che nella scelta dei materiali, delle tecnologie, dell'interfaccia dei dispositivi allestitivi;

– *la linea del tempo*, cioè la durata della visita non solo nella sua totalità ma anche in rapporto alle singole sale e ai singoli artefatti espositivi: il ritmo, le pause e le accelerazioni che scandiscono l'intera fruizione.

A queste variabili se ne possono aggiungere altre, ad esempio quella del *Colorscript allestitivo*:¹⁹ volto a verificare la sequenza cromatica in termini di armonia/contrasto e omogeneità/eterogeneità. Tale strumento è ispirato a quello usato negli storyboard per film di animazione, dove la relazione cromatica tra figure, sfondo e sequenza di scene è elemento fondamentale per l'intera composizione iconografica.

In che termini la variabile sonora può entrare a tutti gli effetti all'in-

terno della partitura allestitiva? Si possono concepire e mettere a punto ulteriori strumenti di analisi e progetto focalizzati sul suono?

Per rispondere a queste domande sono stati sviluppati ulteriori strumenti metodologici in seno a uno specifico percorso di ricerca²⁰. Tali strumenti, interconnessi, sono basati sul ruolo del suono nell'allestimento permanente e temporaneo. Si è attinto alla letteratura scientifica incrociando concetti e strategie derivanti da dispositivi orientati alla ricerca e alla pratica progettuale relativi a diversi contesti in cui il sound design trova applicazione. Tali strumenti sono pensati sia per guidare le fasi iniziali del processo di design, stimolando al contempo pratiche di co-progettazione, in particolare tra exhibit designer, sound designer e curatori, sia per verificare le scelte progettuali fatte.

Il primo, che si pone in continuità con la *Partitura allestitiva* sopra descritta e ne risulta una sorta di spin-off, è la *Partitura sonoro-allestitiva/Exhibit sound score*²¹ successivamente dettagliata nell'ambito del progetto Sound.DeCH (fig. 1). Si tratta di un'elaborazione visiva per l'analisi e la progettazione avanzata, incentrata sull'esperienza fruitiva, che descrive in modo diagrammatico le narrazioni e i dispositivi sonori che si susseguono lungo il percorso espositivo. Anche in questo caso la rappresentazione è organizzata in linee orizzontali parallele, una per ciascuna variabile di progettazione. Questa si focalizza sui tre aspetti chiave del progetto espositivo: *contenuto*, *tempo* (dell'esperienza) e *spazio*, offrendo approfondimenti più dettagliati sulla drammaturgia sonora.

La variabile legata ai *contenuti* rappresenta l'impalcatura narrativa della mostra. Si tratta essenzialmente della sequenza dei temi e delle sezioni così come definita dalla struttura curatoriale, che procede generalmente lungo una traiettoria temporale lineare e sequenziale. Questa trama di fondo non è tuttavia un semplice schema organizzativo: essa costituisce una vera e propria drammaturgia sonora, poiché assegna a ogni parte dell'esposizione un contenuto audio specifico. È qui che si articola l'intera gamma delle scelte relative al suono. Si parte dal contesto mediale, che può includere audio narrativi lineari o non lineari, paesaggi sonori, componenti audiovisive, fino a soluzioni multimediali, crossmediali o transmediali. A questo si legano gli approcci alle narrazioni sonore, come la linearità, il contrasto, la stratificazione o il ritmo, e le funzioni che il suono è chiamato a svolgere, che possono essere evocative, informative, estetiche, iconiche o simboliche. Non mancano poi le strategie narrative in termini di performatività: il suono può essere drammatico, avvolgente, orientato alla scoperta o contemplativo. I registri espressivi spaziano dal nostalgico all'affettivo, dal ludico all'ironico, dal didascalico al poetico. Dal punto di vista categoriale, si può distinguere tra suono diegetico e non diegetico, musica, diverse forme di narrazione – come copioni, presentazioni teatrali, letture, dialoghi interattivi, racconti orali, interviste – e infine suoni ambientali. Le espressioni sonore concretamente impiegabili includono la voce, gli effetti sonori, la musica, i suoni naturali, il rumore e persino il silenzio. A monte di tutto ciò, si colloca la scelta tra suoni concreti o

sintetizzati. Infine, si devono tenere in considerazione le caratteristiche sonore propriamente dette, come le qualità generali, il timbro e la morfologia.

A questa dimensione contenutistica si affianca la variabile del *tempo*, che indica semplicemente la durata complessiva dell'esperienza culturale sonora, considerando il tempo parziale che i visitatori potenzialmente dedicano ai diversi momenti dell'esposizione.

Completa il quadro la variabile dello *spazio*, che riguarda le soluzioni contestuali e tecniche per realizzare le narrazioni sonore. Essa abbraccia diverse scale di intervento. In primo luogo, la scelta degli artefatti allestitivi: sistemi espositivi, materiali, forme e distribuzione spaziale. In secondo luogo, il grado di interattività può andare da soluzioni non interattive a sistemi reattivi fino a quelli pienamente interattivi. Vengono poi i sistemi di mediazione, come schermi tattili, dispositivi mobili, interfacce aptiche, sensori o sistemi basati sul movimento del corpo. Infine, un capitolo a sé è rappresentato dalle tecnologie audio e dagli impianti di amplificazione. Qui le decisioni progettuali riguardano la visibilità degli elementi (se vanno resi visibili o nascosti), la tipologia dei trasduttori (altoparlanti, attuatori, trasduttori, pannelli direzionali, docce sonore, cuffie a loro volta distinte in intraurali, sovraurali, circumaurali, semi-aperte o aperte), i canali di trasmissione (mono, stereo, surround, sia standard che site-specific), le modalità di spazializzazione – che possono andare da 0D a 3D fino a configurazioni SPATIAL²² – e infine gli interventi di correzione acustica ambientale.

EXHIBIT SOUND SCORE
Detailed scriptographic design of sound narratives, section by section, as a linear narrative (focus on audience's listening experience)

CONTENT	Museum/exhibition sections (from the beginning to the end)				
	Media context e.g. audio/storytelling - linear/non-linear; Soundscape; Audiovisual; Multimedia; Crossmedia; Transmedia				
	Sonic narrative approaches e.g. linearity/contrast/stratification/rhythm				
	Sound functions e.g. evocative / functional-informative / aesthetic (value range); indexical, iconic, Symbolic				
	Narrative strategies • Performativity (e.g. dramatic, enveloping, discovery, contemplative) • Registers (e.g. nostalgic, affective, ludic, ironic, didascalic, poetic) • Sound categories (e.g. diegetic/non diegetic; music; narratives: scripts/theatrical presentations/ readings/interactive dialogues/oral stories/interviews; ambient sounds) • Sound expressions (e.g. voice, sound effects, music, natural sounds, noise, silence) • Type of sounds (e.g. concrete, synthesised,...) • Sound characteristics (e.g. General qualities; Timbre; Morphology)				
TIME	Time of experience				
	Artifact mise-en-scène (e.g. displays and exhibits design, materials, shapes, spatial distribution,...)				
SPACE	Interaction • Interactions between sounds and other design elements (e.g. light, materials, objects on display, visuals, ...) • Interactivity (e.g. interactive, non interactive, reactive sounds) • Systems of mediation (e.g. touch screens, mobile devices, haptic, sensors, body movement)				
	PA systems • Appearance (eg. visible, hidden) • Typology (e.g. loudspeakers, actuators, transducers, directional panels, sound showers, headphones: intra-aural, supra-aural, circumaural/se-mi-open, open) • Transmission channels (es. mono, stereo, surround - standard or site-specific) • Spatialisation (eg. 0D, 1D, 2D, 3D, SPATIAL) • Room acoustics correction				

Fig. 1:
Partitura sonoro-allestitiva / Exhibit Sound Score, toolkit diagram, SounDeCH, Politecnico di Milano,
<https://www.soundech.it/>,
© Riva & Trocchianesi 2025.

Gli altri due strumenti sviluppati sono complementari tra loro: *Tela delle narrazioni* e *Sistema notazionale della narrazione sonora*. Questi si propongono come supporto al progettista per immaginare e rappresentare visivamente le caratteristiche principali dei progetti sonori, concentrandosi in particolare sulle esperienze d’ascolto, sulle strategie curatoriali e sulla drammaturgia del suono, rendendo esplicite le relazioni esistenti tra contenuto, spazio, tempo, pubblico e media.²³

Nello specifico, la *Tela delle narrazioni sonore/Sound narratives canvas* (fig. 2) si articola in quattro fasi di lavoro, di cui la prima presenta un carattere prevalentemente analitico, mentre le successive sono orientate alla progettazione.

Si parte innanzitutto da un *quadro generale del museo o della mostra*, vale a dire una sintesi delle caratteristiche principali dell’istituzione o dell’evento espositivo. In questa fase si guarda con particolare attenzione alla tipologia dell’allestimento: la durata, lo spazio che lo ospita, il dominio tematico o disciplinare, il contesto – che può essere fisico, digitale o ibrido – e l’ambiente sensoriale, seguendo la classificazione proposta da Lenzi e Ciuccarelli.²⁴ A questi si aggiungono le strategie curatoriali adottate, che possono essere di vario tipo: individuali o corali, esplicite o implicite, socio-geografiche, solo per fare alcuni esempi.

Il secondo punto riguarda il *fruitore*. Si tratta della prima fase propriamente ideativa, ed è interamente incentrata sulla tipologia di pubblico

atteso. Ci si interroga quindi sulle aspettative che i visitatori portano con sé, sugli obiettivi che intendono perseguire, sui diversi livelli di coinvolgimento che possono manifestare e, non da ultimo, sulle condizioni di accessibilità da garantire.

La terza area è quella dell'*esperienza di ascolto*, che rappresenta la seconda fase ideativa. Qui l'attenzione si sposta sulle modalità concrete attraverso cui il visitatore incontrerà il suono. Si definisce quindi il tipo di esperienza di ascolto che si intende proporre: immersiva, stereo, binaurale, individuale o collettiva, per citare alcune possibilità. Contestualmente, si chiarisce il contesto mediale di riferimento, che può essere multimediale, crossmediale o transmediale. Infine, si esaminano le relazioni che si instaureranno tra il progetto sonoro e l'acustica dello spazio architettonico, un aspetto spesso decisivo per la riuscita dell'allestimento.

Si arriva infine alle *narrative sonore*, che costituiscono la terza e ultima fase progettuale strettamente interconnessa con la strategia curatoriale adottata a monte. Questa si articola a sua volta su diversi piani. Innanzitutto, si delineano gli approcci relativi all'impiego del suono come medium, interrogandosi su ciò che il suono può fare: aiutare l'interpretazione, emozionare, facilitare l'apprendimento, coinvolgere, rendere accessibile un contenuto. Parallelamente, si definiscono le strategie narrative di fondo, che possono basarsi sulla storia con un approccio lineare (*story-based*), sulle tematiche con un approccio non lineare (*concept-based*) o sull'oggetto esposto ed eventuale biografia con un approccio episodico (*object-based*).

A queste si aggiungono gli approcci fruitivi, che orientano il modo in cui il visitatore si rapporta all'esperienza: si può puntare sulla contemplazione, sulla scoperta, sull'immersività o sulla drammaturgia. Infine, si scelgono i registri comunicativi più adatti al racconto che si intende costruire: nostalgico, emozionale, ludico, ironico, poetico o didascalico, a seconda del pubblico a cui ci si intende rivolgere e al linguaggio generale della mostra.

Il secondo strumento sviluppato: il *Sistema notazionale della narrazione sonora/Sound narratives notation* (fig. 3) è stato impostato in base all'analisi strutturata di venti casi di studio paradigmatici dell'impiego del suono nella narrazione espositiva che ha rivelato quattro principali linee interpretative volte a richiamare strutture compositive musicali: *linearità, stratificazione, contrasto e ritmo*. Tale strumento è ispirato alla pratica della notazione grafica nella musica elettroacustica, elettronica e computer-based; dalle diverse tecniche utilizzate dai sound designer per abbozzare le loro intenzioni sonore²⁵ nonché dalle strategie di visualizzazione dei dati (data viz) impiegate dai designer per rappresentare visivamente soggetti complessi.²⁶ Questo consente ai progettisti di tradurre la struttura spaziale, narrativa e uditiva della mostra in una rappresentazione visiva concisa, significativa e d'impatto.

Tutti gli aspetti sopra descritti sono variabili fondamentali che influenzano l'esperienza culturale e determinano la qualità della visita; per questo, un approccio metodologico e strutturato al progetto allestitivo

Fig. 2:
Tela delle narrazioni sonore / Sound Narratives Canvas, toolkit diagram, SounDeCH, Politecnico di Milano, <https://www.soundech.it/>, © Riva & Trocchianesi 2025.

Fig. 3:
Sistema notazionale della narrazione sonora / Sound Narratives Notation, toolkit diagram, SounDeCH, Politecnico di Milano, <https://www.soundech.it/>, © Riva & Trocchianesi 2025.

SOUND NARRATIVES CANVAS

Concept canvas to develop sound narratives (focus on audience's listening experience)

MUSEUM/EXHIBITION IDENTIKIT EXHIBITION/MUSEUM TITLE PLACE YEAR CURATOR EXHIBITION DESIGNER SOUND DESIGNER	MUSEUM/EXHIBITION TYPOLOGY 1 Duration ☐ Temporary ☐ Permanent ☐ Both Space ☐ Interior ☐ Exterior ☐ Both Domain ☐ Physical ☐ Digital ☐ Phygital Context ☐ Onsite ☐ Online ☐ Offline Sensory context ☐ Monosensory (list main sense) ☐ Multisensory (list involved senses)	EXPECTED AUDIENCE What audience do you imagine you will engage? What characteristics does it have? What ambitions and desires?	GOALS What are the objectives in terms of sound design? What communicative message do you intend to convey? What results are you aiming for? What needs are you trying to meet?	ENGAGEMENT (gradient) Semantic environment Sensory environment	ACCESSIBILITY 2 ☐ Inclusive ☐ Assistive listening systems ☐ Tactile cues ☐ Visual cues ☐ Textual cues ☐ Exclusive
	CURATORIAL STRATEGIES Narrative Approaches ☐ Chronologica ☐ Thematic ☐ Episodic ☐ Linear (sequential) ☐ Open ☐ Hypertextual ☐ Mixed Narrative Strategy ☐ Story-based ☐ Concept-based ☐ Object-based Curatorial perspectives ☐ Dominant/hidden stories ☐ Social, Geographic, Economic context ☐ Art and Design ☐ Material culture (tangible heritage) ☐ Unitary perspective / Coral perspective ☐ Identity ☐ Memory and nostalgia ☐ Industry ☐ Technology	SOUND AS MEANS ☐ Interpretation ☐ Emotion ☐ Learning ☐ Engagement ☐ Spatial Revelation ☐ Accessibility	LISTENING EXPERIENCE ☐ Stereo ☐ Immersive ☐ Binaural ☐ Spatial sound (ambisonic) ☐ Interactive ☐ Automatic ☐ Mixed ☐ Individual ☐ Collective ☐ Mixed	MEDIA CONTEXT ☐ Sound narrative ☐ Linear ☐ Non-Linear ☐ Soundscape ☐ Audiovisual ☐ Multimedia ☐ Crossmedia ☐ Transmedia	ROOM ACOUSTICS 3 Starting from the room acoustics (i.e. reverberant, soundproof,...), what interaction do you imagine between your sound project and the existing acoustics? Do you need corrections to the museum environment for your purposes?
		NARRATIVE STRATEGY ☐ Story-based (single stories, linearity) ☐ Concept-Based (themes, stratification, non-linearity) ☐ Object-based (scattered and dot stories, artifact biographies)	PERFORMATIVE STRATEGIES ☐ Dramatic (contrasts, dramaturgy) ☐ Enveloping (immersion, interactivity) ☐ Discovery (knowledge multiplying) ☐ Contemplative (aesthetic impact)	NARRATIVE REGISTERS 4 ☐ Nostalgic ☐ Affective/Emotional ☐ Ludic ☐ Ironic ☐ Didascallic ☐ Poetic	

1 Exhibition/Museum overview

2 Use case

3 Listening experience

4 Sound narratives

SOUND NARRATIVES NOTATION

Synthetic visualisation of how sound moves in space (focus on audience's listening experience)

Sonic approach
☐ Linearity
☐ Contrast
☐ Stratification
☐ Rythm

SPACE
Exhibition plan --> Absolute score

CONTENT
Objects and stories around objects -->
Notes or groups of notes
• objectual artifacts
• visual artifacts
• textual artifacts

SOUND
Sound narratives progression in space and time

RELATIONSHIPS
• phrase --> macro-themes tie several micro-stories together
• slur --> micro-stories tie several single stories together

DYNAMICS
use text, from pianissimo (nearly silence) to fortissimo (climax), with all intermediate variations, and/or line thicknesses

CRESCENDO/DECRESCENDO
Sound progression --> Experience progression

DISCRETE SOUNDS/CONTINUOUS SOUNDS
single stories (points) VS thematic narratives (broken lines/curves/spirals...)

INTERACTIONS
Interactive sounds (interactive/reactive)

consente di tenere sotto controllo variabili complesse e multilivello²⁷.

Gli strumenti analitico-progettuali sopra descritti sono stati sottoposti a una verifica empirica in contesto operativo. Una buona parte della letteratura si concentra sulla definizione di tassonomie funzionali del suono in ambito museale senza proporre necessariamente sistematiche indicazioni sulle procedure attraverso cui tali funzioni possano essere tradotte in scelte progettuali concrete, specialmente in presenza di vincoli allestitivi preesistenti (ad esempio come integrazioni in allestimenti museali permanenti). È proprio su questo scarto – tra *funzione descritta* e *processo operativo* – che si innesta la strategia di validazione illustrata di seguito.

La validazione è stata condotta nell'ambito di un workshop progettuale della durata complessiva di due settimane (di cui sei giorni in presenza, i restanti giorni di lavoro in autonomia), ospitato presso il Politecnico di Milano e incentrato sull'implementazione sonora della parte allestitiva permanente dell'ADI Design Museum a Milano. La scelta del museo non è casuale: la sua ricchezza di oggetti iconici e rappresentativi di fenomeni di costume, sociali e culturali si prestava particolarmente a una narrazione sonora che potesse rendere la visita più coinvolgente e immersiva. Questo aspetto ha posto i partecipanti di fronte alla sfida di integrare interventi sonori senza alterare né la fruizione visiva né il percorso fisico esistente.

Hanno preso parte al workshop sei giovani progettisti, suddivisi in tre gruppi misti, con profili disciplinari complementari: exhi-

bit designer, interaction designer e communication designer. Tale eterogeneità è stata volutamente ricercata per testare la *traducibilità pluridisciplinare* degli strumenti proposti, ovvero la loro capacità di costituire un lessico condiviso tra figure professionali con competenze progettuali complementari che abitualmente affrontano il progetto museale con linguaggi e priorità differenti. Resta ancora da validare lo strumento tra profili con ruoli non progettuali: sound maker (artisti) e curatori. In questo caso sicuramente la questione della codificazione di un linguaggio condiviso risulterebbe più complessa e articolata.

La strategia di validazione si è fondata su tre criteri principali, ciascuno dei quali è stato reso osservabile attraverso specifici indicatori.

In primo luogo, è stata valutata la *valenza euristica* degli strumenti, intesa come l'attitudine a orientare il ragionamento progettuale nelle fasi iniziali, riducendo il tempo di ideazione e il numero di soluzioni abbandonate.

In secondo luogo, si è misurata la *traducibilità operativa* degli strumenti, ovvero la capacità intrinseca di costituire un lessico condiviso tra le diverse specializzazioni progettuali presenti – exhibit, interaction e communication design – facilitando la negoziazione e la convergenza tra sensibilità e scale di intervento differenti. Questo criterio è stato rilevato attraverso un questionario di autovalutazione somministrato al termine del workshop.

In terzo luogo, è stato considerato il criterio della *coerenza contestuale*, volto a verificare che gli output progettuali generati attraverso l'impiego degli strumenti risultassero

effettivamente aderenti ai vincoli museali e al brief assegnato: il rispetto dell'allestimento permanente esistente, la coerenza narrativa con il racconto museale e la fattibilità tecnica delle soluzioni proposte. La rilevazione è avvenuta tramite una sessione di presentazione dei concept di fronte a una commissione di esperti, oltre che ai conduttori del workshop.

In conclusione, le categorie interpretative hanno funzionato come *attivatori di pensiero progettuale*, orientando le discussioni di gruppo verso questioni pertinenti (relazioni suono-spazio, suono-tempo, suono-oggetto esposto). La traducibilità interdisciplinare è risultata particolarmente elevata tra designer, ma una validazione tra figure professionali diverse resta ancora da verificare. Inoltre, è necessario prevedere una semplificazione di alcune categorie in quanto non sono state ritenute sufficientemente chiare da poter essere applicate in autonomia.

Verso un lessico condiviso e una pratica integrata

Concludendo, interessa mettere in evidenza alcuni aspetti cruciali di questo ambito di studio e – in termini ancora più ampi – della selezione di saggi qui raccolta. Alimentare il dibattito disciplinare, culturale e tecnico è molto importante in un panorama museale sempre più complesso e articolato, in cui il ruolo del suono assume un'importanza via via più riconosciuta, ma non ancora pienamente codificata.

Riconoscere il sound design come disciplina di studio e come pratica progettuale nell'ambito dell'allestimento e della museografia significa,

innanzitutto, compiere un duplice movimento. Da un lato, attribuire al termine “design” – accanto a “sound” – una progettualità che non è finalizzata esclusivamente, né principalmente, al suono in sé, bensì al ruolo del suono come variabile progettuale tra le tante che entrano in gioco nella definizione del percorso di visita: la luce, la grafica, le tecnologie digitali, la scansione temporale dell'esperienza. Dall'altro lato, significa andare oltre il limitante uso del suono come “aggiunta decorativa” o “effetto atmosferico”, per intenderlo invece come dispositivo strutturale in grado di supportare l'organizzazione dello spazio, la gestione dei tempi, la modulazione delle relazioni e la generazione di percorsi narrativi.

In quest'ottica è importante superare una logica meramente additiva – il suono come strato sovrapposto a un allestimento già definito – in favore di una logica integrativa e contestuale: il progetto sonoro introdotto dalle fasi iniziali del processo curatoriale e museografico, come una delle variabili che concorrono a definire la sceneggiatura espositiva. Questo implica un ripensamento delle prassi professionali consolidate e, in particolare, delle modalità di collaborazione tra figure che talvolta agiscono separatamente: curatori, museografi, sound designer, architetti, light designer, tecnologi. Una delle sfide è quella di costruire un alfabeto comune – un lessico condiviso, ma anche un metodo di lavoro interdisciplinare – che consenta a queste figure di dialogare su basi paritarie, senza che nessuna dimensione (visiva, spaziale, sonora, narrativa) venga subordinata a un'altra.

Un ulteriore aspetto emerso è la dimensione relazionale del suono: questo non si limita a veicolare contenuti informativi o a creare un'atmosfera, ma costruisce e modula la prossemica tra i visitatori, può facilitare l'interazione con i display, crea condizioni di ascolto condiviso o individuale.

Guardando al futuro della ricerca in questo campo, si profilano almeno tre direzioni meritevoli di approfondimento. La prima è di ordine metodologico: come si documenta, analizza e valuta criticamente un allestimento sonoro? Quali strumenti – descrittivi, analitici, valutativi – possono essere messi a punto per rendere conto dell'esperienza sonora del visitatore, restituendo al tempo al progettista elementi utili per iterazioni successive? La seconda è di ordine formativo: come si formano i sound designer capaci di operare in contesti museali, e come si formano i curatori e i museografi a dialogare consapevolmente con la dimensione sonora, ma soprattutto a lavorare in team mettendo a frutto competenze umanistiche, progettuali e tecnico-specialistiche? La terza, infine, è di ordine conservativo e di aggiornamento: che cosa significa preservare un allestimento sonoro nel tempo, in un'epoca di rapida obsolescenza tecnologica? Come si documenta e si rende riproducibile un'esperienza sonora che è per sua natura contingente, situata, legata a specifici dispositivi digitali? E come si può aggiornare in funzione di cambiamenti relativi alla collezione, alla narrazione, alla tipologia di pubblico?

Se questi interrogativi restano in larga parte aperti, ciò che queste riflessioni critiche e i contributi qui

raccolti esprimono chiaramente è che la progettazione della dimensione sonora – anche nella negazione del suono stesso se fatta come scelta consapevole e maturata insieme alle altre variabili di progetto – è questione fondamentale nel contesto museale contemporaneo. Si tratta di una lente attraverso cui ripensare criticamente l'intera esperienza espositiva: le sue narrazioni, le sue spazialità, le sue temporalità, le sue relazioni. Alimentare il dibattito disciplinare, culturale e tecnico su questi temi non è solo un atto dovuto, è una condizione necessaria affinché il museo contemporaneo – così come il mondo delle mostre temporanee – si configuri come uno spazio inclusivo, polisensoriale, abitabile, memorabile e adattivo.

Endnotes:

- 1 Delle Monache, Misdariis, Özcan 2021.
- 2 Numerose iniziative testimoniano questa tendenza: si possono citare il convegno *Exhibiting Sounds of Changes* (2018), un fascicolo monografico del 2019 della rivista *Curator: "The Museum Journal"* dedicato alla presenza del suono negli spazi museali, e la sezione tematica su suono e design all'interno della conferenza DRS 2022 tenutasi a Bilbao.
- 3 Candela, de Visscher 2023.
- 4 Bubaris 2014.
- 5 Cortez 2022.
- 6 Cortez 2023.
- 7 Riccò 2023.
- 8 Levent, Pascual-Leone 2014.
- 9 Everett 2019.
- 10 Kaghat et al. 2020.
- 11 Truax 2001.
- 12 Zimmermann, Lorenz, Specht 2003; Kaghat et al. 2020.
- 13 Zimmermann, Lorenz 2008.
- 14 Capanna, Lupone 2019.
- 15 Freire, 1970.
- 16 Oliveros 2005.
- 17 Balboni Brizza 2006, p. 57.
- 18 Trocchianesi 2014.
- 19 Trocchianesi 2023.
- 20 Finanziamento Farb *SounDeCH-Sound Design for Cultural Heritage*, Responsabile scientifico: Raffaella Trocchianesi, Research fellow: Micol Riva (<https://www.soundech.it/>).
- 21 Zhang, Trocchianesi 2023.
- 22 Riva, Trocchianesi 2023; Riva, Zhang, Trocchianesi 2025.
- 23 Udsen, Halskov 2024.
- 24 Riva, Trocchianesi 2025.
- 25 Lenzi, Ciuccarelli 2024.
- 26 Hug 2020; Delle Monache, Rocchesso 2019.
- 27 Lenzi, Ciuccarelli 2024; Caiola, Lenzi, Riccò.
- 28 *Gli strumenti progettuali qui descritti relativi al suono sono stati implementati ed elaborati in seno al progetto Farb SounDeCH-Sound Design for Cultural Heritage, Responsabile scientifico: Raffaella Trocchianesi, Research fellow: Micol Riva* (<https://www.soundech.it/>).

References:

- Balboni Brizza 2006: Balboni Brizza M. T., *Immaginare il museo*, Milano, Jaca Book, 2006.
- Bubaris 2014: Bubaris N., *Sound in museums – museums in sound*, in “Museum Management and Curatorship”, 2014, 29, 4, pp. 391-402, DOI: <https://doi.org/10.1080/09647775.2014.934049>.
- Caiola, Lenzi, Riccò 2022: Caiola V., Lenzi S., Riccò D., *Audiovisual sonifications: A design map for multisensory integration in data representation*, in Lockton D., Lenzi S., Hekkert P., Oak A., Sádaba J., Lloyd P. (a cura di), *DRS2022: Bilbao*, Bilbao, Design Research Society, 2022, pp. 25-27.
- Candela, de Visscher 2023: Candela E., de Visscher E., *Learning from “The Sounding Object”: Sound Design in the Critical Reimagining of Museum Object Narratives*, in “Design Issues”, 2023, 39, 2, pp. 57-71, DOI: https://doi.org/10.1162/desi_a_00717.
- Capanna, Lupone 2019: Capanna A., Lupone M., *Ambiente-Forma-Opera*, in “L’architettura delle città - The Journal of the Scientific Society Ludovico Quaroni”, 2019, 11, 15, pp. 59-79.
- Cortez 2022: Cortez A., *Museums as sites for displaying sound materials: a five-use framework*, in “Sound Studies”, 2022, 8, 1, pp. 43-72, DOI: <https://doi.org/10.1080/20551940.2021.1975442>.
- Cortez 2023: Cortez A., *Sound as a producer of social spaces in museum exhibitions*, in “Curator: The Museum Journal”, 2023, 66, 2, pp. 317-328, DOI: <https://doi.org/10.1111/cura.12547>.
- Delle Monache, Misdariis, Özcan 2021: Delle Monache S., Misdariis N., Özcan E., *Conceptualising sound-driven design: An exploratory discourse analysis*, in “ACM International Conference Proceeding Series”, 2021, DOI: <https://doi.org/10.1145/3450741.3465258>.
- Delle Monache, Rocchesso 2019: Delle Monache S., Rocchesso D., *Sketching sonic interactions*, in Filimowicz M. (a cura di), *Foundations in sound design for embedded media*, New York, Routledge, 2019, pp. 79-101.
- Everrett 2019: Everett T. A., *A Curatorial Guide to Museum Sound Design*, in “Curator: The Museum Journal”, 2019, 62, 3, pp. 313-325, DOI: <https://doi.org/10.1111/cura.1230>.
- Freire 1970: Freire P., *Pedagogy of the Oppressed*, New York, Herder and Herder, 1970.
- Hug 2020: Hug D., *How Do You Sound Design? An Exploratory Investigation of Sound Design Process Visualizations*, in *Proceedings of the 15th International Audio Mostly Conference (AM'20)*, Graz, ACM, 2020, pp. 114-121.
- Kaghat et al. 2020: Kaghat F. Z., Azough A., Fakhour M., Meknassi M., *A new audio augmented reality interaction and adaptation model for museum visits*, in “Computers & Electrical Engineering”, 2020, 84, DOI: <https://doi.org/10.1016/j.compeleceng.2020.106606>.
- Lenzi, Ciuccarelli 2024: Lenzi S., Ciuccarelli P., *Designing tools for designers: The Data Sonification Canvas*, in Gray C., Ciliotta Chehade E., Hekkert P., Forlano L., Ciuccarelli P., Lloyd P. (a cura di), *DRS2024: Boston*, Design Research Society, 2024, pp. 1-14.
- Levent, Pascual-Leone 2014: Levent N., Pascual-Leone A. (a cura di), *The Multisensory Museum. Cross-Disciplinary Perspectives on Touch, Sound, Smell, Memory, and Space*, Lanham, Maryland, Rowman & Littlefield, 2014.
- Oliveros 2005: Oliveros P., *Deep Listening: A Composer's Sound Practice*, New York, iUniverse, 2005.
- Riccò 2023: Riccò D. (a cura di), *Accessibilità museale*, Milano, FrancoAngeli, 2023.
- Riva, Trocchianesi 2025: Riva M., Trocchianesi R., *Designing sounds for exhibitions. Tools to enhance sound-driven design strategies*, in D. de la Prida, J. Ramis, M. Machimbarrena (a cura di), *Proceedings of the 11th Convention of the European Acoustics Association Forum Acusticum / EuroNoise 2025*, atti del convegno (Forum Acusticum EuroNoise 2025, Malaga, 23-26 giugno 2025), Malaga, EAA - European Acoustic Association, pp. 6059-6066.
- Riva, Zhang, Trocchianesi 2025: Riva M., Zhang Y., Trocchianesi R. “Sound and Synaesthesia. A holistic perspective to exhibition design”, VIII International Congress “Synaesthesia: Science and Art”, Malaga, ©Fundación Internacional Artecittà, Alcalá la Real – Jaén, 2025.

- Trocchianesi 2014: Trocchianesi R., *Design e narrazioni per il patrimonio culturale*, Santarcangelo di Romagna, Maggioli Editore, 2014.
- Trocchianesi 2023: Trocchianesi R., *Esperienza culturale. Approcci e strumenti design driven*, in Zanella F. (a cura di), *Design! Oggetti, processi, esperienze*, Milano, Electa, 2023.
- Truax 2001: Truax B., *Acoustic Communication*, seconda ed., Westport (CT), Ablex Publishing, 2001.
- Udsen, Halskov 2024: Udsen A. S., Halskov K., *Sonic placemaking—facilitating listening behaviour through design*, in “The Design Journal”, 2024, 27, 2, pp. 328-346.
- Zhang, Trocchianesi 2023: Zhang Y., Trocchianesi R., *Perspectives of Sound: Promoting Social Inclusion Under the Principle of “Access for All” in Museums*, in “DIID”, 2023, 1, Digital Special Issue 1, pp. 384-393. DOI: <https://doi.org/10.30682/diiddsi23t2q>.
- Zimmermann, Lorenz, Specht 2003: Zimmermann A., Lorenz A., Specht M., *User Modeling in Adaptive Audio-Augmented Museum Environments*, in Brusilovsky P., Corbett A. T., de Rosis F. (a cura di), *User Modeling*, Berlin-Heidelberg, Springer, 2003, pp. 403-407, DOI: https://doi.org/10.1007/3-540-44963-9_57.



The synesthetic power of sound in exhibition design: From sound as trigger to sound as interpreter

Marco Borsotti

Keywords:

Exhibition Design, Museum Studies, Narration, Soundscapes, Multisensory Spaces.

ABSTRACT:

Museums and exhibitions are increasingly becoming places of narration. The design of their exhibition systems implies not only “displaying” but rather developing a “participatory planning that generates shared and sharable culture”. This proposal starts from the central premise that exhibition design must intercept and activate the *perceptual capacities of our senses*. Our contemporary world is increasingly inclined to an obsessive spectacularization of images; storytelling, however, is based on listening by its very nature. It is inherently auditory, even before being visual. In the sphere of exhibition design, combining sound and sight means enhancing the capacity of environments and artefacts to enter into *sympiotic resonance* with visitors, triggering a *synaesthetic condition* in which a new sense, unconsciously called into play, activates different experiential levels, involves the other senses, and generates *perceptual concatenations*. Specifically, through the analysis of some paradigmatic case studies, this article aims to explore what happens when sound interacts with exhibition content, bringing it to life, and to examine the curatorial approaches and the methodological and operational choices that underpin them. Here, sound acts as a catalyst or accompaniment, ultimately becoming the interpreter of the narrative, thus fulfilling the dual role of both content and narrative and participatory tool.

Musei e mostre sono sempre più luoghi di narrazione. La risoluzione dei loro sistemi allestitivi non si attua soltanto nel “mettere in mostra”, quanto nello svilupparsi come “progettualità partecipata che genera cultura condivisa e condivisibile”. Questo contributo muove dall’assunto principale che l’allestimento deve saper intercettare, attivandole, le *capacità percettive dei nostri sensi*. Il nostro mondo contemporaneo è sempre più incline a una spettacolarizzazione ossessiva delle immagini; la narrazione, invece, si basa per sua stessa natura sull’ascolto. È intrinsecamente uditiva, prima ancora che visiva. Nell’ambito dell’allestimento espositivo, affiancare il suono alla vista significa, dunque, potenziare straordinariamente la capacità degli ambienti e degli oggetti di entrare in *risonanza simbiotica* con i visitatori, innescando una *condizione sinestetica*, dove un nuovo senso, inconsciamente chiamato in gioco, attiva livelli esperienziali diversi e coinvolge gli altri quattro, generando *concatenamenti percettivi*. In particolare, questo contributo intende esplorare, attraverso l’analisi di alcuni casi studio paradigmatici, cosa accade quando il suono intercetta i contenuti allestitivi e li anima, per verificarne gli approcci curatoriali e le scelte metodologiche e operative. Ecco, allora, che il suono agisce come innesco o accompagnamento, fino a diventare l’interprete stesso della narrazione, generando il duplice ruolo di contenuto e di strumento narrativo e partecipativo.

Opening Picture:

Migliore+Servetto Architects, Milan, Chopin Museum. Photo by Marcin Czechowicz. Courtesy Migliore+Servetto Architects.

Marco Borsotti

Architect, PhD in Interior Architecture and Exhibition Design, Associate Professor at Politecnico di Milano/AIUC School/DABC Department. He is a member of the Board of Lecturers of the PhD in Architectural, Urban and Interior Design and a lecturer at the Master IDEA Exhibition Design. He mainly deals with contemporary exhibition design in terms of museography and new narrative models for enhancing tangible and intangible cultural heritage.

CC BY 4.0 License

<https://creativecommons.org/licenses/by/4.0/>

©Marco Borsotti, 2026

<https://doi.org/10.60923/issn.3034-9699/26203>

Sound as a *Communicative Synthesizer*

Museums and cultural exhibitions are increasingly becoming places of storytelling. The design of their exhibition systems is not simply a matter of “displaying,” but rather of developing them as a “participatory project that generates shared and sharable culture.”¹ It can be said, therefore, that exhibition design has become a complex ecosystem, where design strategies are developed that define the encounters not only between the collections on display and their visitors, but also between the multiple levels of narrative that can be revealed and activated by and for both, thus creating places filled with evocative presences. Both collections and visitors are, in fact, “carriers of stories”² and museums and exhibitions must make these stories “inhabitable”, not only in the interaction between space and objects, but also between these and the memories, sensations, and suggestions that accompany them and make them more deeply comprehensible. “The impact of the storytelling approach can be (...) radical. It can open up new topics, new ideas, and convey stories from every angle. Not just top-down histories, but bottom-up stories which invert, question, and interrogate.”³ The senses constantly accompany us in the stories that define our individuality and our belonging to a community, and help in establishing our choices and actions, shaping our personal inclinations with an intensity that the rational part of our behavior often ignores. Yet, we all have conscious experience of how a scent, a taste, or a sound can trigger within us sudden chains of relationships that project us into scenarios

of our own experience or give rise to new ones, allowing us to summarize the accumulation of knowledge with specific sensorial relationships that transcend the mere “calculable” boundaries of space and time, generating *a memory of things*. Yet, most of our modes of communication – and exhibitions, which are essentially a three-dimensional communication apparatus, are no exception – are based on the preponderant, unavoidable, and almost invasive use of images, almost as if sight were the only sense capable of guiding us through everyday life.⁴

Indeed, we live in a contemporary world that tends to privilege sight as the dominant sense, in an obsessive spectacularization of images⁵ that, however, in their unconditional proliferation, become increasingly less significant, within a process that pursues *simulacra*,⁶ rather than models that look to reality, originality, and concreteness. Pervasive and omnipresent images – initially advertising and television, today our mobile devices, merciless multipliers of images to be consumed in a few seconds –⁷ have lost the “corporeal dimension of photography to become a numerical sequence.”⁸ This decline is part of a general crisis in communication, also spread thanks to a culpable unawareness of the other human senses. A crisis that feeds on the proliferation of *storytelling*, emptied of its capacity to generate meaning.

Everyone’s talking about narratives these days. Yet, paradoxically, the very fact that narratives are used in every context signals

*a crisis in the narrative experience. At the heart of this noisy storytelling lies a narrative void that manifests itself as a lack of meaning and a loss of direction. Neither storytelling nor even the narrative turn is capable of sparking a return to narrative.*⁹

Thus begins Byung-Chul Han's essay *The Crisis of Narration*. Later, the renowned philosopher clarifies:

*Today, storytelling is booming. So much so that it has created an atmosphere in which it seems possible to tell each other stories again. In reality, the spread of storytelling has a completely different meaning from narrative practice. It serves, above all, to make stories instrumental and marketable.*¹⁰

Yet, museums and exhibitions, if they consistently pursue their cultural and social mandate – thus excluding their “mainstream”¹¹ deviations – are repositories of non-commercial narratives. “Museums are places of community and sharing. Propagators of identity and historical awareness, they are promoters of critical thought.”¹² Places where we encounter the past, present, and future, to discover, learn, and participate, orienting ourselves in the meaning of things, traversing stories large and small, the ambition of eternity, and the wisdom of everyday life. “What moves every person who looks back is – and

should be – the desire to move forward: through history, we proclaim who we are and what we want to become”.¹³

Museums and cultural exhibitions, therefore, are *places of narration*. Contemporary storytellers welcome the memory of what has been and project it into the “memory of what will be”. By creating conditions for remembrance, they activate “the practices, representations, expressions, knowledge, skills – as well as the instruments, objects, artefacts and cultural spaces associated therewith – that communities, groups and, in some cases, individuals recognize as part of their cultural heritage”.¹⁴

Narrative, moreover, is, by its very nature, a two-way relationship based on listening. Narration, therefore, is aural, even before it is visual (or tactile, olfactory, or gustatory). In the context of exhibition design, combining sound with sight means, therefore, exceptionally enhancing the ability of environments and objects to enter into *sympathetic resonance* with visitors, triggering a *synesthetic condition*, where a new (but ancient) human sense, unconsciously called into play, activates other levels of experience and awakens the other four, generating perceptual chains.

Sound can also represent change in the sensory environment, drawing visitor attention by raising intrigue. (...) Neurocognitive studies have shown that capturing attention reflexively by presenting an auditory cue assists percep-

*tion of visual stimuli at the same location.*¹⁵

fact, a powerful design tool for triggering and developing *critical narratives*.

Furthermore, sound is itself narrative: it evokes, conveys, and makes recognizable circumstances, objects, and people, associating itself with places, times, and experiences – be they social, collective, or individual – just like the main categories of human memory.¹⁶ In doing so, sound makes a vast amount of “decryptable” information, very quickly and intuitively: sound is therefore a *communicative synthesizer*. It can be said that sound encourages us to “look”, as it generates different levels of interaction, depending on its multiple characteristics and the resulting sensorial outcomes.¹⁷ After all, as Ellen Lupton writes, sound is “personal,” “haptic,” “spatial,” and “synesthetic.”¹⁸

*Sound design, in an expanded sense, can open up the roles that sound has to play within design practices as a critical tool – particularly in experience and communication design. As something that is fleeting but that also is physical and spatial, felt in the body, and connected to concepts and politics of the voice, vocality, and memory, sound is suited for prompting questions, for destabilizing that which is thought to be stable, and for re-examining what we think we know.*¹⁹

From sound as trigger to sound as interpreter.

What role can sound play within an exhibition design system? And what happens when sound, in its various meanings, becomes the subject of the exhibition itself, the motif and fulcrum of the curatorial and exhibition narrative, generating the dual role of both exhibit content and narrative and participatory tool?

The fundamental assumption is that the use of audio should not simply be a complementary solution, brought into the exhibition design to enhance visitors’ emotional engagement episodically; rather, it should represent an opportunity to offer a different perspective on the content, constituting an integral part of it, made available to the public itself. The presence of audio is, in

Incorporating audio into the exhibition system means *activating listening practices* among visitors, whose senses will be stimulated more deeply and comprehensively, generating differentiated levels of awareness of the contents and contexts presented. How these practices can be operationalized and incorporated into the exhibition ecosystem is, of course, intrinsically linked to multiple parameters, from curatorial choices to the configuration of the exhibition space, from the narrative structure to the impact of sound on the overall staging system.

A few case studies, freely selected from recent projects, can provide methodological insights that, while not exhaustive, identify recognizable and distinctive attitudes toward the use of sound in exhibition de-

sign. Through them, a wide range of different ways of configuring a soundscape in relation to the multiple sources activated, the relationships they establish with the narrative structure of the environmental setup, and their mutual interaction are explored. Particular attention will be paid to the resulting perceptual outcomes and their role in the broader understanding of the exhibition and its ability to generate interactions with the individuals who attend.

Sound as *Environmental Redundancy*

To provide a powerfully evocative synthesis of the theme of unity in different human cultures, Ralph Appelbaum Associates and Mona Kim Projects presented *Voices*, an exhibition centered on an intensely immersive hemicyclical environment, at the first Universal Forum of World Cultures, held in Barcelona in 2004. The title is a declaration: to speak about languages and communication in the world, placing voices, oral expression, and the sound of speaking at the center.

The challenge: we live in a world with 191 countries, 5,000 languages, and +6 billion inhabitants. Yet 95% of all languages may disappear in this century. How do we create a powerful message and experience to reach the public's heart, and lend a sense of urgency to this stark reality? (...) The resulting set of spaces combined 500 min-

*utes of footage, +300 images, words, light, and sound to create a never-been-done-before exhibition format which was completely media and image-driven.*²⁰

A large hemisphere, constructed from a 12-meter-high open-mesh metal structure, surrounds visitors with a kaleidoscope of emotionally impactful images, focused on the faces of ordinary people, interspersed with zooms detailing their features, gestures, and expressions. These images are displayed by 46 digital projectors with 114 localized speakers. Along the outer perimeter, 42 multimedia stations provide statistical information on languages spoken around the world, translations, learning, and more. The power of the visual impact is evident, but it is equally clear that sounds, in this case human voices, play a fundamental role in triggering the narrative.²¹ Visitors are surrounded by a choral, polyphonic outcry that, despite the objective impossibility of deciphering all the words spoken – who knows all the languages on the planet? – generates an immediate awareness of the wide variety of cultural values that the human race embodies. After all, just imagine what would happen if the video sequences were missing their soundtrack: a visual “bombardment” without a recognizable soul.

Sound as the *Intimacy of Dialogue*

In *Sensitive City*, conceived and designed by Studio Azzurro for the Italian Pavilion at the 2010 Shanghai Expo, six cities (Siracusa, Matera, Spoleto, Lucca, Chioggia, and

Trieste) and their still-human-scale lifestyles are portrayed and revealed, guiding visitors through a highly empathetic and highly natural communication experience, despite the extensive use of digital solutions (11 video programs, 11 video projectors, 9 computers, 1 IR system for sensitive surfaces, 4 holographic screens). Indeed, “the places are described through the testimonies of those who inhabit them, eight hundred people who can be addressed by the public with a simple wave of the hand. A gesture that becomes interaction, a sensitive insight into lived stories, into personal perspectives on the city.”²² Here, the aesthetic experience of exploration is triggered by the sequential action of touching and listening. Extending your hand to stop and activate the digital testimonial delicately brings us back to the mutual attention of physical contact, while willing ourselves to pay attention to the words of the unknown interlocutor who appears before us implies a poetics of listening that is an invitation to mutual understanding, to exchange, to the making available of one’s time, granted in the mutual pleasure of the intimacy of a direct dialogue, despite its digital dislocation. One could almost say that the images, which also surround the visitor, recede and return to being the visual complement of the spoken words. Sound and time, in their synchronized editing, accompany each other and expand the perception of the moment of a chance but precious encounter, in the experiential infinity that will return to memory for times to come.

Sound as a “held note”²³

In 2015, Rome, his beloved hometown, hosted *Renato Zero. The exhibition*. It is dedicated to one of the most popular Italian singers of all time. The installation by NEO Narrative Environments Operas encourages visitors to engage with a multifaceted artist who, from his earliest days, combined his vocal talents with a powerful stage presence – initially rebellious and transgressive, then, by the late 1990s, more intimate and minimalist. The exhibition looks at the artist, the character, and also the man, and in doing so, casts a profound gaze on Italian society, its contradictions, ambiguities, and weaknesses. Hence, the choice of the DNA metaphor, as an element common to all human beings, yet unique to each of us, becomes the common thread that leads the visitor to discover the artist’s most human nature and his evolution.

*(...) the inspiring idea that characterizes the journey (...) is linked to the concept of DNA, that is, the set of information that constitutes the genetic heritage of a living being and, speaking of the human race, that which makes us simultaneously similar and different from one another. The narrative path represents an ideal transcription of Renato Zero’s genetic code, of that DNA that made him, through his courage, his heart, and his intelligence, a stubbornly different man and, at the same time, our brother.*²⁴

Two long, opposing walls welcome the visitors as they proceed through dense sequences of images, documents, and photographs by the artist, juxtaposed with references to Italian history over the past sixty years and interspersed with red and white light bars – evoking DNA strands – that intertwine different narrative layers, conceptually uniting them into a single life experience. Numerous video inserts give voice not only to Zero's songs, but above all to his words, through excerpts from interviews and conversations he held with his audiences during concerts.

*Renato Zero's film and photographic documents, but above all his words and music, accompany the audience through the Italian history of the last fifty years, arranged as individual constituent parts of a single sequence. (...) Renato Zero's music and words alternate with the sounds of life flowing in a continuous interweaving, underscoring the substance of things.*²⁵

The flow of sounds is continuous and shifts seamlessly from music to speech, from ambient sound to punctual sound, in an almost natural flow that finds its privileged moments in the encounter with the singing and, above all, the words of Renato Zero, who becomes the narrative voice of the exhibition. This occurs, with particular intensity, in the long sound corridor located halfway through the exhibition, where

excerpts from interviews introduce the metaphor of the years of Zero's artistic "fall" whose "rebirth" materializes in the audience's ovation after his famous performance at the Sanremo Italian Song Festival. *Zero* is a multisensory installation where sound takes visible form in the digital luminescence of numerous video contributions, and words intertwine with music, like a single narrative text spanning an entire lifetime.

Sound as a Narrative Counterpoint

When one of the world's most important historical music publishing companies decides to celebrate its 200th anniversary with an exhibition, it's clear that music becomes the conceptual and narrative heart of the event. In 2008, Atelier Brückner was invited by Bertelsmann AG and Ricordi & C. to exhibit in Brussels some of the treasures of the Ricordi Archive, an extraordinary guardian of the history of the Italian opera tradition – arguably the most renowned in the world of opera, not least because of the recognition it received from UNESCO, which included it in the Representative List of the Intangible Cultural Heritage of Humanity in 2023.²⁶

The narrative structure of *That's Opera* allows visitors to fully participate in the entire process of creating an opera: "The exhibition guides the visitor into the 'backstage' area of the world of opera. Here, five theme-based areas illustrate the genesis, namely the 'making of' an opera – from the 'Libretto', the 'Score', 'Scenography', 'Voices and Costumes', and on to the final performance, the 'Rappresentazione'".²⁷



1

Each space pursues a strong emotional gradient, achieved through an intensely dramatic staging, accompanied by music whose presence or absence emphasizes the relationship between the exhibited objects and the logical sequence of the *making of*. Thus, the exhibition's *Prologue* invites the visitor to pass through several red curtains to encounter a screening of a performance of *Aida*, while in the *Libretto* room, the presence of the original scores is emphasised by the absence of sound: writing as an internalization of the creative process of music. In a strong perceptual contrast, in the "Score" room, the space is filled with sound, metaphorically transposing the experience of the so-called "mystic gulf" or orchestra pit. This careful sequence of sound presences, strongly contextualized to the main narrative system – the discovery of the "behind the scenes" – and to the collection on display, generates a sort of auditory counterpoint that avoids the risk of transforming the visiting experience into

a mere audition of selected famous pieces: a design choice that fully responds to the concept of *museum synaesthesia* theorized by Uwe R. Brückner, co-founder of the Atelier.

*Scenography has a long-term effect on visitor reception. In a good exhibition, understanding through observation and thus visual perception is not at the centre, but rather it offers an experience which addresses several senses at the same time. The term used for this is "museum synaesthesia" and means that the exhibition is perceived at the same time by seeing, moving, hearing, and sometimes even by touching and smelling.*²⁸

Fig. 1:
Studio Azzurro,
Milan
Fabrizio De Andr . La mostra.
Photo by
Fabio Cirifino
Courtesy
Studio Azzurro.

Marco Borsotti

The synesthetic power of sound in exhibition design: From sound as trigger to sound as interpreter



Sound as a *Game of Complicity*

A major traveling event, created by Studio Azzurro, toured Italy between 2009 and 2011 as a tribute to one of its most beloved singer-songwriters, *Fabrizio De André*. *The exhibition* traces not only his creative journey but above all the complexity of his imagination, his poetry, and his social and political sensibilities. The result is five sections populated with images and objects, among which visitors are invited to observe, but first and foremost to listen, often taking direct action to access the Genoese musician's sonic world. In the *Poetics* room (fig. 1), some of his songs, representative of the main themes of his work – Genoa, women, anarchy, the underdog, war, and death – combine audio and video in a vision that superimposes the singing onto the lyrics and the evocative images they portray. In the *Music* room, instead, by choosing a De André album cover and placing it on a *sensitive table*, information about the history of that recording and its contents is displayed, and

clips from interviews that refer to the historical and social context that inspired the individual songs are activated. An intriguing logical inversion, where the vinyl does not generate the sound, but rather explains it, revealing its creative background, and making it a narrative of itself (fig. 2). Finally, large video installations bring to life De André's most beloved characters, "revisited as figures from the universe of tarot cards, a world the singer-songwriter had chosen as the backdrop for his latest tour".²⁹ The installations imagined by Studio Azzurro transform the visit into a subtle game of complicity, where the content is offered to an audience that must take action firsthand and encounters the sound, not only as a musical track, but above all as oral testimony, in a logic where both provide access to an understanding of the layered complexity of human and artistic factors that lie "behind" a piece of music and that, first and foremost, qualify the depth of a unique artist's vision.

Fig. 2:
Studio Azzurro,
Milan
Fabrizio De André. La mostra.
Photo by
Fabio Cirifino
Courtesy
Studio Azzurro.

Sound as a *Listening Practice*/1

The key tenet of the exhibition design project for the *Chopin Museum* in Warsaw, created in 2010 by Migliore+Servetto Architects, is the development of “emotional landscapes and soundscapes.”³⁰ These “landscapes” allow visitors to access the world of the Polish composer and pianist through multiple thematic tracks, developed with multiple multimedia systems that involve public interaction as an open system of exploration and deepening. “The special atmosphere of the exhibition, stimulating both the imagination as well as the senses, is due to the careful combination of historical exhibits, music, scents, interactive elements and design.”³¹

The narrative structure becomes multidimensional, and sound acts as a supporting experiential layer. “The project clearly operates with a sound layer as an essential part of the exhibition, and not only as its background.”³² Thanks to the use of *Radio Frequency Identification* (RFID) technology that enables automatic data identification and storage, the numerous digital tools present throughout the exhibition allow visitors to access additional content and audio contributions, thanks to exhibition elements that trigger different musical listening practices. Thus, in the room dedicated to the musician’s hometown, “Warsaw”, three individual stations allow visitors to listen to Chopin’s youthful compositions in a personal and “intimate” way, while in the *Micolaj Chopin room*, immersed in a white space, the back wall becomes transparent and reveals a view of the living room of Chopin’s paternal home, which comes alive with its in-

habitants and, above all, the sounds of everyday life (fig. 3). Again, in the room dedicated to the “French period”, the ambient background music of the garden of George Sand’s house, the artist’s beloved summer retreat, contrasts with Chopin’s contemporary work, which is diffused throughout the room when drawers containing musical scores are opened. The most lyrical moments in the use of sound as a generative system of emotional engagement are achieved in two places with profoundly different narratives: the *Composer’s room* and the *Death room*. While in the first room (fig. 4), in fact, a true musical visualization is realized:

*We then design a large, bright installation cascading on the 14 different stations for study and investigation. The electroluminescent light, moving along the long vertical plates containing musical notation from Chopin, visually translates the rhythm of the musical piece, diffuses in the background,*³³

in the second one, it is the total absence of sound – an inescapable silence, achieved thanks to an anechoic environment, where the end of Chopin’s life and thus of his musical creation is dramatically crystallized – that suggests how this end is nothing other than the beginning of access to the eternity of his artistic legacy. In the *Chopin Museum*, the audio component is intrinsically linked to the visitor experience and the unfolding of a narrative in



3

which the objects in the collection transcend the static nature of their physical condition, becoming dynamic interpreters of a pervasive soundscape.

Sound as a *Listening Practice*/2

The *Caruso Museum*, dedicated to one of the greatest opera performers of all time, tenor Enrico Caruso, created in 2023 at the Royal Palace of Naples by NEO Narrative Environments Operas, is an intensely sonic place, paying homage not only to the unique voice of its protagonist³⁴ but also to the pervasive musicality that permeates the streets of his hometown. In the monumental Sala Dorica, visitors encounter multiple audio contributions integrated into the exhibition system by iconic elements revisited for exhibition purposes – from gramophones to

vinyl records – through multiple modes of experience, such as multimedia tables, 3D animations, film installations, and as many as 43 audio stations.³⁵ The museum adopts a *Beacon* system (small transmitters based on *Bluetooth Low Energy* (BLE) technology, capable of sending short-range radio signals to smartphones, tablets, and other mobile devices equipped with decoding apps), which allows visitors to listen to music and podcasts, as well as use audio guides, in close visual connection with the objects and iconography arranged along the route, thus offering a customizable, multi-layered exploration. The exhibition narrative unfolds along the parallel thread of the artist's private and public persona and makes extensive use of digital technology to enable multiple moments of interaction, where audio plays a

Fig. 3:

Migliore+Servetto
Architects, Milan
Chopin Muzeum
Photo by
Marcin Czechowicz
Courtesy
Migliore+Servetto
Architects.

prominent and scenographic role. A striking feature is the presence of five large video-projected discs (fig. 5), each dedicated to a musical piece that marked a milestone in the rise of the “Caruso legend”. These discs display looped images triggered by the visitor’s passage and synchronized with the audio content. A little further on, the records are displayed in their original form: eight 33-rpm vinyl records recorded by the tenor, which visitors can ideally “play” by selecting tracks from their mobile phone (fig. 6), thanks to *Near Field Communication* (NFC) technology, which allows for the automatic identification and pairing of two devices, initiating a two-way data exchange, without the use of cables or login credentials. Finally, numerous display and multimedia tables feature tags that allow access to dedicated podcast content. The entire highly immersive exhibition system is shaped in its aesthetic and formal aspects by the multifunctional ac-

cessibility of audio content, which structures the timing and modalities of the relationship between space, collection, and visitor.

Conclusions

The selected case studies span the last twenty years, presenting experiences developed by leading international studios, each characterized by diverse vocations and approaches: from the rigorous and holistic methodological approach of Atelier Brückner³⁶ to the aesthetic-technological-narrative evolution of Studio Azzurro, which consolidates the principle of “narrative” museums,³⁷ to the ongoing integrated and innovative research that distinguishes NEO Narrative Environments Operas and the active and disruptive cultural principle of the contemporary museum embraced by Migliore+Servetto Architects.³⁸



Fig. 5:
NEO Narrative
Environments
Operas, Milan
Museo Caruso
Photo by
Carlo Oriente
Courtesy
NEO Narrative
Environments
Operas.

Everyone is fully aware of the synesthetic power of sound in exhibition design. Therefore, the presence of sound is never a simple matter of sensorial complementarity but rather of integrated action, first of all within the curatorial narrative program, and then within the entire environmental ecosystem. To borrow Stefania Zuliani's words³⁹ it is aimed at "destabilising the exhibition canon", understood as a merely visual and monosensorial layout.

Exhibiting sound thus becomes a matter of coordinated, modulated, rhythmic, alternating, and blended intersections between noise-and-voice-and-sound-and-music, in a scenario that stimulates the visitor, often an active participant in initiating the synesthetic process itself.

*Sight isolates, whereas sound incorporates; vision is directional, whereas sound is omnidirectional. The sense of sight implies exteriority, but sound creates an experience of interiority. (...) Hearing structures and articulates the experience and understanding of space. We are not normally aware of the significance of hearing in spatial experience, although sound often provides the temporal continuum in which visual impressions are embedded.*⁴⁰

Almost fifty years have passed since the premiere of one of the most brilliant interpretations of the synesthetic power of sound, conceived by director Steven Spielberg for

the movie *Close Encounters of the Third Kind*, which he wrote and directed.⁴¹ In the iconic final scene, in fact, with extraordinary and visionary visual intensity, Spielberg represents the realization of the first encounter between humans and alien entities, through a dialogue based on a simple musical sequence of five notes, which a pianist – who, in the crescendo of the frenzy of performance, will alternate with a computer – and a colossal extraterrestrial spaceship – which will act as a kaleidoscopic cosmic linguistic instrument – perform in an increasingly whirling and powerful manner. Behind the pianist, an immense luminous screen represents the succession of notes through the lighting and extinguishing of sequences of colored horizontal bars: a sort of super-pixel LED wall *ante litteram*. By overcoming the specialized cryptic nature of the graphemes of a score and transforming music into an event readable and comprehensible to all, the artifice defines a coordinated system that involves sight and hearing, as well as the physicality itself determined by the powerful sound vibrations performed.

In an unstoppable crescendo, the film's key sequence thus unfolds a multisensory communication based on the repeated set of five sounds – four notes, two of which are separated by an octave, written by John Williams, at Spielberg's direct direction, who wanted them to be understood as the musical transposition of the word "hello" – and their instantaneous chromatic visualization. Spielberg thus transforms the most imaginative of "extraterrestrial" dialogues into an unexpected collective sensorial experience, crowned by the final transposition

of the notes into gestures – inspired by the Kodaly method for teaching music to children – as, finally, the first form of universal greeting. Spectators witness sound becoming music becoming language. Music is transposed into light and gestural sequences. Multiple sensorial engagements that introduce physical contact and the culture of encounter, here benevolent, friendly, and welcoming.

In many ways, this cinematic sequence is a sort of involuntary premonition of a manifesto for contemporary exhibition design – not coincidentally, a design discipline with many kinships with the seventh art – that aspires to the “staging” of a multisensory experience, where content reveals its narrative and therefore cultural, social, artistic, and historical significance, also thanks to digital tools that find in sound an extremely effective signifier, capable of reaching the invisible, that which encompasses and transcends sight.

A signifier that acts as a performative element to generate surplus information or as an interpreter to define and structure new levels of understanding and access to knowledge, in a system that pursues the habitability of places dense with meaning, yet capable of making this “meaning” welcoming and engaging.

The focus shifts from the object to the narrative surrounding it, reconstructing a life that contextualizes the artifact, bringing it out of its immobile sacredness. Thus, by juxtaposing the physicality of the material objects, spaces, and bodies with the immaterial dimension of the multimedia narrative, one can suggest the invisible, or rather, give space to the interpretation of that lost vital and ritual component that completes the meaning of its presence.⁴²

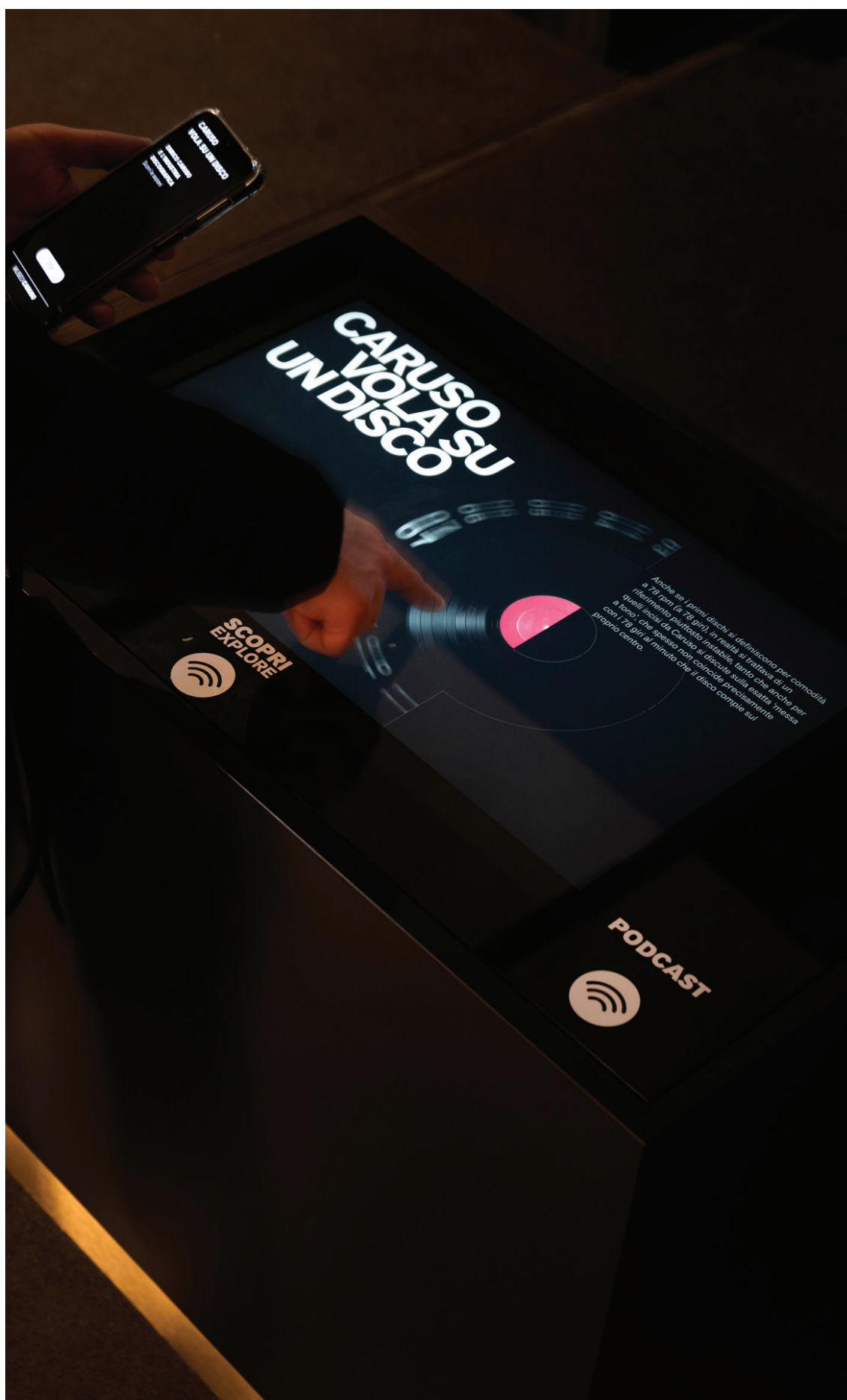


Fig. 6:
 NEO Narrative
 Environments
 Operas, Milan
Museo Caruso
 Photo by
 Carlo Oriente
 Courtesy
 NEO Narrative
 Environments
 Operas.

Endnotes:

- 1 Borsotti 2017. [Author's trans.]
- 2 Studio Azzurro 2011.
- 3 Hughes 2021, p. 3.
- 4 See also the first part of Zuliani 2024.
- 5 Debord 1968; Codeluppi 2007.
- 6 Baudrillard 2025.
- 7 “It was essentially only by chance that I noticed an article in front of me reporting on research by the Tate Gallery in London on how and to what extent, in the new era of hyperconnectivity, we pause before works of art in museums. The dwell time is impressive: 8 seconds.” Iotti 2020, p. 61. [Author's trans.]
- 8 “(...) photography, as we have known it for over a century, implied a real referent, a direct relationship with the event being photographed. But today, in the digital age, these coordinates are often only approximate, uncertain: images can be generated, modified, reused without any link to a recognizable origin. (...) ‘Image’ thus becomes a more elastic term, suitable for designating both a photo taken with a smartphone and an image generated by an algorithm, a 3D rendering, or any other visual form that the future will be able to invent.” Camporesi 2025, pp. 6-7 [Author's trans.]
- 9 Han 2024, p. 5. [Author's trans.]
- 10 Han 2024, p. 5. [Author's trans.]
- 11 Montanari, Trione 2017.
- 12 Migliore, Servetto 2025, p. 14.
- 13 Greppi 2024, pp. 11-12. [Author's trans.]
- 14 UNESCO 2003, *Text of the Convention for the Safeguarding of the Intangible Cultural Heritage*. (Paris, 17 October 2003). Article 2 – Definitions <https://ich.unesco.org/en/convention> (accessed on 29/01/2026).
- 15 Roppola 2012, p. 130. In the Article, the author also refers to Hopfinger J.B., Luck S.J., Hillyard S.A., *Selective Attention: Electrophysiological and Neuromagnetic Studies*, in Gazzaniga 2004, pp. 561-574.
- 16 Ricoeur 2012; Halbwachs 1987; Assmann 2002.
- 17 Lupton, Jasper, Wagner 2018, pp 68-128.
- 18 Lupton, Jasper, Wagner 2018, pp. 84-89.
- 19 Candela, de Visscher 2023, p. 57.
- 20 <https://www.monakimprojects.com/projects/voices#slide-21> (accessed on 29/01/2026).
- 21 It's useful to recall here, for conceptual assonance, what Stefania Zuliani writes about the traveling performance, staged in Kassel for *Documenta 13* by Janet Cardiff and George Bures Miller: “The place is created, revealed each time through the sound of the voice, which embodies the word and transcends it. Because the voice is not a servant of language, but a force that contradicts the transparency of sight, which overturns the privilege of the eye on which Western thought has been based at least since Plato, the ‘philosophy that closes the ears’ of which the museum is both the result and the instrument”. Zuliani 2024, p. 55. [Author's trans.]
- 22 <https://www.studioazzurro.com/opere/sensitive-city/> (accessed on 29/01/2026). [Author's trans.]
- 23 “The precise meaning of tenuto is contextual: it can mean either holding the note in question for its entire duration (or longer, with a slight rubato) or playing the note

slightly louder. In other words, the tenuto symbol can alter both the dynamics and the duration of a note. In either case, the notation indicates that a note should be emphasized.” [https://it.wikipedia.org/wiki/Articolazione_\(musica\)](https://it.wikipedia.org/wiki/Articolazione_(musica)) (accessed on 29/01/2026). [Author's trans.]

24 NEO Narrative Environments Operas, n.d., Works, *Zero*. <https://www.neo.mi.it/works/zero-la-mostra/> (accessed on 29/01/2026). [Author's trans.]

25 NEO Narrative Environments Operas, n.d., Works, *Zero*. <https://www.neo.mi.it/works/zero-la-mostra/> (accessed on 29/01/2026). [Author's trans.]

26 The Archive, founded in 1808, is the historical memory of the music publisher Ricordi, acquired in 1994 by the German multinational Bertelsmann, which has since ensured its preservation and cultural development. Its prestige lies in the variety of documents it preserves, which offer a comprehensive view of Italian culture, industry, and society. Housed in the Palazzo di Brera in Milan, the Archive collects scores, letters from composers, librettists, and singers, sketches and costume designs, librettos, period photographs, and Art Nouveau posters. (Ricordi Historical Archive) <https://www.archivioricordi.com/chi-siamo/l-archivio/> (accessed on 29/01/2026). [Author's trans.]

27 Atelier Brückner 2011, p. 258.

28 Atelier Brückner 2019, p. 154.

29 Studio Azzurro 2009, from the project report.

30 “The soundscape is defined by the constituent sounds of an auditorily perceived environment, whether they are “natural” or the result of human activity. The study of soundscapes is the primary object of acoustic ecology (or ecoacoustics). The term soundscape, and the studies that refer to it, owe their success above all to the work *The Soundscape* (1985) by the Canadian Raymond Murray Schafer, to the World Soundscape Project he founded in the second half of the 1960s (with the collaboration of, among others, Bruce Davis, Barry Truax, Hildegard Westerkamp), and more recently to the activities of the World Forum for Acoustic Ecology (WFAE). [https://www.treccani.it/enciclopedia/il-paesaggio-sonoro_\(Storia-della-civilt%C3%A0-europea-a-cura-di-Umberto-Eco\)/](https://www.treccani.it/enciclopedia/il-paesaggio-sonoro_(Storia-della-civilt%C3%A0-europea-a-cura-di-Umberto-Eco)/) (accessed on 29/01/2026). [Author's trans.]

31 https://muzeum.nifc.pl/en/muzeum/kolekcja-artykul/1026_fryderyk-chopin-museum/ (accessed on 29/01/2026).

32 Knast 2011, p. 75.

33 Knast 2011, p. 181.

34 “Caruso is a boy from the womb of Naples. He earns his living as an apprentice in a foundry, and in the evenings, he sings serenades among the tables of the restaurants on the seafront. Little Enrico doesn't yet know that one day he will become “the one, the only, the great Caruso” (Rosa Ponselle, *The New York Times Archives*, 25 febbraio 1973, p. 105). (Rosa Ponselle, *The New York Times Archives*, 25 febbraio 1973, p. 105). He doesn't even imagine that in his rich, fleshy timbre, capable of the colors of a baritone, in the cello-like sweetness of his legato, his contemporaries would recognize the most perfect incarnation of the “tenor of the new century.” Valente 2003. [Author's trans.] <https://www.marsilioarte.it/magazine/enrico-caruso-il-tenore-che-e-diventato-un-mito/> (accessed on 29/01/2026).

35 <https://ettsolutions.com/progetti/museo-caruso/> (accessed on 29/01/2026).

36 Atelier Brückner has consolidated a methodological practice called Creativ(e) Structur(e), which inserts each phase of the design approach into a multidisciplinary, integrated, and holistic system: “The Creativ(e) Structur(e) is the fundament of our design philosophy ‘form follow content’, it is method, navigation system, and curriculum at the same time. It helps to orchestrate all creative instruments in order to achieve a ‘Gesamtkunstwerk’, a holistic piece of art”. Atelier Brückner 2019, p. 172.

37 “The museum is increasingly becoming a place in which to live, to participate in a story through multiple stimuli (...) A dynamic, organic place, not only intended for

collection and exhibition, which marks the transition from the idea of a 'collection museum' to that of a 'narrative museum'. Studio Azzurro 2011, p. 13. [Author's trans.]

38 “(...) to shape a new concept of places of culture and encounter revolving around the idea we like to describe as “Museum Seeds”. (...) like a seed, a place of culture, must be capable of taking root in the surrounding urban and social fabric in order to activate new forms of behavior”. Migliore, Servetto 2025, p. 20.

39 Zuliani 2024, p. 62.

40 Pallasmaa 2012, p. 53.

41 *Close Encounters of the Third Kind (Incontri ravvicinati del terzo tipo)*, 1977, U.S.A., directed by Steven Spielberg, Columbia Pictures, EMI Films.

42 Studio Azzurro 2011, p. 13. [Author's trans.]

References:

Assmann 2002: Assmann A., *Ricordare. Forme e mutamenti della memoria culturale*, Bologna, Il Mulino, 2002.

Atelier Brückner 2011: Atelier Brückner, *Scenography. Making spaces talk. Projects 2002-2010*. Stuttgart, Avedition, 2011.

Atelier Brückner 2019: Atelier Brückner, *Scenography 2 Staging the space. Projects and Philosophy 1997-2018*. Basel, Birkhäuser, 2019.

Baudrillard 2025: Baudrillard J., *Simulacri e impostura. Bestie, Beaubourg, apparenze e altri oggetti*, Sesto San Giovanni (MI), Pgreco, 2025.

Borsotti 2017: Borsotti M., *Tutto si può narrare. Riflessioni critiche sul progetto di allestimento*, Sesto San Giovanni, Mimesis, 2017.

Camporesi 2025: Camporesi S., *Una foto è una foto è una foto*, Torino, Einaudi, 2025.

Candela, de Visscher 2023: Candela E., de Visscher E., *Learning from “the sounding object”: Sound design in the critical reimagining of museum object narratives*, in “Design Issues”, 2023, 39 (2), pp. 57-71.

Codeluppi 2007: Codeluppi V., *La vetrinizzazione sociale. Il processo di spettacolarizzazione degli individui e della società*, Torino, Bollati Boringhieri, 2007.

Debord 1968: Debord G., *La società dello spettacolo*, Bari, De Donato, 1968.

Gazzaniga 2004: Gazzaniga M.S. (ed.), *The Cognitive Neurosciences*, Cambridge, Massachussets, MIT Press, 2004.

Greppi 2024: Greppi C., *Storie che non fanno la storia*, Bari, Laterza, 2024.

Halbwachs 1987: Halbwachs M., *La memoria collettiva*, Milano, Unicopli, 1987.

Han 2024: Han B-C., *La crisi della narrazione. Informazione, politica e vita quotidiana*, Torino, Einaudi, 2024.

Hughes 2021: Hughes P., *Storytelling exhibitions. Identity, truth and wonder*, London, Bloomsbury Visual Arts, 2021.

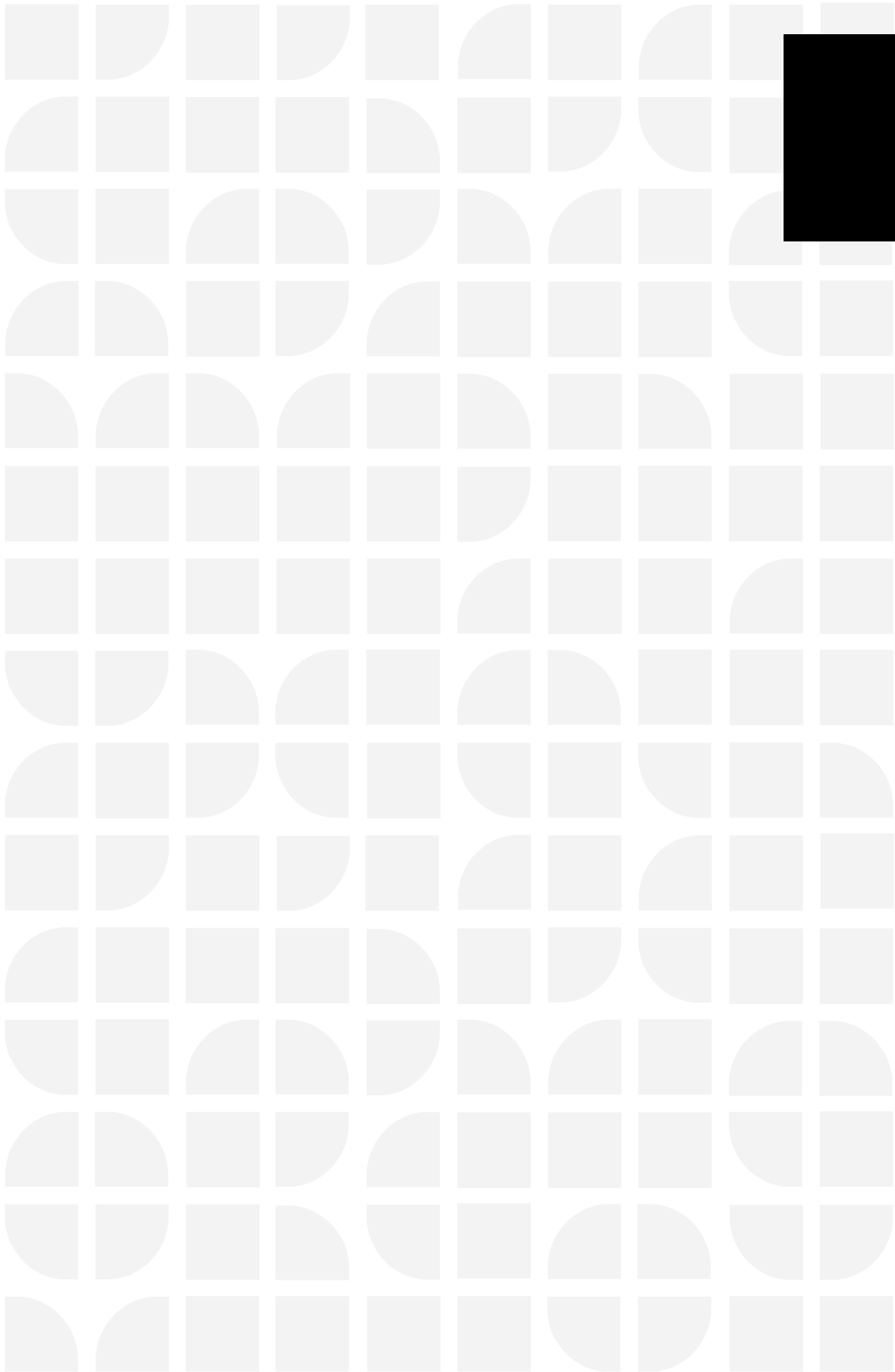
Iotti 2020: Iotti L., *8 secondi. Viaggio nell'era della distrazione*, Milano, Il Saggiatore, 2020.

Knast 2011: Knast A. (ed.), *Muzeum Chopina*, Warszawa, Narodowy Instytut Fryderyka Chopina, 2011.

Lupton, Jasper, Wagner 2018: Lupton E., Jasper A., Wagner N., *Notes on Touch, Sound, Smell, and Flavor*, in Lupton E., Lipps A. (eds.), *The Senses: Design Beyond Vision*, New York, Cooper Hewitt, Smithsonian Design Museum and Princeton Architectural Press, 2018.

Lupton, Lipps 2018: Lupton E., Lipps A. (eds.), *The Senses: Design Beyond Vision*, New York,

- Cooper Hewitt, Smithsonian Design Museum and Princeton Architectural Press, 2018.
- Migliore, Servetto 2025: Migliore I., Servetto M., *Museum Seed. The futurability of cultural places*, Milano, Electa, 2025.
- Montanari, Trione 2017: Montanari T., Trione V., *Contro le mostre*, Torino, Einaudi, 2017.
- Pallasmaa 2012: Pallasmaa J., *The eyes of the skin. Architecture and the Senses*, Chichester, John Wiley & Sons, 2012.
- Ponselle 1973: Ponselle R., *The One, The Only, The Great Caruso*, The New York Times Archives, February 25, 1973, p. 105
- Ricoeur 2012: Ricoeur P., *Ricordare, dimenticare, perdonare. L'enigma del passato*, Bologna, Il Mulino, 2012.
- Roppola 2012: Roppola T., *Designing for the Museum Visitor Experience*, New York, Routledge, 2012.
- Valente 2023: Valente L., *Enrico Caruso. Da icona a mito*, Venezia, Marsilio Arte, 2023.
- Studio Azzurro 2009: Project Report, Courtesy of Studio Azzurro
- Studio Azzurro 2011: Studio Azzurro, *Musei di narrazione. Percorsi interattivi e affreschi multimediali*, Cinisello Balsamo (MI), Silvana Editoriale, 2011.
- Zuliani 2024: Zuliani S., *Exhibiting the voice. Displays of the invisible*, in Castellani F., Glicenstein J., Zanella F. (eds.), *Questioning Exhibit Display. Theories, Forms, Perspectives*, Paris, Hermann Éditeurs, 2024, pp. 53-67.



Sound as a means to enhance visitors' engagement in museums

Licia Calvi

Keywords:

Museum practices, Visitors' engagement, Sound classification, AI-based sound.

ABSTRACT:

This paper investigates the extent to which sound, in all its facets (thereby including also music and voice), is used in museums as a means to enhance the visitor experience and to facilitate visitors' engagement with the exhibition. This is done by creating a taxonomy of its most common uses and analysing them in the light of a theory of soundscape.

Questo articolo analizza in che misura il suono, in tutte le sue sfaccettature (inclusi quindi anche musica e voce), venga utilizzato nei musei come strumento di progettazione per migliorare l'esperienza del visitatore e facilitarne il coinvolgimento con l'esposizione museale. A tal fine, viene creata una tassonomia dei suoi usi più comuni e li si analizza alla luce di una teoria del paesaggio sonoro.

Licia Calvi

Licia Calvi is a Senior Lecturer and Researcher at the Breda University of Applied Sciences, the Netherlands, specialising in the digital transformation of museums, and an Adjunct Professor in Museum Communication Studies at the University of Bergamo, in Italy. A Digital Humanist, she investigates how digital technology is used in museums beyond enhancing the visitor experience, to shape (new) museum practices and the role storytelling plays in them.

Introduction

In a recent podcast on *Sounds of heritage*,¹ John Beauchamp and Katarzyna Jagodzińska talk about sound as a form of heritage that is often overlooked in heritage discourse and introduce their initiative of a register of heritage sound as a testimony of the value of sound as such a heritage form.

While this demonstrates the attention that scholarship is devoting to sound research (as this special issue also testifies), in this article, I do not intend to walk that road, and discuss sound as heritage form worth analysing further. Rather, I intend to investigate how sound is becoming part of museums' curatorial practices and an element in the design of exhibitions, as a tool to support the narrative and enrich the visitor experience and help create new meanings. This approach is very much in line with the current focus on *experiences* in museums² and in particular on multisensory ones.³ This article therefore attempts at developing a classification of current curatorial and design practices involving sound. This classification, far from being exhaustive, is rather a mapping of recurrent uses of sound to enhance the experience of museum-goers. It is meant as a tool to support designers in their design choices when designing museum experiences, so that they can choose what proper form of sound to use depending on what they intend to design. But it can also be a starting point for future research on how sound might be deployed in museums.

In an attempt at developing this taxonomy, my approach to sound goes beyond its commonsense defini-

tion of both natural and man-made sound, like that of machineries, and involves any kind of auditory, or sound signal,⁴ as foreground sounds that demand attention, thereby including also music and voice, but not noise, nor the keynote sounds in Schafer's soundscape definition,⁵ that is the environmental place-based background sounds. Silence, to be understood not as the absence of sound but as an acoustic, and therefore narrative, element as Schafer already posited in his seminal work,⁶ is also not included in this overview of museums' curatorial practices and exhibit design using sound.

Literature review

The attention to sound as one of the defining elements of an environment and as an important one to understand an environment *narratively* originates from Schafer's seminal work on the concept of *soundscape*.⁷ In this work, Schafer analyses and distinguishes among different types of sound (from keynote sounds to signals and sound-marks) and explains their narrative power in helping understand the environment they are part of culturally, socially and beyond.

The reference to Schafer's classification has impacted museums in prompting their multisensory turn, away from the centrality of vision typical of Western museology⁸ towards an approach to museum exhibition design that also involves other senses, like touch, smell and sound, indeed.

In the literature, different types of sound uses in museums are identified. They include *ambient sound-*

scapes to create atmospheric environments that transport visitors to different times or places, like in history or natural history museums.⁹ *Sound as a form of heritage*,¹⁰ as mentioned at the beginning of this article, whereby sound elements are treated as cultural objects themselves through the use of original recordings in museums thereby safeguarding their authenticity. *Sound as a form of art*, as with music, when this becomes the object of the exhibition.¹¹ *Interactive sound installations* to foster visitor participation. According to studies by Wakkary and Hatala,¹² such interactive installations increase visitors' engagement time and encourage their exploratory behaviour. Research by Bitgood¹³ further demonstrates that exhibitions incorporating soundscapes increase visitor dwell time by 40-60% compared to silent displays. The multisensory stimulation they trigger appears to capture and sustain attention more effectively than visual elements alone. Sound, as a matter of fact, as scholars like Droumeva¹⁴ claim, can convey cultural meanings that visual displays alone cannot capture, as Schafer's discussion of soundscape had already pointed out. Additionally, sound installations generally demonstrate positive effects on the visitor's experience in that they facilitate what Dudley¹⁵ calls 'material consciousness', that is a heightened awareness about exhibition spaces and collection items. This heightened awareness can emerge precisely as the result of engaging multiple senses simultaneously, what makes such encounters embodied. The combination of the embodied character of such encounters and of a multi-sensorial space makes the perception

of the museum collection and the resulting museum experience more memorable, and meaning making a whole embodied and immersive experience as well.¹⁶

Sound installations tout court can make museums more accessible to diverse audiences, like visually impaired visitors, for whom audio descriptions and sonic cues provide essential navigation and interpretive information.¹⁷ For neurodiverse visitors, soundscapes can create more welcoming environments by providing predictable auditory structures or calm zones.¹⁸

Finally, *sound as narrative*, ranging from audio guides, to oral histories and first-person accounts. These latter ones in particular have proven especially effective for creating empathy and personal connection,¹⁹ while research by Bedford²⁰ shows that hearing authentic voices and testimonies deepens emotional engagement with difficult histories and marginalised perspectives. Falk and Dierking's contextual model of learning²¹ suggests that sound helps visitors construct meaningful personal narratives by triggering memories and emotions.

Curiously, there are other ways of including sound in museums. In the exhibition *A Red that Sings*,²² at the Royal Museum of Fine Arts in Antwerp (KMSKA), sound is used as a metaphor to describe how colours can be experienced, like "red, which sings".²³ But even in the less lyrical forms described in this section, what emerges from the overview above is that sound use in museums seems to result in an emotionally resonant experience on many levels. Sonic elements, regardless of their nature (among those discussed in

this article), do as a matter of fact carry meanings, evoke emotions, and support meaning making, as Schafer had already pointed out clearly in his foundational soundscape analysis.²⁴ Museums that use them therefore create richer, more memorable, and more accessible experiences in that they engage visitors fully, sensorily *and* emotionally.

Sound as a tool to enhance the experience of museum goers

Of the many approaches that can be recognised related to sound use in museums, three seem to be the most common ones that I could identify so far. The taxonomy that results from this analysis (see in Table 1) is therefore based on cases I experienced myself in the mainly Dutch speaking (i.e., Flemish and Dutch) museum landscape. This explains its inevitable incompleteness. It has no ambition to be a benchmark, rather just a starting point to explore sound practices in museums further.

At what can be considered a more basic level in a taxonomy of sound as a design tool to augment the visitor experience, lies the use of sound in mainly scientific museums. These museums are often discovery-driven, their exhibitions are built in a way as to nudge visitors to do, to experiment, to try out. There, therefore, sound is used to accompany many visitors' actions during their discovery journey. Often, sound is part of the device that the visitor is activating and is intended to make this action more vivid, tangible and real. But at times, this matching sound-movement is there just to stress the visitor's action on the device and to make the experience

more 'dramatic', in a way.

We can call this use of sound as *sound-as-machinery*. In a way, this is similar to what Schafer calls a keynote sound (see again in Table 1), i.e., the background sounds that define a sonic environment and determine the setting of a sonic narrative, in that they still shape the visitor's emotional and cognitive frame.²⁵ By their remaining in the background, these (keynote) sounds do not distract visitors from their main activity, but help create that sense of being transported into a different time and place. In a history museum, this type of sounds can correspond to the ticking of a historical clock. In our own design of the *Secret Marquise* exhibition,²⁶ sound-as-machinery was the crackling of the fireplace in one of the period rooms.

In a science museum, this is the result of acting on a machinery (thereby its name), like turning a crank, or the noise of a spinning wheel and looms in a textile museum or the energy mixer at the NEMO museum in Amsterdam.

A further use of the sound-as-machinery notion is to be seen in the Chocolate Nation in Antwerp. This, as a matter of fact, represents a case of a museum that, while not being a history or science museum but rather an *experience* museum, still uses sound in the manner just described. In this museum, visitors wander in an experiential journey of smells, tastes, and sounds that brings them from the cocoa plantations in Africa to the port of Antwerp. The pinnacle of this journey and the climax of the story that is told in this way is an immense and fantastic machinery which occupies a prominent position, both in the museum

space and in the story.²⁷ Here, visitors are emotionally drawn into the production process of cocoa beans while this spectacular machine gets into motion adding lights and projectors to the sounds of its engines moving, thereby making it a truly sensorially immersive experience.²⁸ This is what makes it an experiential journey: a journey that triggers all senses, not just the eyes, and in which sound, the sound of this imposing machinery, helps cater for this amazing experience.

The example just illustrated can in fact be considered at the crossroads between the sound-as-machinery layer and the next level in our taxonomy of soundscape, that we could call the *sound-as-space* layer.

At this layer, the museum space becomes the storyteller and, in this context, the museum space and the exhibition are the stage on which this story unfolds. Then, sound, often, but not always, as music, can become very relevant to create an (even more) immersive (and dramatic) experience.

Of this type of sound use, the examples abound.

The first ones that comes to mind are the still relatively popular immersive experiences à la teamLab.²⁹ For them, music (rather than simply sound) is integral to the curatorial practice. While this is effective to augment the experience, and to immerse visitors completely, it is questionable whether this is also effective from a curatorial point of view: sometimes, like with the van Gogh immersive experience that travelled the world a few years back, the choice of the music is not always entirely aligned with the historical framing of the paintings that are

being projected but it is definitely instrumental to the creation of an even more amazing ‘wow’ effect. And also, as an imaginative trigger for and from the paintings: emotional and narrative immersion is then achieved at its fullest.

But next to these cases, there are many more exhibitions where music is an integral part of both the curatorial practice and the exhibition design.

Again, at the Royal Museum of Fine Arts in Antwerp, for example, the just ended exhibition on Eugène Van Mieghem, a local artist from the start of the 20th century, with paintings portraying the city with her harbour and its inhabitants (migrants, dockworkers and vagabonds), alternates the works grouped by topic (e.g., celebrating carnival or scenes from everyday life in the city) with the sound of the scenes depicted in those works. So, the port-related wall is augmented with the typical noises one can hear at the port: the voices of the dockworkers, the engines of the ships approaching or departing, the cawing of seagulls, the wind. At the corner related to the carnival ball, one can hear toasting glasses, people’s laughter and chatter, music. It is not clear whether it is the visitor’s movement that activates this sound or whether this is simply pre-programmed and is launched at a regular interval. What is clear however, is that this sound, together with the fact that the exhibition is displaced in one single and not too big room, which is kept relatively dark, with an equally dark floor, helps immerse the visitor in the atmosphere of the city in the early 20th century. Here, sound amplifies what space

already insinuates.

This sound-as-space resonates with Schafer's signal sound concept³⁰ in that it is more prominent than the sound-as-machinery discussed before and therefore eligibly becomes part of the visitor experience. Its function is not just to set the tone of the exhibition space, to contribute to its atmosphere by transporting visitors into another (spatial or temporal) dimension, but to explicitly add meaning to it thereby affecting the visitor's meaning making process and ultimate experience.

Somehow similar is Yates and Løvlie's use of the concept of "experience blend"³¹ as a design approach for historic house museums, in which sonic elements are integrated smoothly (*blended*) with the physical environment so that they do not overtly compete for visitor attention. Their research explores how carefully designed ambient soundscapes can enhance immersion and authenticity without disrupting the contemplative atmosphere characteristic of historic house museums.³² It is this *blendedness* that makes the sound used in these historical house museums sound-as-space rather than sound-as-machinery, thereby bringing this practice conceptually closer to the immersive cases mentioned earlier.

A special mention here are virtual exhibitions, in which visitors explore a physical space by means of VR goggles. Also in this case, music, predominantly, is integral to the curatorial design and beneficial to the ultimate visitor experience: just like music in films, it adds a dramatic tint to the events unfolding.

Finally, *sound-as-storyteller*, when sound is used as a tool to support

the oral narrative when this is told by a digital storyteller, like an avatar, something that has become possible because more and more museums are deploying installations and experimenting with generative AI.

Contrary to the sound as narrative discussed in the literature overview above, *sound-as-storyteller* also includes music when this has the same function music has in movies: to give emphasis to the story, to mark certain dramatic moments in the storyline by creating suspense, generating apprehension, instilling fear, or celebrating happy moments. This entails that the exhibition tells a story by means of a character, either fictitious or historical, and this telling is emphasised by background sound (the sound-as-machinery discussed earlier, or the keynote sounds by Schafer). If I think of the exhibitions with a digital human I have experienced myself recently, I cannot find one concrete example of this scenario. The very simple reason for this is that the function of the digital human is to actively engage visitors in a conversation, by answering their questions and sometimes challenging them with critical answers or additional questions.³³ The type of dialogue that is generated in this way depends on the prompts that the visitor inserts, and essentially because this is not a story, there is no function for music as sound-as-storyteller to put emphasis on any of the sentences that the digital human utters, as in any normal conversation would be the case.

Yet, a similar but different case is when the digital human simply tells a story rather than trying to engage visitors in a dialogue, a story that

foresees a very tiny space for interactivity. Then, these moments might be emphasised through music as sound-as-machinery. The resulting experience feels more like being immersed into a movie with the main character talking to the viewer/visitor and asking them a few questions at critical points in the storyline to enhance that sense that a conversation is taking place, while it is not (the interactivity I was referring to before). This is for example what happens with the exhibition *Encounters in wartime* which was for a short time on display at Hertogenbosch Heritage in Den Bosch.³⁴ In this context, sound as well as music are used as elements of the story that is unfolding, as an integral and not circumstantial part of it, as in a movie, as it were.

But the most frequent occurrences of sound-as-storyteller remain those in which a story is told. Nowadays, the emerging use of generative AI also in museums has given rise to many digital humans doing so.³⁵

A very special case of this is yet another form of AI-generated storytelling: at the same Royal Museum of Fine Arts in Antwerp, AI is used to reproduce Magritte's voice and tell stories that could not be told otherwise.³⁶

René Magritte is known for not being a public speaker. There are apparently only three such public lectures he gave, one of which was given at the Antwerp museum in 1938, to explain the meaning of his art. But none of these lectures was recorded back then. So, to celebrate this one lecture, the museum reconstructed Magritte's voice through AI using archival recordings and it is him that the visitors can listen to

during this exhibition. What makes this unique is the fact that the story that is told is based on that one particular lecture, which has been reconstructed using the notes taken by one of the curators. These are the only traces that are left of it. And that this story is told in the artist's own, albeit reconstructed, voice. In this sense, this is like listening to the real Magritte himself talking to you. There are several of these 'listening stations' in the exhibition space that give visitors the impression that the artist is explaining his artworks directly to them, adding in this way an element of personalisation to the whole experience. The reproduction is said to be very faithful and respectful of the artist,³⁷ so, in this way, putting a layer of authenticity to this otherwise non-authentic experience.

Table 1 summarises the taxonomy just discussed and shows how and why the newly proposed terms differ from the original benchmark soundscape developed by Schafer.³⁸

The development of Table 1 is not intended as an academic exercise for its own sake but as a way to cater for and recognise recent developments, for example precisely in the use and role that generative AI is taking up in the design of exhibitions and in its function in a possible soundscape of museum practices.

Type of sound	Function	Link to Schafer's soundscape	Corresponding type of sonic installation in literature	Differences among them
Sound-as-machinery	Mainly present in scientific museums as the matching sound that accompanies visitors' actions during their discovery journey. Otherwise, as background sound, as ambience that defines a sonic environment to set the atmosphere, or sometimes for naturally occurring sounds. In this sense, this is a basic level of sound.	Keynote sounds	Ambient soundscapes	Its double function: not only as just ambient background sound but also as sound that mimics and accentuates visitors' actions (this mainly in science museums).
Sound-as-space	It strengthens and heightens the museum experience that unfolds in space by being an essential element that defines it.	Sound signal	No clear correspondence among those listed	Sound is an eligible element of the story that is unfolding in space and effectively contributes to it. It remains in the background (but not in the same way as the earlier type of sound, i.e., sound-as-machinery) and it supports the story by contributing to the storyline, for example by emphasising the narrative arc.
Sound-as-storyteller	Oral narration, regardless of the ways in which this is delivered.	No clear correspondence	Sound as narrative	Contrary to the previous type of sound, here the sound is in the foreground and tells the story. The main difference with existing categories is in the attention that is given to the emergent use of AI-generated conversations, that seem to represent an area in fast development whose implications are yet to be investigated.

Table 1:
Sound classification.

Conclusion

This article discusses how sound is not merely supplementary, an add-on, a nice-to-have, to museum experiences but how it can fundamentally transform how visitors engage with collections, spaces and, most importantly, narratives in museums. Museums that thoughtfully integrate sonic elements, especially in the sound-as-storytelling form that was identified, create richer, more inclusive, and more emotionally powerful encounters with cultural heritage.

This article presents a taxonomy of possible sound uses in museums, based on a few real-life cases. In developing this taxonomy of sound types, Schafer's work on the concept of soundscape provides fundamental foundations and references.

The main difference with it, and with the sound types reported in the literature section above, is sound-as-storyteller, and in particular its AI-centred form.

This is where research is still limited because this practice is still in its infancy. But more research will be needed since more and more museums are investing in and working with generative AI.

Endnotes:

- 1 Beauchamp, Jagodzińska 2025.
- 2 See, among others, Calvi, Vermeeren, Sabiescu 2025.
- 3 Luo, Doucé, Nys 2024.
- 4 Schafer 1977.
- 5 Schafer 1977.
- 6 Schafer 1977.
- 7 Schafer 1977.
- 8 Classen, Howes 2006.
- 9 As already discussed in Schafer 1977.
- 10 See, for example, in de Carvalho 2025.
- 11 Zhang 2025.
- 12 Wakkary, Hatala 2007.
- 13 Bitgood 2006.
- 14 Droumeva 2017.
- 15 Dudley 2010.
- 16 Bagnall 2003.
- 17 Mesquita, Carneiro 2016.
- 18 Hutson, Hutson 2025.
- 19 Hover et al. 2025.
- 20 Bedford 2001.
- 21 Falk, Dierking 2000.
- 22 <https://kmska.be/en/a-red-that-sings-masterpieces-by-ensor-wouters-and-schmalzigaug> (last accessed on 08/07/2026)
- 23 This is a reference made by the local painter Jules Schmalzigaug to the vermilion red in Ruben's painting *Adoration of the Magi*, as described in the exhibition.
- 24 Schafer 1977.
- 25 Schafer 1977.
- 26 Calvi et al. 2024.
- 27 https://www.chocolatenation.be/en?gad_source=1&gad_campaignid=21189367656&gclid=CjwKCAjwxITRBhBYEiwA6mZm7ZSHvc-q-jqmru9bkQAYR8jPkQEecDWxDWSAbbFRsqpHWdMfvsc3hoCiXkQAvD_BwE (last accessed on 08/07/2026).
- 28 See also in Calvi, Vermeeren 2024.
- 29 <https://www.teamlab.art/> (last accessed on 08/07/2026).
- 30 Schafer 1977.
- 31 Yates, Løvlie 2024.
- 32 Yates, Løvlie 2024.
- 33 See Calvi 2026.
- 34 Hover et al. 2025.
- 35 See again Calvi 2026.
- 36 <https://www.theartnewspaper.com/2025/11/19/in-his-own-words-antwerp->

museum-recreates-magritte-lecture-using-ai (last accessed on 08/07/2026).

37 <https://www.theartnewspaper.com/2025/11/19/in-his-own-words-antwerp-museum-recreates-magritte-lecture-using-ai> (last accessed on 08/07/2026).

38 Schafer 1977.

References:

Bagnall 2003: Bagnall G., *Performance and performativity at heritage sites*, in “Museum & Society”, 2003, 1, 2, pp. 87-103. DOI: <https://doi.org/10.29311/mas.v1i2.17>.

Beauchamp, Jagodzińska 2025: Beauchamp J., Jagodzińska K., *Sounds of Heritage*, podcast, 2025. URL: <https://open.spotify.com/episode/57JlNmLYobcX0djBdDjzaU>.

Bedford 2001: Bedford L., *Storytelling: The real work of museums*, in “Curator: The Museum Journal”, 2001, 44, 1, pp. 27-34. DOI: <https://doi.org/10.1111/j.2151-6952.2001.tb00027.x>.

Bitgood 2006: Bitgood S., *An analysis of visitor circulation: Movement patterns and the general value principle*, in “Curator: The Museum Journal”, 2006, 49, 4, pp. 463-475.

Calvi 2026: Calvi L., *The place of aesthetics in museums*, in Simeone L., Gray C.M., Verhoeven A. et al. (eds.), *Proceedings of the DRS Conference 2026*, Edinburgh, 8-12 June 2026. DOI: <https://doi.org/10.21606/drs.2026.2819>.

Calvi et al. 2024: Calvi L., Bargeman B., Hover M., van Waalwijk J., Strijbosch W., Mitas O., *Storytelling as a tool to design museum experiences: the case of the Secret Marquise*, in Zanella F. et al. (eds.), *Multidisciplinary aspects of design: Objects, processes, experiences and narratives*, Cham, Springer, 2024, pp. 423-433. DOI: https://doi.org/10.1007/978-3-031-49811-4_40.

Calvi, Vermeeren 2024: Calvi L., Vermeeren A., *Digitally enriched museum experiences - what technology can do*, in “Museum Management and Curatorship”, 2024, 39, 3, pp. 335-356. DOI: <https://doi.org/10.1080/09647775.2023.2235683>.

Calvi, Vermeeren, Sabiescu 2025: Calvi L., Vermeeren A., Sabiescu A. (eds.), *Transformative Museum Experiences*, Cham, Springer, 2025. DOI: <https://doi.org/10.1007/978-3-031-89521-0>.

Classen, Howes 2006: Classen C., Howes D., *The museum as sensescape: Western sensibilities and indigenous artifacts*, in Edwards E., Gosden C., Phillips R.B. (eds.), *Sensible objects: Colonialism, museums and material culture*, Oxford-New York, Berg, 2006, pp. 199-222.

de Carvalho 2025: de Carvalho A., *Sound as Heritage*, conference presentation, Open University, May 2025. https://www.researchgate.net/profile/Ari-Carvalho/publication/393042944_Sound_as_Heritage/links/685d16ef07d6d53e82ee9b52/Sound-as-Heritage.pdf.

Droumeva 2017: Droumeva M., *Soundmapping as critical cartography: Engaging publics in listening to the environment*, in “Communication and the Public”, 2017, 2, 4, pp. 335-351. DOI: <https://doi.org/10.1177/2057047317719469>.

Dudley 2010: Dudley S. (ed.), *Museum Materialities: Objects, Engagements, Interpretations*, London-New York, Routledge, 2010.

Falk, Dierking 2000: Falk J., Dierking L., *Learning from Museums: Visitor Experiences and the Making of Meaning*, Walnut Creek, AltaMira Press, 2000.

Hover et al. 2025: Hover M., van Waalwijk J., Haggis-Burridge M., Baker C., *Encounters in wartime: interactive technology and storytelling for digital heritage*, in “Journal of Tourism and Cultural Change”, 2025. DOI: <https://doi.org/10.1080/14766825.2025.2592711>.

Hutson, Hutson 2025: Hutson P., Hutson J., *The Virtual Wunderkammer: Integrating Neuroinclusive Design and AI-Augmented Technologies for Immersive Museum Experiences*, in “ISRG Journal of Arts, Humanities and Social Sciences”, 2025, 3, 2, pp. 128-136. DOI: <https://doi.org/10.5281/zenodo.15038356>.

Luo, Doucé, Nys 2024: Luo D., Doucé L., Nys K., *Multisensory museum experience: an integrative view and future research directions*, in “Museum Management and Curatorship”, 2024, pp. 1-28. DOI: <https://doi.org/10.1080/09647775.2024.2357071>.

Mesquita, Carneiro 2016: Mesquita S., Carneiro M.J., *Accessibility of European museums to visitors with visual impairments*, in “Disability & Society”, 2016, 31, 3, pp. 373-388. DOI: <https://doi.org/10.1080/09687599.2016.1167671>.

Schafer 1977: Schafer R.M., *The soundscape: our sonic environment and the tuning of the world*, New York, Knopf, 1977.

Wakkary, Hatala 2007: Wakkary R., Hatala M., *Situated play in a tangible interface and adaptive audio museum guide*, in “Personal and Ubiquitous Computing”, 2007, 11, 3, pp. 171-191. DOI: <https://doi.org/10.1007/s00779-006-0101-8>.

Yates, Løvlie 2024: Yates M.F., Løvlie A.S., *Subtle sound design: Designing for experience blend in a historic house museum*, in “ACM Journal on Computing and Cultural Heritage”, 2024, 17, 1, pp. 1-15. DOI: <https://doi.org/10.1145/3633476>.

Zhang 2025: Zhang Y., *Integrating Sound in Exhibition Narratives and Design: A Scenographer's Approach in Musica ex Machina*, in “Konsthistorisk Tidskrift/Journal of Art History”, 2025, 94, 3–4, pp. 237–256, DOI: <https://doi.org/10.1080/00233609.2025.2542800>.





‘How sound makes me feel’. Towards an Aural Diverse Practice of Sound Design in Museums

Stefania Zardini Lacedelli, Marco Mason

Keywords:

Aural Diversity, Sonic Inclusion, Museum Auditory Environments, Human-Centered Design, Design-as-practice.

ABSTRACT:

As museums increasingly recognise the fundamental role of sound in shaping more inclusive experiences, there is a growing need for design practices that can engage with the plurality of ways people hear, perceive and respond to sound. Research on Aural Diversity highlighted the limitations of conventional sound design, which often assumes a standardised mode of listening. This article investigates how Human-Centred-Design (HCD) methods can be mobilised to capture the embodied, individual and situated nature of sonic experiences. Drawing on a participatory workshop conducted at the Science Museum in London, the article examines a sequence of activities designed to understand how existing acoustic conditions and sound installations were experienced by participants. Through soundwalking, drawing, reflective writing and collective discussion, the workshop progressively surfaced embodied sonic knowledge, revealing often-invisible sensory barriers within the galleries. Findings show how this framework can operate as an emerging design practice to explore, understand and articulate aural diversity from the earliest stages of the design process, offering museums a situated, adaptable, and reflexive method for engaging with the complexity of human hearing.

Mentre i musei riconoscono sempre più il ruolo fondamentale del suono nel plasmare esperienze più inclusive, cresce la necessità di pratiche di progettazione in grado di interagire con la pluralità di modi in cui le persone ascoltano, percepiscono e rispondono al suono. La ricerca sulla diversità uditiva ha portato all'attenzione critica i limiti della progettazione sonora convenzionale, che spesso presuppone una modalità di ascolto standardizzata. Questo articolo indaga come i metodi di progettazione di Human-Centred-Design (HCD) possano essere utilizzati per cogliere la natura corporea, individuale e situata delle esperienze sonore. Prendendo spunto da un workshop partecipativo condotto presso il Science Museum di Londra, l'articolo esamina una sequenza di attività progettate per comprendere come le condizioni acustiche esistenti e le installazioni sonore venissero percepite dai partecipanti. Attraverso passeggiate sonore, disegno, scrittura riflessiva e discussione collettiva, il workshop ha fatto progressivamente emergere la conoscenza sonora corporea dei partecipanti, rivelando barriere sensoriali spesso invisibili. I risultati mostrano come questo approccio possa funzionare come una pratica progettuale emergente per esplorare, comprendere e articolare la diversità uditiva fin dalle prime fasi del processo di progettazione, offrendo ai musei un metodo contestualizzato, adattabile e riflessivo per affrontare la complessità dell'udito umano.

Stefania Zardini Lacedelli

Research Fellow in Heritage and Creative Technologies at Anglia Ruskin University and Honorary Research Fellow of the Institute for Digital Culture - University of Leicester. With a PhD in Museum Studies, her work explores how sound can foster inclusive, participatory and wellbeing-oriented heritage practices. Her research involved over 50 cultural organisations across Italy and UK in the development of community sound archives, participatory storytelling platforms and immersive soundwalks.

Marco Mason

Associate professor at Northumbria University's School of Design, Arts, and Creative Industries, UK. With a Ph.D. in design sciences, his interdisciplinary research explores the digital transformation of museums, emphasising the role of design in addressing emerging challenges. He has held affiliations with leading institutions; Iuav Faculty of Arts and Design, Massachusetts Institute of Technology, School of Museum Studies in Leicester, and University of Cambridge.

Opening Picture:

Workshop participant during the soundwalk at the Medicine Galleries (Science Museum), March 2025 © Stefania Zardini Lacedelli.

CC BY 4.0 License

<https://creativecommons.org/licenses/by/4.0/>

©StefaniaZardiniLacedelli,MarcoMason,2026

<https://doi.org/10.60923/issn.3034-9699/26205>

1. Introduction

Within today's multisensory, media-rich, multi-platforms environments in which museums operate, sound plays a central role: it enriches curatorial approaches,¹ deepens emotional and sensorial engagement with collections,² amplifies under-represented historical voices,³ and operates as a museological object in its own right.⁴ Yet, despite this expanded array of sonic practices and sonic epistemologies, museum sound design often remains shaped by the implicit assumption of an "auditory normate" – an idealised listener assumed to possess a 'good' and 'ontologically normal' hearing.⁵ Such assumptions obscure the reality that hearing exists along a spectrum of differences shaped by biological, technological, cultural and lived experience dimensions.⁶ Emerging scholarship on Aural Diversity calls for a shift in perspective,⁷ urging the heritage sector to acknowledge and accommodate the plurality of listening experiences and diverse ways to respond to sound, rather than designing for an imagined neuro-typical ear.

Within this context, this article investigates how Human-Centred Design (HCD) methods can inform more inclusive approaches to the use of sound in museums, by meaningfully engaging with aural diversity. It asks, first, how sound design practices in museums might better respond to the plurality of hearing and sonic experiences, moving beyond the assumption of a single, idealised listener. Second, it examines how HCD methods can be mobilised to capture perceptual, emotional, and sensory dimensions of listening, as well as to identify sonic bar-

riers that might be embedded within heritage spaces.

To explore these questions, we conducted a participatory workshop at the Medicine Galleries at the Science Museum (UK). This workshop tested a sequence of participatory sonic observation activities designed to foreground embodied and situated auditory experience. The aim of this research was primarily methodological: to explore how HCD methods, informed by principles of Aural Diversity, can operate as an emerging design practice to capture perceptual, emotional and sensory dimensions of listening within the acoustically dense environment of a gallery space.

The workshop was intentionally situated within a media-rich gallery in order to engage with the realities of a complex auditory environment.⁸ In museums, and particularly in large exhibition spaces such as the Science Museum, curated sound installations coexist with visitors' voices, footsteps on hard floors, reverberant architectural surfaces, mechanical systems, and sound bleed from adjacent displays. Listening within such spaces is therefore never directed at a single, isolated source; it is shaped by overlapping acoustic fields, spatial permeability, and fluctuating levels of attention and distraction. By situating the study within this dynamic and multilayered acoustic ecology, the research seeks to understand how sound is experienced by a plurality of listeners, each bringing different lived experiences, perceptual sensitivities, bodily conditions to the museum space.

The paper is structured as follows: Section 2 outlines the growing role

of sound in museums, introduces Aural Diversity as a key paradigm for recognising the plurality of listening experiences, and establishes the relevance of Human-Centred Design for inclusive sonic practices. Section 3 presents the case study, detailing the Medicine Galleries context, the participatory activities, and the insights generated through each tool. Section 4 discusses how these tools and activities, when orchestrated together, function as an emerging aural-diverse design practice. The paper concludes by reflecting on the methodological, theoretical and practical implications of embedding aural-diverse approaches within Human-Centred Design for museums.

2. Literature Review

2.1 From interpretative medium to inclusive design practice: Reframing Sound Design in Museums

In the past two decades, sound has gained a primary role in museums. For much of their modern history, museums privileged visual and material culture, positioning sound as a complementary medium. Within the trans-sensory logic which is permeating museum theory and practice,⁹ however, sound has moved decisively to the foreground. Aligned with the broader “sonic turn” across the humanities and social sciences,¹⁰ a growing body of works established sound as primary narrative, affective and epistemic medium capable of supporting meaning making, introducing new modes of engagement and operating as curatorial object in its own right.¹¹ In gaining central relevance, sound

functioned as a disrupting force, prompting institutions to rethink previous exhibition vocabulary and spatial logics,¹² and introducing new sonic epistemologies for understanding audience engagement, the act of curation, and the museum architecture.¹³ The publication of the first *Handbook of Sound in Museums*¹⁴ and the convening of the first international conference dedicated to the field¹⁵ marked this maturation. Today, museum sound design is an established domain of research and practice.

Within this extensive body of work, however, sound has been theorised predominantly through an interpretative paradigm. Drawing on its intrinsic ability to engage, immerse, connect, sound has been conceived as something to compose, curate and manage – a designed layer added to an otherwise defined environment, capable of expanding museum narratives and deepening sensorial and emotional engagement with collections. This model presumes a degree of curatorial control: sound as authored and intentionally deployed.

Within the broader transformation the sector is experiencing under what has been conceptualised as “post-digital museum,”¹⁶ a complementary paradigm is emerging. As museums become more mediatised, participatory and relational,¹⁷ they are reconceived not simply as sites of display but as social infrastructures. The language of exhibition increasingly makes room for co-creation,¹⁸ social care,¹⁹ health and wellbeing.²⁰ In this context, what was once imagined as a space of silent contemplation has been reconfigured as a socially animated environment, shaped by what Kelly

terms “social sounds”:²¹ the unpredictable, relational and collective sonic life generated by living environments.

In such spaces, sound exceeds curatorial intention. Alongside designed audio installations and sound-based practices resonate conversations, voices, footsteps, ventilation systems, mechanical hums, café noise and reverberation across varied architectural surfaces.²² Museums thus exemplify what auditory neuroscience describes as “auditory complex environments”:²³ spaces characterised by multiple simultaneous sound sources, fluctuating signals and competing acoustic information.

It is precisely this shift – from curated sound to lived sound – that is reorienting the field towards an inclusive design paradigm.²⁴ When sound is understood not only as a meaning-making tool but as an environmental condition, the central question changes. The issue is no longer solely what sound can communicate, but how it enables – as well as how it hinders – participation: how it helps to navigate, orient and make people feel comfortable within heritage environments.

Within this inclusive paradigm, structural barriers embedded in the spaces become critically visible. In complex auditory environments such as heritage spaces, sound constitutes an integral component of informational and perceptual load and might contribute to experiences of sensory overload and information saturation – phenomena extensively discussed in the literature on “museum fatigue”²⁵ and neurodiversity research.²⁶ Such environments may be especially diffi-

cult to navigate by individuals who have noise sensitivities – conditions in which everyday sounds are experienced as intrusive, painful or overwhelming²⁷ – or neurological hearing differences that affect how auditory information is processed and filtered.²⁸ This is not only a matter of providing adjustments for underrepresented groups. It requires recognising that aural architecture and sound design in public spaces have historically been informed by what Renel calls the “auditory normate”: an idealised, non-disabled listener whose hearing is presumed stable and consistent.²⁹ Grounded in the social model of disability,³⁰ this social relational model of sonic exclusion highlights the auditory values and norms embedded in the design that does not consider hearing differences. In other words, what is imagined, hidden and reproduced in the design of public spaces³¹ is an idealised and unrealistic body and mind that fails to account for differences in how people hear and respond to sounds.

The emerging paradigm of Aural Diversity³² contributes to dismantling these normative hearing assumptions. By acknowledging that hearing varies across biological, neurological, technological and cultural dimensions, Aural Diversity brought to the fore a multitude of auditory conditions beyond hearing loss alone, which arise from how the brain processes sound. This includes sound tolerance sensitivities such as hyperacusis,³³ misophonia³⁴ and tinnitus,³⁵ as well as Auditory Processing Disorders,³⁶ alongside technologically mediated listening through hearing aids and cochlear implants.³⁷ In the light of this activating paradigm, it becomes clear

that sonic accessibility in public spaces such as museums and galleries cannot be reduced to accommodations framed around blindness or deafness. Rather, it concerns the multiplicity of ways each individual uses sound to navigate, localise, communicate and construct a sense of belonging within heritage environments.³⁸

Accommodating the needs of an aural diverse population therefore emerges as a primary design challenge within contemporary museum practice. In recognising that hearing is highly variable across individuals and in constant flux throughout life, then the central question becomes methodological: how can the sonic perception be meaningfully captured and translated into an inclusive design practice? Sonic perception is not an isolated sensory function; neuroscience research demonstrated that hearing is deeply interwoven with memory, attention, spatial orientation, emotional processing, and imagination.³⁹ To design inclusively requires engaging this complexity – yet conventional acoustics research has largely prioritised quantitative metrics such as decibel levels and reverberation time, often with limited attention to the psychological and sociological repercussions of acoustic environments.⁴⁰

Addressing this methodological gap requires moving toward design frameworks that place lived experience, perceptual knowledge and participatory processes at the centre of sonic decision-making – a shift that situates Human-Centred Design as a crucial framework for operationalising aural diversity.

2.2 Human-Centred Design (HCD) for Aural-Diverse Practices

Human-Centred Design (HCD) has become a central driver of change in contemporary museum practice⁴¹. Research on museum digital transformation⁴² has shown that HCD contributes not merely by delivering digital products or exhibition technologies by functioning solely as a set of methods to produce specific outputs – such as digital systems or digitally embedded exhibitions⁴³ – but rather it is increasingly understood as a practice-based approach that reconfigures how museums frame problems, integrate visitor perspectives, and generate knowledge about visitor experience.⁴⁴ In this sense, HCD operates as an infrastructural capability, organisational mindsets and even, in some more advanced cases, organisational culture, supporting cross-departmental knowledge exchange, encouraging co-creative processes over siloed expertise, embedding empathy, experimentation, and iterative learning, and aligning visitor-centred values with strategic decision-making.⁴⁵

Importantly, the kind of Human-Centred Design referred to in this article should not be understood as a formalised practice that is only viable within large, well-resourced institutions or museums with dedicated design teams. Instead, as discussed extensively in *Museums and Design Practices*,⁴⁶ HCD practices are already present, often implicitly and in situated forms, across a wide range of small and medium-sized museums. In these contexts, HCD does not necessarily manifest through formalised design roles or the adoption of branded

design-thinking frameworks,⁴⁷ but through locally adapted practices of listening, collaboration, reflection, and experimentation embedded within everyday work routines, which are distributed, collective, and accessible ways of working that can be enacted by curators, educators, digital staff, front-of-house teams, and managers alike.

Framing HCD in this way is particularly relevant for aural-diverse practices. We need a brief premise to clarify this point. Indeed, from an inclusive design perspective, scholars⁴⁸ and professionals⁴⁹ have argued for *accessibility by design* emphasising that accessibility should be embedded at the earliest stages of design rather than retrofitted after solutions are developed. In other words, accessibility is not a feature to be added after design decisions have been made, but an initial, generative condition for design itself, an orientation that aligns closely with HCD's core commitment to integrating people's needs, experiences, and values at the forefront and throughout the design process. Kat Holmes' *Mismatch: How Inclusion Shapes Design*⁵⁰ reinforces this stance by arguing that exclusion does not originate in individual bodies or abilities, but in mismatches between people and the designed environments that surround them. The notion of mismatch reframes where "the problem" is located: rather than situating exclusion in individual sensory differences, Holmes shows how exclusion emerges when design decisions are guided by narrow, implicit assumptions about users, which are assumptions that often remain invisible because they reflect dominant or taken-for-granted experiences.

Applied to sound in museums, this position challenges normative assumptions about hearing (see Section 2.1 above) and foregrounds aural diversity as an important aspect to consider when designing for visitor experiences. HCD provides conceptual and practical means, as well as ethical grounding, to surface ("make them visible") and interrogate these assumptions early in the design process, by prioritising lived experience, empathy, and participation over abstract standards of accessibility or compliance-driven approaches. In particular, design practices of understanding ('Discovery' in the UK Double Diamond⁵¹, Fig. 1) – such as the workshop presented in this article – become strategically important precisely because they enable museums to recognise where mismatches occur, and to reframe sound not as a technical layer to be optimised, but as a dimension of experience that is deeply entangled with the design process (in line with organisational values).

3. Case Study: "How Sound Makes me Feel" Workshop

Embedding aural diversity into museum design practice presents a methodological challenge. Sonic perception is a complex topic to study for the multidimensionality and subjectivity of the listening experience.⁵² If sound design is to move beyond normative assumptions of an 'aural typical listener', design methods must be capable of capturing, externalising, and interpreting these embodied, situated, subjective dimensions. The case study presented here responds to this challenge by shifting from theo-



retical reflection to methodological experimentation, using HCD design tools to capture how existing acoustic conditions and sound installations are perceived and experienced within gallery spaces.

The workshop *How Sound Makes Me Feel*, conducted by the co-author Stefania Zardini Lacedelli in March 2025 at the Medicine Galleries of the Science Museum, London, functioned as a situated case study through which principles of aural diversity were translated into design practice. The workshop experimented with a series of interrelated participatory activities to generate experiential knowledge about sonic perception.

The workshop was therefore conceived within the ‘understanding/discovery phase’ of the HCD process (Fig. 1 and 2): a structured sequence of participatory tools aimed at eliciting situated auditory experience, render it communicable, and translating it into design-relevant insights. The orchestration of these tools tested how aural-diverse principles might be operationalised

within museum practice and inform inclusive sound design.

Participants were fifteen MA Museum Studies students. The workshop did not ask participants to disclose or identify with any form of diagnosed hearing conditions, but proceeded from the assumption that all individuals are intrinsically aurally diverse. This decision was methodologically intentional. Rather than distinguishing between “normal” and “special” hearing, the study was framed on the premise that all individuals bring different perceptual sensitivities, lived experiences, listening behaviours, and emotional responses to sound. Participants were guided through a structured sequence of participatory activities including an auditory self-assessment tool, a soundwalking and sound-drawing exercise, reflective writing on an Aural Empathy Canvas, and a final collective discussion.

The workshop took place in the Science Museum’s Medicine Galleries, a section of the museum which undertook a major redisplay in 2020. These five interconnected galler-

Fig. 1:
The Double
Diamond by the
Design Council.
CC BY 4.0 license

ies foreground personal stories of medicine through digital media, interactive displays, and dedicated sound installations. Sound plays a key curatorial role, contributing to foregrounding personal, intimate and patient-centred perspectives.⁵³ At the same time, these galleries are characterised by high-visitor density – reaching up to 12,000 visitors on peak days (figure provided by the museum’s curatorial team), multiple concurrent audio sources, reverberant architectural conditions, and overlapping acoustic zones. These environmental features made the site particularly suitable for examining how sound contributes – or hinders – cognitive, sensory and emotional engagement.

The following sections describe each activity in detail, beginning with the preliminary sonic mapping conducted in preparation for the workshop. A detailed account of each tool is then presented followed by the results generated through their application. As will be shown, each tool elicited a distinct yet complementary layer of insight: from participants’ pre-existing attitudes toward acoustic environments, to their embodied and spatial perceptions of the gallery soundscape, and finally to the emotional, cognitive, and physical dimensions of engaging with specific sound installations.

3.1 Human-Centred Sonic Mapping of the Medicine Galleries

Prior to the workshop, co-author Zardini Lacedelli conducted a preliminary sonic mapping of the Medicine Galleries (Fig. 1). Documented through photographs, short videos and audio recordings, this mapping aimed to identify the defining acoustic characteristics of the space and chart the distribution of sound-based installations across its five interconnected galleries. The acoustic mapping was informed by the human-centred principles of the APEAL method,⁵⁴ developed by Apex Acoustics. APEAL centres auditory perception and listening methods in the acoustic assessment, enabling non-specialists to participate meaningfully in evaluating acoustic conditions of an occupied place. In contrast to purely quantitative measurements conducted in unoccupied spaces, this method adopts soundwalking⁵⁵ as a way to engage with inhabited environments and capture the dynamic, subjective dimension of the sonic experience. Inspired by the principles of this method, a selection of photo, video and audio recordings were collected while walking in each gallery, attending to how sound was encountered in motion and in context. As part of this process, co-author Zardini Lacedelli also experienced five sound-based installations to include in the workshop (listed in Table 1). The selection was guided by the intention to expose participants to diverse sound technologies, modes of sound engagement, and degrees of acoustic containment.

Gallery	Sound installation / Audio Exhibit selected	Sound Technologies used in the installation
Medicine and Bodies	When Medicine Defines Normality	Single-cup earphone (mono handset).
Medicine and Treatments	Therapist's Room	Headphones.
Medicine and Treatments	John Gibson & Son pharmacy	Directional speakers, triggered on entrance. Induction loop provided for users of hearing devices.
Faith, Hope and Fear	Faith, Hope and Fear	Sound Showers/overhead speakers triggered upon entrance in the alcove.
Medicine and Communities	Padded Cell	Directional speakers.

Table 1: List of the sound installations selected for the workshop.

The galleries are organised into five interconnected sections: three “narrative” galleries – *Medicine and Bodies*, *Medicine and Treatments*, and *Medicine and Communities* – and two “spotlight” galleries – *Exploring Medicine* and *Faith, Hope and Fear*. Together, these spaces form a continuous exhibition environment in which visitors move fluidly between thematic areas. The sonic mapping made explicit how each gallery sustains a distinct acoustic atmosphere while remaining permeable to neighbouring sounds.

The first gallery after the entrance is *Medicine and Bodies*, which explores how medicine has shaped the way bodies are observed, measured, and categorised. The displays combine objects, photographs, and personal accounts to challenge fixed notions of the “normal” body. For this section, the installation *When Medicine Defines Normality* (Fig. 3) was selected to be included in the workshop. In this installation, large photographic portraits by Siân Davey are paired with audio interviews in which patients reflect on living with sensory or physical impairments, chronic illness, or men-

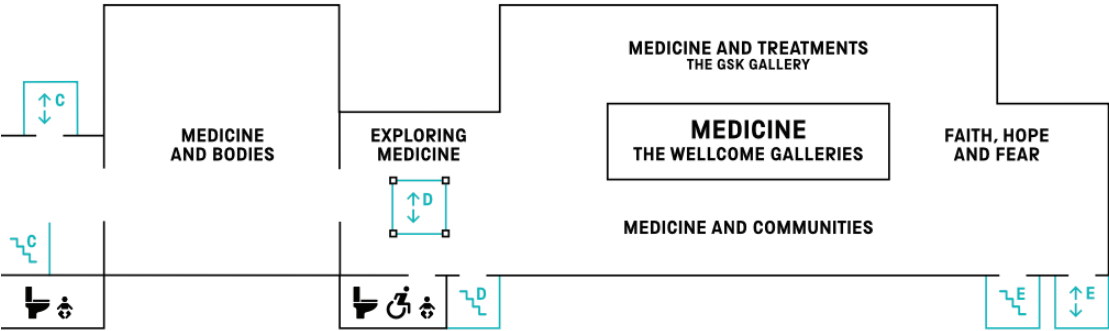


Fig. 2: Map of the Medicine Galleries, Science Museum.



3

tal-health conditions. The juxtaposition of image and voice constructs a deeply personal encounter that questions how medicine has historically defined – and constrained – ideas of normality. This installation uses a single-cup earphone (mono handset) to deliver the audio from video recorded testimonies, offering a semi-contained listening zone embedded in a visually as well as sonically dense environment.

The second gallery – *Exploring Medicine* – is a largely silent installation bringing together around one thousand objects from diverse medical traditions to challenge preconceptions of what “medicine” looks like. With no recorded audio or sound technology to support the experience, the gallery relies on visual density and minimal labelling encouraging observational and self-directed engagement. The gallery was included in the workshop as a space to listen during the soundwalk, but no audio exhibit was selected for further analysis.

Personal stories are again at the centre of the third gallery, *Medicine and Treatments*, which is focused on individual experiences of medical treatments. For this environment, two sonic installations were selected. The first, the *Therapist’s Room* (Fig. 4), is a headphones-based installation which invites visitors to sit into chairs and listen to audio recordings of therapists and patients. While patients speak about their mental-health experiences and how therapy helped them articulate difficult emotions and confront internal struggles, the therapists reflect on their own perspective, describing their role in creating a safe listening space and acknowledging the emotional labour their work entails. The use of headphones encourages a self-contained, intimate listening experience, partially isolating the visitor from the surrounding gallery soundscape.

A further installation selected for the workshop was the *John Gibson & Son pharmacy* (Fig. 5). In this re-

Fig. 3:
When Medicine defines Normality
exhibit, Medicine
Galleries, Science
Museum ©
Stefania Zardini
Lacedelli.



4

constructed Victorian-era pharmacy, actors voice the pharmacist, his apprentice Alice, and customers, re-enacting everyday interactions, while ambient noises – street sounds, footsteps, a chiming clock, a doorbell – reinforce the sense of stepping into a functioning historical environment. Here, directional speakers triggered upon entrance distribute spatialised audio across the room, creating a shared sonic environment that can be experienced collectively, while an induction loop ensures accessibility for users of hearing devices.

Further on, *Faith, Hope and Fear* explores the emotional and spiritual dimensions of illness and healing. The section brings together objects associated with belief, ritual, and care, alongside contemporary testimonies on highly emotive and ethically complex topics such as IVF, pilgrimage, oncology and neonatology. By entering six dedicated alcoves, visitors are presented with a single poignant object, and as they

step over the threshold, a voice recording of the donor introduces their own story. The alcoves are equipped with directional speakers embedded in the walls and on the ceiling, producing a localised listening field which contains the sound within each architectural niche.

Finally, the galleries conclude with *Medicine and Communities*, which foregrounds public health, lived experience, and the impact of social systems on wellbeing. For this section, the *Padded Cell* installation was selected, where visitors can hear the recorded voices of former patients of psychiatric hospitals who experienced confinement (Fig. 6). Designed to mimic the dimensions and spatial arrangement of a real psychiatric “padded cell” displayed directly alongside it, the installation employs directional speakers within an enclosed architectural space, offering a powerful, immersive aural encounter with the realities of psychiatric hospitals.

Fig. 4:
The *Therapist's Room* installation, Medicine Galleries, Science Museum © Stefania Zardini Lacedelli.



5



6

Fig. 5:
The John Gibson & Son pharmacy, Medicine Galleries, Science Museum. © The Board of Trustees of the Science Museum.

Fig. 6:
The Padded Cell, Medicine Galleries, Science Museum © Stefania Zardini Lacedelli.

3.2. Tuning Acoustic Perception: Auditory Self-Assessment

3.2.1 Description of the activity

On the day of the workshop, participants completed an auditory self-assessment prior to entering the galleries. Conceived as a preparatory reflective tool rather than a data-collection instrument alone, this activity was designed to attune participants to their own auditory perception and to foreground sound as a critical dimension of heritage experience. It functioned as a “tuning” device: orienting attention toward specific acoustic phenomena while prompting reflection on individual listening preferences and auditory sensitivities before undertaking the sonic observation.

The self-assessment tool was informed by the principles of the Aural Diversity Toolkit,⁵⁶ a design resource intended to support architects, curators, and spatial designers in recognising aural diversity as a spectrum of listening experiences. Drawing upon the empirical research with aurally divergent participants,⁵⁷ the activity adapted the toolkit’s principles to the specific context of museums and heritage spaces. Structured around four interconnected prompts, it invited participants to reflect on the importance of the acoustic environment in their decisions to enter public spaces, to assess their sense of acoustic comfort across different spatial typologies (including museums), to consider the role sound plays in shaping their museum experience, and to identify the types of sounds they find most challenging in exhibition settings.

The first two questions introduced the concept of *acoustic comfort* as a factor shaping how individuals choose, navigate, and experience public spaces. By situating museums alongside other environments – such as restaurants, theatres, supermarkets, parks, railways, airports, or libraries – these questions highlighted both the variability of acoustic conditions across spatial typologies and the diversity of individual responses to them.

The third question translated the toolkit’s identified sound stressors (loud sounds, background noise, high-pitched sounds, reverberant or “echoey” spaces) into heritage environments. Its purpose was to sensitise participants to potential acoustic challenges of museum spaces, preparing them to identify these phenomena during the soundwalk. The fourth question extended the toolkit framework by moving beyond comfort and difficulty toward a more holistic reflection on sound as an interpretative and curatorial agent within museums.

Together, these four prompts tuned participants’ attention to their own sonic perception and provided conceptual anchors that could be recalled while experiencing the space and the installations. In doing so, the self-assessment tool positioned participants as active listeners, each carrying distinct auditory profiles and sonic preferences into their engagement with the Medicine Galleries.

3.2.2. Results

All twelve participants completed the self-assessment (Fig. 7), which was conducted live via Menti.com, allowing responses to be displayed in real time. When asked to consider visiting a public space more generally, ten participants indicated that acoustic conditions play a significant role in their decision-making: four described them as *very important* and six as *quite important*. Only two participants attributed limited importance to sound. These responses suggest a high level of pre-existing sonic awareness within the cohort and confirm that acoustic comfort is a meaningful factor in spatial choice.

In relation to different types of environments, the library emerged as the most comfortable acoustic space among those listed, followed by parks or natural environments, with museums ranked third. At the opposite end of the spectrum, railway stations received the lowest comfort ratings by a substantial margin, fol-

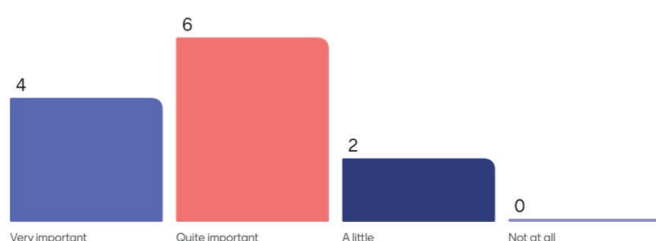
lowed by airports and restaurants/pubs. These results point to a clear preference for environments characterised by lower noise levels, reduced unpredictability, and greater perceived control over auditory input.

When focusing specifically on museums, participants identified sound as a powerful emotional and sensorial trigger. The highest-rated functions of sound were its capacity to raise feelings and emotions, enhance sensorial involvement, and create a sense of intimacy. In contrast, the lowest score was attributed to the ability of sound to foster a feeling of inclusion. This suggests an awareness – later reinforced in the workshop activities – that while sound can deepen engagement, it may simultaneously create barriers, whether due to audibility challenges, sensory overload, or limited accessibility options.

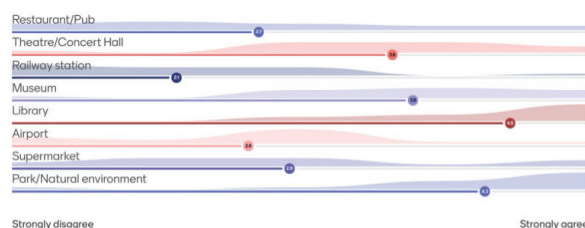
Regarding the most challenging sounds in museum environments, participants consistently identified loud and unexpected sounds, peo-

Fig. 7:
Results of the self-assessment tool informed by the Aural Diversity Toolkit.

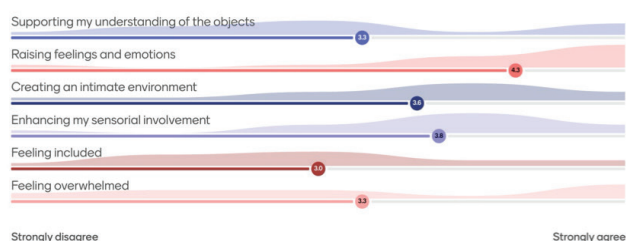
When you're considering visiting a public place, how important is the acoustic environment in making your decision?



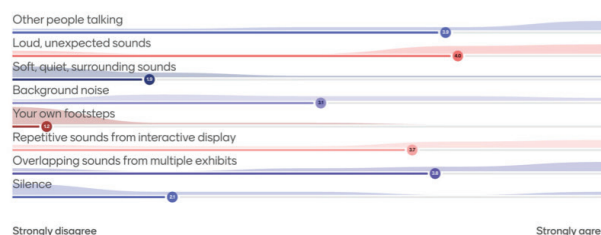
I feel acoustically comfortable in the following spaces:



When you're visiting a museum, sound is instrumental in...



In the museum, I find the following sounds challenging



ple talking, overlapping audio from multiple exhibits, and repetitive sounds from interactive displays. These concerns were later corroborated through the sound-drawing and empathy canvas exercises (see sections 3.3 and 3.4). By contrast, footsteps, soft ambient sounds, quiet background noise, and silence were generally described as the least challenging.

Overall, the survey results established a shared sensitivity to acoustic conditions and anticipated many of the themes – emotional resonance, cognitive load, and sensorial accessibility – that emerged more fully in the *in situ* observation activities.

3.3 Sonic Observation in situ: Walking, Listening and Drawing

3.3.1 Description of the activity

Once on site, the workshop shifted into a structured sonic observation activity combining soundwalking and sound drawing. Before entering the galleries, participants listened to five short audio recordings – each captured in a different section of the Medicine Galleries – and were invited to select the sound they found most interesting. Based on their choice, they were directed to a specific gallery and its associated sound installation, which then became the focus of their *in situ* activity.

At the Medicine Galleries' entrance, each participant began by slowly walking through their assigned section, taking time to attune to its acoustic characteristics (Fig. 8). This activity was informed by soundwalking and deep listening methods, which foreground listening as the primary sense through which

the environment is perceived. A soundwalk invites place discovery through focused auditory attention, encouraging participants to give attention to sounds both acoustically and psychologically.⁵⁸ Pauline Oliveros describes “deep listening” as an expansion of perception towards “the vastness and complexity” of sound – an attunement that heightens awareness of one’s connection to the surrounding environment.⁵⁹ Walking is integral to this practice. Since the 1960s, walking methods have become a tool to question institutional limits, reimpose spatial order, and explore the world in affective, embodied and multimodal way.⁶⁰ In museum contexts, movement is inseparable from experience: exhibitions unfold through wandering, pausing, and transitioning between rooms.⁶¹ Drawing on these principles, the soundwalk sought to foreground the dynamic and transitional nature of gallery



Fig. 8: Workshop participant during the soundwalk at the Medicine Galleries (Science Museum), March 2025 © Stefania Zardini Lacedelli.

experience, inviting participants to engage in attentive listening while in motion across their assigned section.

As part of the soundwalk, participants were invited to engage in a sound-drawing exercise, producing a personal visual representation of their sonic perception. This activity was informed by sound-mapping approaches which use graphic notation to represent the acoustic properties of places.⁶² In particular, the exercise drew on creative approaches developed within the Arts and Humanities Research Council project *Tinnitus, Auditory Knowledge and the Arts*, which used drawing and other artistic practices to explore subjective experiences of tinnitus.⁶³

Inspired by these approaches, this activity explored the use of drawing to externalise inner auditory perception, making perceptible experiences that are otherwise invisible and difficult to verbalise. Through drawing and visual representation, participants were encouraged to translate sonic qualities such as volume, rhythm, repetition, directionality, proximity, and reverberation into lines, marks, densities, symbols, or abstract forms, making them discussable within the group.

3.3.2 Results

The sound-drawing exercise revealed rich multilayered insights conveying the embodied, spatial, and affective dimensions of listening that were otherwise difficult to articulate. Participants employed a highly diverse visual vocabulary to express not only individual sounds, but also their position within the

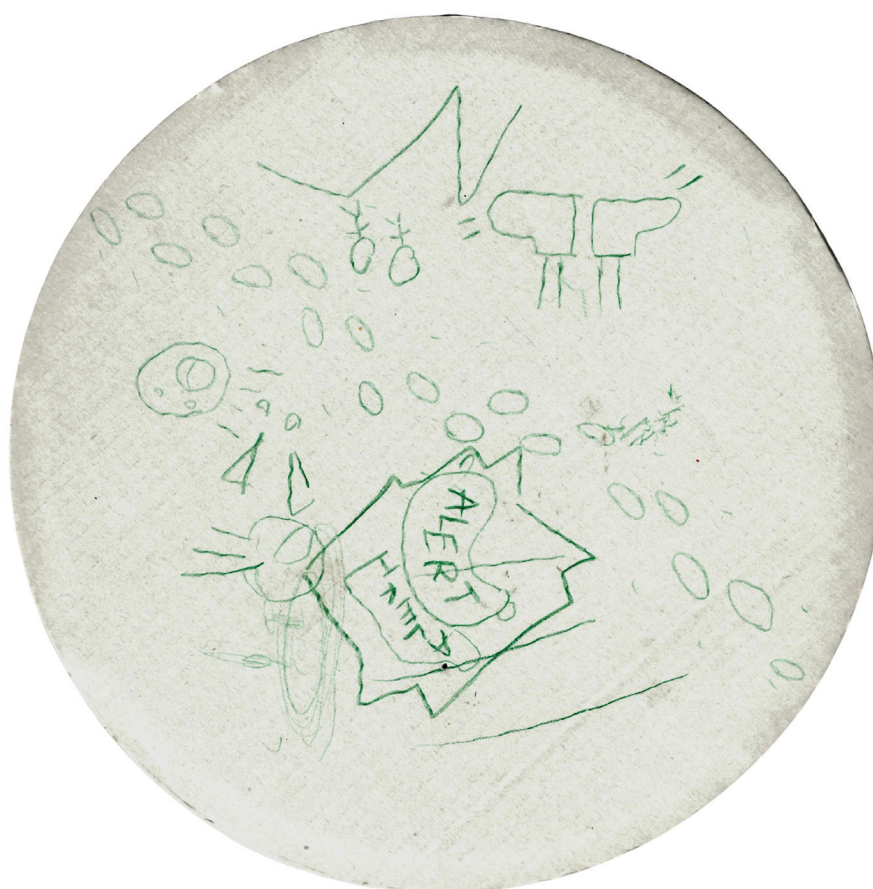
acoustic environment, the simultaneity of sound sources, the dynamic interplay between sound installations and living sounds, and their emotional responses. Across the cohort, modes of representation ranged from waveforms to figurative sketches, symbolic notation, onomatopoeic text, colour coding, layered textures, and spatial zoning. Many drawings combined multiple strategies within a single page, producing hybrid forms that mirrored the complexity of the sonic environments they sought to render.

Some participants adopted sound-wave motifs to capture distinct acoustic qualities. The drawing pictured in Fig. 9, for example, displays lines of varying amplitude and rhythm – jagged, spiked forms to suggest abrupt or high-pitched sounds; undulating curves to evoke softer and more continuous sounds. Differences in shape and density transformed pitch, intensity and rhythm into graphic form.

Others participants relied on symbols and figurative elements. The drawing in Fig. 10 depicts human presence profiles – two silhouettes, a pair of feet, footprint – alongside icons representing specific sound sources, such as speakers and conversational “vignettes.” Exclamation and question marks signal abrupt or intrusive sounds, while a large zone marked “ALERT” visually dominates the drawing, expressing the unpredictability of intermittent noises more forcefully than the participant verbalised during discussion.



9



10

Fig. 9:
Sound drawing
n°2.

Fig. 10:
Sound drawing
n°3.

Particularly striking is the drawing in Fig. 11, which captures the difficulty of focusing on a single sound source by representing the gallery as an acoustic mesh or tangle. Dense clusters of marks, contrasting textures, and variations in colour differentiate between roughness, softness, direction, and intensity. At the centre, the participant positions herself as the listening node – the perceptual anchor – surrounded by figures of a staff member, a baby, and a visitor wearing headphones. Onomatopoeic words such as “stomp,” “boop!”, and “beep beep!” appear at varying sizes to indicate repetition and volume. Textual annotations further layer subjective evaluation of the sonic experience: next to a densely populated sound zone appears the phrase “silence would be preferred”; beside the image of headphones, “library-owned, don’t like sharing”; near an indistinct block of overlapping text, “can’t reach”, suggesting difficulty in discerning speech. Here, auditory perception, personal preference, and accessibility concerns converge in a single multimodal composition.

Several drawings foregrounded the liveliness of the museum environment, emphasising the centrality of human voice. The example in Fig. 12 focuses almost exclusively on speech sounds, with a silhouetted face positioned at the centre to represent the listener. A concentric wave radiates outward, carrying fragments of overheard dialogue: “Alright, this way class”, “Hey, come look at this, wow!”, “Mum, over here!” – alongside the repeated “mutter, mutter, mutter” of indistinct conversation. Near the listener figure, overlapping words become

illegible, visually conveying the cognitive strain of processing multiple conversations simultaneously. The drawing thus captures not only the presence of speech, but its density, directionality, and interpretive load.

Taken together, the drawings demonstrate how participants perceived the galleries as layered and negotiated acoustic environments filled with overlapping voices, curated installations, mechanical noises, and fluctuating intensities. Most importantly, they make visible the situated nature of listening: each drawing centres a perceiver, explicitly or implicitly, and constructs the environment from that subjective point. The use of this tool surfaced a plurality of auditory experiences, highlighting how the same acoustic conditions can be experienced differently across listeners.

3.4 Aural Empathy Canvas

3.4.1 Description of the activity

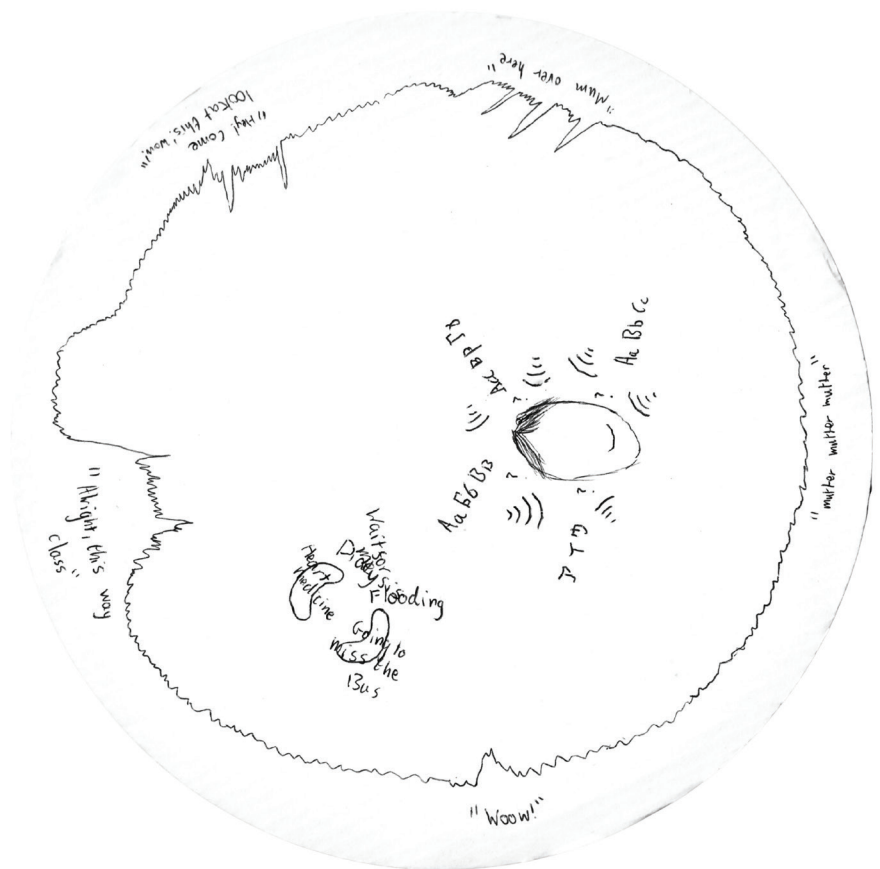
After being immersed into the gallery soundscape, participants were invited to engage with the specific sound-based installation associated with their section. They were invited to listen, observe the technological set-up, and examine how the installation operated within its surrounding acoustic environment. Their reflections were guided by a set of prompts designed to capture multiple layers of the listening experience.

This tool was informed by empathy mapping, a HCD tool widely used in design practice⁶⁴ to articulate users’ thoughts, feelings, pains, and gains in relation to a product or environment. Traditionally, empathy maps help designers move beyond func-



Fig. 11:
Sound drawing
n°6.

Fig. 12:
Sound drawing
n°10.



tional assessment and engage with lived experience, offering “perceptual lenses” to focus on specific dimensions such as emotional responses, bodily sensations, cognitive load. In the workshop, the tool was adapted into an auditory-centred empathy map that reoriented the attention towards listening as a situated, subjective and embodied experience (Fig. 13).

In particular, the prompts extended the core dimensions of empathy mapping to auditory perception, as shown in Table 2.

By integrating these dimensions, the exercise moved beyond a purely descriptive account of the installation as an isolated exhibit. Instead, it framed the sonic encounter as a situated, personalised and mediated experience, one produced through the interaction between curatorial interventions, architectural acoustics,

living soundscape, and the embodied listener. Participants were encouraged to make explicit their tacit sonic impressions: to identify how headphones or directional speakers shaped speech intelligibility, how sound bleed affected meaning, how design decisions could enable, constrain, or complicate accessibility. Through the canvas, the installation was understood as a sonic interface structured by inclusionary and exclusionary dynamics, within a living museum environment.

At the conclusion of the activities, participants reconvened at the gallery entrance and placed their sound drawings and completed Aural Empathy Canvases on the floor (Fig. 14). This collective moment was structured as an opportunity for externalising, articulating and comparing individual experiences. Each participant described

Question	Objective	Empathy Canvas Area
How does the sound installation make me feel?	To explore the affective and emotional impact of the installation.	Feelings
What I found powerful was ...	To identify what aspects of the installations participants found meaningful, powerful, or conceptually effective.	Gains
I find it hard to...	To capture perceptual (audibility, clarity), cognitive (interpretive load), and emotional (discomfort, intimacy, distress) difficulties.	Pains
What technologies and devices are used to bring sound into this space?	To understand how the technologies deployed affected auditory accessibility and sonic perception.	See
Additional sounds I heard that were not part of the exhibit	To consider how ambient noise, reverberation, or sound bleed affected the experience.	Hear

Table 2: List of the questions from the Auditory Empathy Canvas and their relation to Empathy Mapping.

SCIENCE
MUSEUM

Soundwalk

Now find one of the audio exhibits of the 'When Medicine Defines Normality' project. Put your headphones on and listen to the personal stories. Note down your reflections guided by these prompts.

How does this sound installation makes me feel?

What I found powerful was...

I find it hard to...

What technologies and devices are used to bring sound into the space?

Additional sounds I heard that were not part of the exhibit:

A final thought about my experience...

Fig. 13:
Aural Empathy
Canvas for the
'How Sound
makes me feel'
workshop.

their work, explaining how specific graphic choices corresponded to perceived sonic elements, as well as highlighting key reflections from their installation experience. This exchange enabled them to verbally express emotional responses, perceived challenges, and observations about the use of sound technologies. The exchange made perceptual differences explicit: the same

acoustic feature might have been experienced differently, while certain sounds identified by one participant had gone unnoticed by others. Participants also reflected on installations or sections they had not personally encountered, listening to peers' accounts and comparing how similar technologies or spatial configurations were perceived across the group.



14

3.4.2 Results

The Aural Empathy Canvas provided particularly effective in capturing emotional, sensorial, cognitive and physical dimensions of engaging with sound within a curated setting. Whereas the sound-drawing exercise externalised perceptual impressions of the broader acoustic environment, the canvas directed attention to a specific, intentionally designed listening experience. It

structured participants' reflections across multiple layers: what they felt at sensory and emotional levels, how they cognitively processed the content, how their bodies responded (e.g., fatigue, comfort, posture), and how both sound technologies and surrounding acoustic conditions shaped or mediated their engagement. Overall, 11 completed canvases were collected across the selected installations, distributed as shown in Table 3.

Fig. 14: Discussion of the drawings and canvas at the end of the 'How Sound makes me feel' workshop © Stefania Zardini Lacedelli.

Gallery	Installation/Exhibit	Respondents
Medicine and Bodies	When Medicine Defines Normality	5
Medicine and Treatments	Therapist’s Room	1
Medicine and Treatments	John Gibson & Son pharmacy	1
Faith, Hope and Fear	Faith, Hope and Fear	4
Medicine and Communities	Padded Cell	0

Table 3: Number of Aural Empathy Canvas collected per installation.

Intimacy and closeness emerged as strong themes, particularly among participants who experienced *When Medicine Defines Normality* and *Faith, Hope and Fear*. Many described their listening experience using affective descriptors such as “empathetic,” “concerned,” “worried,” and “hopeful”, with one participant explicitly referring to it as an “emotional experience” (AC9). Personal stories were consistently identified as one the most powerful dimensions of the installations. Participants valued hearing individuals “tell their own stories” (AC4), noting how this promoted a sense of “closeness and connection with the people behind the audio” (AC10).

At the same time, the canvas revealed the diversity and subjectivity of affective response. The same installation that fostered empathy and intimacy for some provoked discomfort for others. One participant explicitly referenced misophonia, explaining: “I found it hard to listen. Certain voices and audio peaks trigger misophonia. I would rather read the subtitles” (AC5). This response highlights how vocal timbre, amplitude peaks, or acoustic sharpness can generate distress, underscoring the importance of considering neurodivergent and sensory-sensitive listening profiles in exhibition design.

A recurring theme across eight canvases was the difficulty of sustaining focus on a single audio source. Participants reported they “struggled to remember”, “stay concentrated”, or found it “hard to focus”. The canvas structure helped disentangle these cognitive challenges from purely individual reactions, making visible how attentional fatigue intersected with design and environmental factors. Overlapping and competing sounds were frequently identified as primary sources of distraction: voices and footsteps of other visitors, intermittent audio from nearby displays, noise from other gallery levels, and mechanical hums. One participant captured the cumulative cognitive load very effectively: “I think I prefer silent installations. Sounds make me tired. There is always a chance I will be distracted or surprised and I struggle to remember information” (AC5).

Two participants connected concentration difficulties to physical fatigue – particularly when required to hold a device to the ear (AC4) or stand for prolonged periods (AC11). In contrast, the presence of seating was mentioned as enabling more focused attention. One participant sitting in the *Therapist Room* appreciated having “a relatively quiet and suitable space for thinking”, suggesting that spatial layout, bodily

comfort, and acoustic containment play a decisive role in modulating both cognitive processing and emotional engagement.

Participants appreciated moments of sonic restraint. The installation *John Gibson & Son Pharmacy* was particularly appreciated for its immersive, calm and comfortable characteristics. Here, reduced auditory density was valued as a space for reflection: “I like there’s not always someone talking, it gives you time to think/rest” (AC7) (Fig. 15). However, even in this case, acoustic permeability limited immersion. Voices of audiences both inside and outside the installation space were reported as intrusive, diminishing the installation’s immersive potential. The canvas responses thus revealed how immersion is not a fixed quality of the installation itself but a dynamic condition co-produced by architectural acoustics, technological mediation, and individual sensorial sensitivity.

4. Findings and Discussion: Towards a Participatory Aural-Diverse Design Practice

The findings discussed in this section demonstrate how understanding of aural diversity can emerge through the situated interplay of multiple elements of practice, including activities, mediating artefacts, embodied engagement, shared reflection, and forms of knowledge mobilisation. This perspective aligns with the practice-theoretical approach adopted in this study, drawing on the broader “practice turn” in social theory,⁶⁵ which has subsequently informed organisational and workplace studies,⁶⁶ design research,⁶⁷

and, more recently, digital cultural heritage design research.⁶⁸ From this perspective, understanding within an aural diverse practice of sound design in museums emerges not from isolated methods, individual cognition, or discrete evaluative tools considered independently, but through the relational and processual enactment of practice itself. Importantly, our study should not be interpreted as a comparative claim between practice-based approaches and individual tools or techniques, since the latter were not examined independently within this study and their relative effectiveness therefore remains outside its scope.

4.1. From discrete tools to situated design practice

The first finding concerns how the workshop operated as a situated Human-Centred Design practice – constituted through the interplay of activities, tools, different actors, forms of knowledge, and situated modes of coordination – rather than a collection of separate methods, and how this configuration enabled understandings of aural diversity to emerge. This finding synthesises the relational and processual logic underpinning the other findings discussed in the following sections.

The workshop materialised this perspective through a structured sequence of activities designed to elicit and mobilise understandings of aural diversity in situ. Participants were guided through preparatory reflective questions, an *in-situ* soundwalk, individual sound-drawing activity, Aural Empathy Canvas and collective discussion. Each activity was designed as an interdependent progression towards an

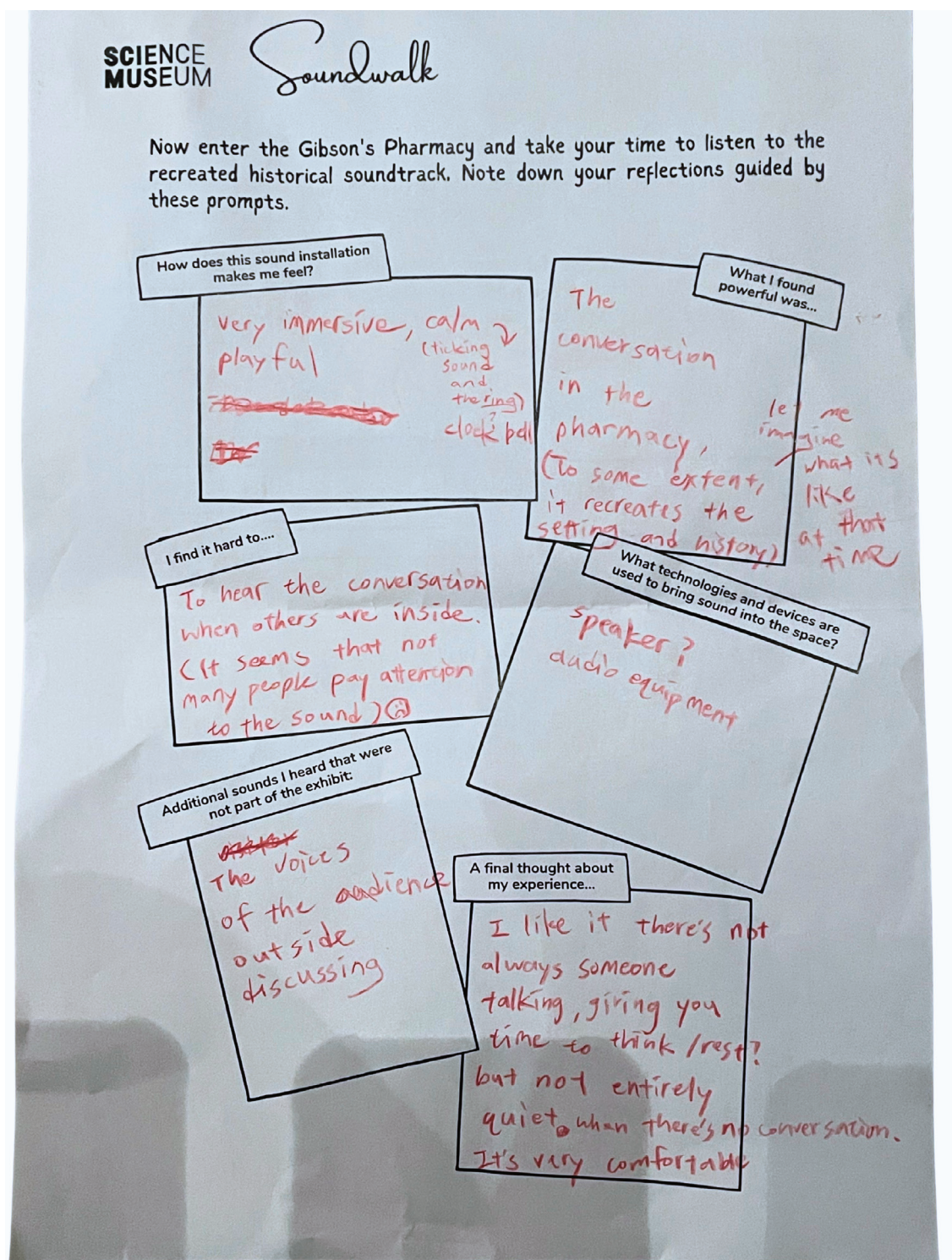


Fig. 15:
Aural Empathy
Canvas of
Gibson's
Pharmacy,
Medicine
Galleries -
Science Museum.

in-depth understanding of sonic experience: preparatory questions oriented attention and expectations; the soundwalk activated listening as a situated and embodied act; drawing slowed perception and enabled externalisation of experience; and the collective discussion

transformed individual reflections into shared knowledge.

As argued in Mason and Vavoula's conceptual framework for digital cultural heritage design practice,⁶⁹ design work becomes meaningful and transferable when activities, mediating tools, and forms of

knowledge production align into a recognisable pattern of practice. In this sense, the workshop should not be interpreted as a mere application of a toolkit, but as an emergent practice in which each tool gains meaning through their relationship. Mason and Dziekan⁷⁰ further emphasise that such a practice-based approach is essential for addressing complex, embodied, and subjective phenomena such as aural diversity. The workshop's results showed how this configuration enabled the surfacing of patterns, tensions, and situated conditions of experience that remain difficult to access through metric or standalone evaluative approaches.

This emerging practice can be meaningfully situated within the Discovery/Understanding and Define phases of established HCD frameworks (e.g. UK Double Diamond, see Fig. 1). Its key contribution lies not in replicable sequencing of activities, but in the underlying logic of practice through which sonic experience becomes observable, discussable, and actionable. Understanding its internal mechanisms – as elaborated in the findings below, together with the detailed description of the workshop above – opens up the possibility for other museums to adopt and adapt this approach within their own situated contexts. While the workshop should not be reproduced as a fixed model – given the specific organisational, spatial, and infrastructural conditions of each museum context and the specific participant profiles involved – its practice logic and mechanisms can be reconfigured and adapted to different situated settings.

4.2 The preparatory auditory self-assessment as cognitive scaffold

This finding concerns the role of the preparatory auditory self-assessment used at the beginning of the workshop as design canvas and cognitive scaffold. While it might superficially resemble a data-gathering instrument, its function within the design practice was fundamentally different. Rather than operating as a survey intended to collect responses for later analysis, the self-assessment enabled shaping participants' attentional stance and orienting how they engaged with subsequent activities. The questions were deliberately open-ended and experiential, prompting participants to reflect on their own relationship with sound and listening sensitivities. Significantly, these questions acted as framing devices, comparable to empathy-oriented tools within Human-Centred Design, guiding what participants would attend to, how they would listen, and which aspects of experience might become salient during the following workshop activities.

From a practice-based perspective, this preparatory activity can also be understood as a situated form of orientation and gradual embeddedness within the understanding context of the workshop, as it progressively situated participants within the sensory, reflective, and interpretative conditions of the practice itself, preparing them to engage more attentively with the situated nature of auditory practice.

Seen in this way, the preparatory self-assessment operated as an enabling device that prepared participants for embodied engagement,

playing a strategic role within the HCD understanding phase. This can be compared to what, in educational theory, is referred to as “scaffolding”: a provisional structure that supports learners as they engage with complex tasks, gradually enabling them to act with greater autonomy.⁷¹ In the case of aural-diverse practice, scaffolding becomes essential and part of the design practice together with other activities, tools, and knowledge mobilised, becoming a recurring “orientation device” that helps team members to better and more deeply engage with a plural, embedded, and experiential phenomena such as aural-diversity.

4.3 Activities externalising tacit and embodied sonic knowledge as epistemic mediators

A third finding concerns how tacit and embodied knowledge related to sound and listening can be externalised and shared through multiple embodied, performative and reflective actions and their interplay. The emphasis here is placed less on the resulting artefacts themselves (whose role will be discussed in 4.4) – and more on the mediated dimensions of these activities as part of a wider sequence of participatory design actions. The diversity of activities mobilised throughout the workshop – from the preparatory auditory self-assessment, to the soundwalk and sound-drawing exercise, to the verbal articulation prompted by the Aural Empathy Canvas – elicited complementary dimensions of the auditory experience, contributing to a more nuanced understanding of how sound is perceived, interpreted, remembered, and negotiated. Importantly,

this understanding did not emerge through verbal communication alone, but through the interplay of multimodal and embodied forms of expression: walking, listening, drawing, writing, and discussing. This suggests how the complexity of auditory and sensory perception often exceeds the limits of language, requiring visual, spatial, and performative forms of articulation to become perceptible and communicable.

In particular, the combined activity of walking, listening and drawing – during which participants were prompted to translate their sonic impressions into visual form – proved to be a particularly effective method for externalising forms of knowledge that typically remain implicit, embodied, and difficult to articulate. While participants moved through the same environment and were exposed to similar sonic conditions, the visual artefacts they produced differed. These differences revealed distinct, situated ways of perceiving, attending to, and interpreting sonic experience. For instance, in several cases, participants captured sonic elements that went unnoticed by others, surfacing aspects that would likely remain invisible within verbal reporting alone. In this sense, the action of drawing functioned not simply as a representational technique, but as a mode of inquiry and sense-making that enabled participants to reflect upon, interpret, and communicate embodied and difficult-to-articulate perceptions.

From a design perspective, this finding exemplifies a tacit-to-explicit knowledge transformation enacted through design activity. Following

Polanyi,⁷² tacit knowledge is not simply extracted through reflection, but becomes expressible through mediated action (i.e. drawing). In this case, drawing functioned as an epistemic action that is a way of “thinking through making.” The sound-drawing disks were not intended to represent sound accurately or objectively, but to support sense-making by inviting participants to externalise embodied listening experiences in a form that could be revisited and discussed.

However, making individual perceptions visible is only a first step; for these insights to inform design, they must be shared, compared, and negotiated across different listening perspectives.

4.4 Boundary objects as mediators of plural listening

A further finding concerns the role of the workshop artefacts (e.g. the sound-drawing disks and the Aural Empathy Canvas) in bringing the plurality of listening experiences into relation. When the artifacts were shared and discussed collectively, they enabled participants to compare experiences, recognise contrasts, and identify patterns without requiring agreement on a single interpretation. This dynamic can be seen through the concept of “boundary objects”,⁷³ which are artefacts that are “plastic enough” to accommodate different interpretations while remaining “robust enough” to sustain shared work across diverse social worlds. Their function is not to eliminate differences, but to make collaboration possible in the presence of differences as boundary objects are not

simply communication tools – they occupy an “in-between position” – enabling coordination without requiring full alignment of understanding amongst team members with different backgrounds.

In the workshop, each participant interpreted and produced their drawing through a personal, embodied listening experience, yet once placed side by side, they became shared reference points. The differences between them – and, crucially, the reflections on those differences – proved essential, as divergent listening perspectives became productive resources for exploring the problem space (see Section 4.6). This is particularly significant for engaging with aural diversity, as it allows differences in sonic perception to become productive resources for exploring the acoustic environment.

4.5 From Boundary Objects to Intermediary Design Deliverables

A further finding concerns the potential for the workshop artefacts to function not only as mediators of plural listening perspectives, but also as evolving carriers of aural-diverse knowledge across subsequent phases of Human-Centred Design. The emphasis here shifts towards the processual and evolutionary nature of design practice: specifically, how these insights can become progressively stabilised and translated into forms that inform future design action. Rather than generating isolated reflections about sound, the workshop produced artefacts capable of carrying insights about auditory experience beyond the immediate activities and into later stages of the design process.

This resonates with Vavoula and Mason's concept of "Intermediary Design Deliverables" (IDDs),⁷⁴ which materialise the progressive stabilisation of understanding within a design process. IDD are artefacts that embody the evolving progression of design, from initial understanding and exploratory phases toward more structured forms of definition and intervention. In this sense, they mark key moments where collective insights, interpretations, and partial agreements become objectified in forms that guide and inform "what happens next", functioning as "connective tissue" across the design lifecycle. They create what Vavoula and Mason describe as moments of provisional consent, whereby certain tensions or insights become recognised as legitimate points of action and, once materialised, enter the process memory of the project, shaping what can subsequently be proposed, revisited, ignored, or re-worked.

Within the context of this study, the workshop itself remained confined to the Understanding/Discovery phase of Human-Centred Design (see Fig. 1) and, therefore, our study could not empirically examine how these artefacts would concretely evolve, circulate, or operate across later design phases. However, the findings suggest that, if an aural-diverse design practice were integrated within broader Human-Centred Design processes, the artefacts generated through the workshop could function as Intermediary Design Deliverables, capable of informing subsequent phases of definition, ideation, development, and even testing. In the case of the Science Museum, for example, insights related to

cognitive fatigue, sound overlap, or the need for quieter reflective spaces can inform future design interventions aimed at improving sonic accessibility of the galleries.

From a Human-Centred Design perspective, this highlights how understanding of sound and auditory experience can be progressively integrated from the earliest stages of design, rather than addressed retrospectively as an accessibility adjustment. In this sense, the workshop artefacts do not simply preserve reflections generated during the activities, but participate in the progressive framing and reframing of the design problem itself, supporting the transition from exploratory understanding toward more structured forms of problem definition discussed in the following section.

4.6 Problem framing as an aural-diverse design practice

The final finding concerns the relationship between understanding sonic experience – as enacted through the workshop – and problem framing in HCD practice. Problem framing refers to the process through which designers and non-designers (e.g. museum practitioners) co-define what is considered relevant, problematic, actionable, and meaningful within a design situation. Rather than assuming that problems pre-exist and simply need to be solved, problem framing recognises that design challenges are progressively constructed, interpreted, and negotiated through inquiry, interaction, and exploration⁷⁵.

Within this perspective, the work-

shop operated within the problem framing space. Rather than aiming at delivering a formal problem statement (or a design brief), it configured the problem space itself, enabled participants to articulate and negotiate what aspects of auditory experience might become relevant, actionable, or meaningful for future design intervention. Positioned between the Discover and Define phases, the workshop operated as a formative and situated process through which the design problem progressively began to take shape, laying the groundwork for subsequent framing during the Development and Ideation phases.

This understanding of “problem framing” aligns with foundational research in design. Dorst⁷⁶ argues that problem framing is a strategic design capability: it reshapes how situations are understood and what becomes actionable. Earlier, Dorst and Cross⁷⁷ demonstrated that problems and solutions co-evolve in design activity: designers and non-designers iteratively structure and restructure the problem space while simultaneously exploring possible solutions.

Within this perspective, the way in which problem framing was enacted in the workshop can be understood not as a separate or preliminary activity, but as an integral and foundational component of the design process itself, allowing to continuously refine, clarify and articulate the set of conditions, tensions and experiences through which aural diversity become understood, negotiated and addressed.

5. Conclusion

This article set out to investigate how Human-Centred Design (HCD) can meaningfully engage with aural diversity within contemporary museum environments. Rather than treating sound solely as a curatorial medium or an environmental condition to be managed, the study reframed it as a complex, embodied and situated dimension of experience – one that requires design approaches capable of capturing plurality, tacit knowledge, and sensory difference. Through the workshop *How Sound Makes Me Feel*, the article examined how an emerging design practice can be developed to understand and work with aural diversity from the earliest stages of the design process.

A central contribution of the study lies in demonstrating that design value did not emerge from single/isolated tools, but from the structured sequencing of activities – preparatory reflection, soundwalking, drawing, focused analysis through the Aural Empathy Canvas, and collective discussion. Together, these activities created a scaffold that enabled participants to attune to their listening experiences, surface embodied perceptions, and recognise the multiplicity of ways sound is perceived, processed, and emotionally experienced. Understanding developed gradually, through immersion, externalisation, and comparison – a progression integral to HCD’s commitment to empathy, participation, and critical reflection.

The use of creative methods and visualisations – particularly sound walking and sound drawings – proved essential. These artefacts enabled tacit and embodied listening knowledge to become visible and

discussable, functioning as *boundary objects* that supported meaning making across diverse experiences. As participants identified recurring tensions – fatigue, difficulty focusing, cognitive overload, or the benefits of sonic restraint – these artefacts became *Intermediary Design Deliverables*, stabilising key insights and carrying them forward into the design process as legitimate considerations for inclusive design. In doing so, they helped preserve and amplify auditory plurality, rather than reduce it to standardised measures.

The study also showed how this emerging practice contributes to problem framing, a core component of HCD. Rather than defining accessibility issues in advance, the workshop shaped the very conditions through which the “problem” of sound inclusion in museums could be recognised and articulated. This shift – from problem solving to problem framing, as well as from sound accessibility to sonic inclusion – aligns with contemporary design scholarship and demonstrates why inclusive sonic design must begin with in depth understanding.

Taken together, the findings suggest that aural-diverse design can operate as an embedded HCD practice, especially within the early Understanding and Defining phases of established frameworks such as the Double Diamond. What is transferable is not a prescriptive toolkit, nor a replicable sequence of fixed steps, but the logic and mechanics of the practice: orienting attention towards sonic perception, fostering embodied engagement, creating shared artefacts for reflection, and maintaining the plurality of listening experiences as a design re-

source.

In post-digital, media-rich museum environments – where sound is increasingly central yet often under-theorised – this emerging aural-diverse design practice provides a way for museums to perceive what traditional acoustic evaluation methods cannot. It reveals how sound can support or hinder engagement, how visitors navigate sensory complexity, and how inclusive design must attend not only to technological accessibility but to perceptual, emotional, and cognitive dimensions of experience. By embedding this practice, museums can begin to recognise hearing differences not as a deficit to be accommodated, but as a form of disability gain⁷⁸ – a source of insight and lived knowledge that enhances the quality of experience for all visitors.

Limitations

This study has limitations that shape the scope of its findings. The work was conducted in a single museum and on a specific day, meaning that the sound environment reflects conditions that may vary across time, visitor numbers, or temporary activities. All participants were MA Museum Studies students, representing a specific, self-selecting group with prior academic and practical engagement with museum contexts and visitor experience design. This prior familiarity may have influenced how participants engaged with the workshop tools, particularly in relation to reflective, interpretative, and task-based activities and may not reflect how different museum visitors would engage with the same methods. Further work is needed to consider how the tools and activities might need to be adapted for more diverse participant groups, particularly those with diagnosed hearing conditions such as hyperacusis, tinnitus, misophonia, auditory processing disorders, autistic listening profiles and hearing loss. These groups may be at greater risk of sensory overload, fatigue, or anxiety when engaging with research activities involving complex or unpredictable sound environments. Future applications of this approach should therefore prioritise accessibility, informed consent, and safeguarding considerations, ensuring that participation is designed to minimise discomfort and support positive, empathetic and inclusive research experiences.

Acknowledgements

The workshop described in this article was developed as part of the preparatory research for the Early Career Research proposal *Hearing in Motion: Heritage Sites as Laboratories for Exploring Aural Diversity* (PI: Stefania Zardini Lacedelli), submitted to the Wellcome Early Career Awards in February 2026. The authors would like to thank Katie Dabin, Keeper of Medicine and Stewart Emmens, Curator of Community Health at the Science Museum, as well as the SMG Research Team for their support and insightful feedback during the revision of this paper. We are grateful to the members of the Aural Diversity Networks for their valuable feedback on an earlier version of this work presented at the Aural Diversity Conference (Salford, 2025). Our sincere thanks also go to Professor Ross Parry and the MA Museum Studies students for their willingness to participate and engage so thoughtfully in the study.

Endnotes:

- 1 Cortez 2022.
- 2 Zardini Lacedelli, Stack, Jamieson 2021.
- 3 Byrne 2012.
- 4 Kannenberg 2017.
- 5 Renel 2022.
- 6 Drever, Hugill 2022.
- 7 Davies 2023.
- 8 Weisser et al. 2019.
- 9 Eardley et al. 2022; Vohra et al. 2025.
- 10 McEnaney 2019.
- 11 Bubaris 2014; Cortez 2023; Wiens, de Visscher 2019; Thormälen, Brooks, Stephens 2022.
- 12 Kannenberg 2017; Mansell, Jamieson, De Little 2022.
- 13 Mansell 2017; Schulze 2018; Zardini Lacedelli 2027 (forthcoming).
- 14 Schulze et al. 2027 (forthcoming).
- 15 The first international conference dedicated to the field, *Sound in Museums*, was held in Kolding in 2024; a second edition followed in Mafra in 2025. See *Sound in Museums* 2025.
- 16 Parry 2013.
- 17 Drotner et al. 2018.
- 18 Popple, Prescott, Mutibwa 2020.
- 19 Morse 2020.
- 20 Lackoi, Patsou, Chatterjee 2016.
- 21 Kelly 2017.
- 22 Romeo Pitone, Harvie-Clark 2023.
- 23 Weisser et al. 2019.
- 24 Heylighen, Rychtarikova, Vermeir 2010; Zhang, Trocchianesi 2023; Eardley et al. 2024.
- 25 Bitgood 2009.
- 26 Granland, Sadia, Cooper 2026.
- 27 Rosas Pérez et al. 2025.
- 28 Bendo et al. 2024.
- 29 Renel 2022.
- 30 Guffey 2023.
- 31 Hamraie 2017.
- 32 Drever, Hugill 2022.
- 33 Çakır 2025.
- 34 Ferrer-Torres, Giménez-Llort 2022.
- 35 Jarach et al. 2022.
- 36 Alanazi 2023.

- 37 Kytö 2022.
- 38 Renel 2019.
- 39 Palmer, Rees 2010.
- 40 Renel 2019.
- 41 Mason 2018; Mason 2022.
- 42 Parry, Dziekan 2021; Mason, Dziekan, Parry 2025.
- 43 Vermeeren et al. 2018; Mason 2020; Hornecker, Ciolfi 2022.
- 44 Mason, Dziekan 2025a.
- 45 Mason, Dziekan 2025b.
- 46 Mason, Dziekan 2025a.
- 47 See Design Thinking Stanford. The Stanford d.school Human-Centred Design (Design Thinking) framework, structured into five iterative phases: *Empathize* (understanding of users and contexts), *Define* (articulating and reframing the design challenge), *Ideate* (generating and exploring possible ideas/solutions), *Prototype* (materialising ideas in tangible forms), and *Test* (evaluating and refining ideas/solutions through feedback). Although visually represented as sequential, the phases are iterative and recursive, with problem framing and solution development co-evolving throughout the process. Source: <https://dschool.stanford.edu/>.
- 48 Hou, Riccò 2025.
- 49 Chiaccheri 2022.
- 50 Holmes 2018.
- 51 The Double Diamond by the Design Council is a visual representation of the design and innovation process. It's a simple way to describe the steps taken in any design and innovation project, irrespective of methods and tools used. Source: <https://www.designcouncil.org.uk/our-resources/the-double-diamond/> CC BY 4.0 license.
- 52 Thompson, Biddle 2013.
- 53 Bond et al. 2021.
- 54 Harvie-Clark, Romeo Pitone 2020.
- 55 Westerkamp 2007.
- 56 Arup 2024.
- 57 The Aural Diversity Toolkit is grounded in empirical research conducted through a questionnaire completed by 49 aurally divergent participants, followed by in-depth interviews. The research centred lived experience, inviting participants to describe their challenges, preferences, assistive strategies, and levels of confidence across different public acoustic environments. The findings were synthesised into six aural-diverse personas that illustrate varied auditory needs and listening profiles.
- 58 Kannenberg 2016.
- 59 Oliveros 2005.
- 60 Biserna 2022.
- 61 Kelly 2017.
- 62 Thulin 2016.
- 63 Thompson 2024.
- 64 Dam, Siang 2018.
- 65 Reckwitz 2002; Schatzki, Knorr-Cetina, von Savigny 2001.

- 66 Nicolini 2012.
- 67 Kimbell 2012.
- 68 Mason, Vavoula 2021.
- 69 Mason, Vavoula 2021.
- 70 Mason, Dziekan 2025a.
- 71 Vygotsky, Cole 1978.
- 72 Polanyi 2009.
- 73 Star, Griesemer 1989.
- 74 Vavoula, Mason 2017.
- 75 Within the UK Double Diamond, framing operates primarily across the Discover and Define phases – the exploratory space in which the workshop took place – where broad exploration is gradually synthesised into more focused directions for design action. However, problem framing also extends beyond these phases as an iterative process embedded throughout design practice, where problems continue to be refined and clarified through ideation, prototyping, and testing.
- 76 Dorst 2015; van der Bijl-Brouwer, Dorst 2017.
- 77 Dorst, Cross 2001.
- 78 Eardley, Jones 2025.

References:

- Alanazi 2023: Alanazi H.M., *Understanding Auditory Processing Disorder: A Narrative Review*, in “Saudi Journal of Medicine & Medical Sciences”, 2023, 11, 4, pp. 275-282. DOI: https://doi.org/10.4103/sjmms.sjmms_218_23.
- Arup 2024: Arup & Aural Diversity Network, *Aural Diversity Toolkit (inclusive acoustic design guidance)*, Arup. Retrieved from <https://www.arup.com/globalassets/downloads/insights/aural-diversity-toolkit.pdf>.
- Bendo et al. 2024: Bendo G.J., Sturrock A., Hanks G., Plack C.J., Gowen E., Guest H., *The Diversity of Speech Perception Difficulties Among Autistic Individuals*, in “Autism & Developmental Language Impairments”, 2024, 9, Article 23969415241227074.
- Biserna 2022: Biserna E. (ed.) *Going Out: Walking, Listening, Soundmaking*. Brussels, umland editions / Q-O2, 2022.
- Bitgood 2009: Bitgood S., *Museum Fatigue: A Critical Review*, in “Visitor Studies”, 2009, 12, 2, pp. 93-111.
- Bond et al. 2021: Bond S., Dabin K., Emmens S., Hurley S., McEnroe N., *Curating Medicine: The Wellcome Galleries*, in “Science Museum Group Journal”, 2021, 14. DOI: <https://doi.org/10.15180/201407>.
- Bubaris 2014: Bubaris N., *Sound in Museums – Museums in Sound*, in “Museum Management and Curatorship”, 2014, 29, 4, pp. 391-402.
- Byrne 2012: Byrne S., *Voicing the museum artifact*, in “Journal of Conservation and Museum Studies”, 2012, 10, 1, pp. 23-34. DOI: <https://doi.org/10.5334/jcms.1011204>.
- Çakır 2025: Çakır O., *An Architectural Design Guideline for Pain Hyperacusis Patients: Silent House Typology*, in “Civil Engineering and Architecture”, 2025, 13, 6, pp. 4546-4558.
- Chiaccheri 2022: Chiaccheri M.C., *Museum Accessibility by Design: A Systemic Approach to Organizational Change*, London, Bloomsbury Academic, 2022.

Cortez 2022: Cortez A., *Museums as Sites for Displaying Sound Materials: A Five-Use Framework*, in “Sound Studies”, 2022, 8, 1, pp. 43-72. DOI: <https://doi.org/10.1080/20551940.2021.1975442>.

Cortez 2023: Cortez A., *Sound as Producer of Social Spaces in Museum Exhibitions*, in “Curator: The Museum Journal”, 2023, 66, 2, pp. 317-328. DOI: <https://doi.org/10.1111/cura.12547>.

Dam, Siang 2018: Dam R.F., Siang T.Y., *Empathy Map – Why and How to Use It*, in “Interaction Design Foundation”, 2018. Available at: <https://www.interaction-design.org/literature/article/empathy-map-why-and-how-to-use-it>.

Davies 2023: Davies B., *Can acoustic design accommodate aural diversity?*, in “INTER-NOISE and NOISE-CON Congress and Conference Proceedings”, 2023, 265, 2, pp. 5064-5071. DOI: https://doi.org/10.3397/IN_2022_0732.

Dorst 2015: Dorst K., *Frame Innovation: Create New Thinking by Design*, Cambridge, MA, MIT Press, 2015.

Dorst, Cross 2001: Dorst K., Cross N., *Creativity in the design process: Co-evolution of problem-solution*, in “Design Studies”, 2001, 22, 5, pp. 425-437.

Drever, Hugill 2022: Drever J., Hugill A. (eds.), *Aural Diversity*, London-New York, Routledge, 2022.

Drotner et al. 2018: Drotner K., Dziekan V., Parry R., Schröder K.C. (eds.), *The Routledge Handbook of Museums, Media and Communication*, London, Routledge, 2018.

Eardley et al. 2022: Eardley A.F., Thompson H., Fineman A., Hutchinson R., Bywood L., Cock M., *Devisualizing the Museum: From Access to Inclusion*, in “Journal of Museum Education”, 2022, 47, 2, pp. 150-165.

Eardley et al. 2024: Eardley A.F., Jones V.E., Bywood L., Thompson H., Husbands D., *The W-ICAD Model: Redefining Museum Access Through the Workshop for Inclusive Co-created Audio Description*, in “Curator: The Museum Journal”, 2024, 68, 1, pp. 219-242. DOI: <https://doi.org/10.1111/cura.12649>.

Eardley, Jones 2025: Eardley A.F., Jones V.E. (eds.), *The Museum Accessibility Spectrum. Reimagining Access and Inclusion*, London-New York, Routledge, 2025.

Ferrer-Torres, Giménez-Llort 2022: Ferrer-Torres A., Giménez-Llort L., *Misophonia: A Systematic Review of Current and Future Trends*, in “International Journal of Environmental Research and Public Health”, 2022, 19, 11, 6790. DOI: <https://doi.org/10.3390/ijerph19116790>.

Granland, Sadia, Cooper 2026: Granland M.E., Sadia T., Cooper E., *Beyond the Minimum: Designing for Neurodiversity in Museums and Galleries*, in “Archnet-IJAR: International Journal of Architectural Research”, 2026, 20, 3, pp. 522-544. DOI: <https://doi.org/10.1108/ARCH-05-2024-0206>.

Guffey 2023: Guffey E.E. (ed.), *After Universal Design. The Disability Design Revolution*, London-New York, Bloomsbury Visual Arts, 2023.

Hamraie 2017: Hamraie A., *Building Access. Universal Design and the Politics of Disability*, Minneapolis, University of Minnesota Press, 2017.

Harvie-Clark, Romeo Pitone 2020: Harvie-Clark J., Romeo Pitone R., *Acoustic perception EvALuation of buildings – the APEAL method*, in “Proceedings of the Institute of Acoustics”, 2020, 42, 1, pp. 211-220.

Heylighen, Rychtarikova, Vermeir 2010: Heylighen A., Rychtarikova M., Vermeir G., *The Sound of Inclusion: A Case Study on Acoustic Comfort for All*, in Langdon P., Clarkson J., Robinson P. (eds.), *Designing Inclusive Futures*, London, Springer, 2010, pp. 75-84.

Holmes 2018: Holmes K., *Mismatch: How Inclusion Shapes Design*, Cambridge, MA, MIT Press, 2018.

- Hornecker, Ciolfi 2022: Hornecker E., Ciolfi L., *Human-Computer Interactions in Museums*, Cham, Springer Nature, 2022. DOI: <https://doi.org/10.1007/978-3-031-02225-8>.
- Hou, Riccò 2025: Hou W., Riccò D., *Accessible design for museums: A systematic review on multisensory experience based on digital technology*, in “International Conference on Design and Digital Communication”, Cham, Springer, 2025, pp. 291-305.
- Jarach et al. 2022: Jarach C.M., Lugo A., Scala M., van den Brandt P.A., Cederroth C.R., Odone A., Garavello W., Schlee W., Langguth B., Gallus S., *Global Prevalence and Incidence of Tinnitus: A Systematic Review and Meta-analysis*, in “JAMA Neurology”, 2022, 79, 9, pp. 888-900. DOI: <https://doi.org/10.1001/jamaneurol.2022.2189>.
- Kannenberg 2016: Kannenberg J., *Listening to Museums: Sound Mapping Towards a Sonically Inclusive Museology*, in “Museological Review”, 2016, 20, pp. 6-17.
- Kannenberg 2017: Kannenberg J., *Towards a More Sonically Inclusive Museum Practice: A New Definition of the “Sound Object”*, in “Science Museum Group Journal”, 2017, 8. DOI: <https://doi.org/10.15180/170805>.
- Kelly 2017: Kelly C., *Gallery Sound*, London-New York, Bloomsbury Academic, 2017.
- Kimbell 2012: Kimbell L., *Rethinking Design Thinking: Part II*, in “Design and Culture”, 2012, 4, 2, pp. 129-148.
- Kytö 2022: Kytö M., *Soundscapes of Code: Cochlear Implant as Soundscape Arranger*, in Drever J., Hugill A. (eds.), *Aural Diversity*, London–New York, Routledge, 2022.
- Lackoi, Patsou, Chatterjee 2016: Lackoi K., Patsou M., Chatterjee H. J., *Museums for Health and Wellbeing. A Preliminary Report*, National Alliance for Museums, Health and Wellbeing, 2016.
- Mansell 2017: Mansell J., *A Chamber of Noise Horrors: Sound, Technology and the Museum*, in “Science Museum Group Journal”, 2017, Spring Issue. DOI: <https://dx.doi.org/10.15180/170704>.
- Mansell, Jamieson, De Little 2022: Mansell J., Jamieson A., De Little A., *Staging Listening: New Methods for Engaging Audiences with Sound in Museums*, in “Science Museum Group Journal”, 2022, n. 221704. DOI: <https://dx.doi.org/10.15180/221704>.
- Mason 2018: Mason M., *Design-driven innovation for museum entrances*, in Parry R., Page R., Moseley A. (eds.), *Museum Thresholds: The Design and Media of Arrival*, London-New York, Routledge, 2018, pp. 58-77.
- Mason 2020: Mason M., *The elements of visitor experience in post-digital museum design*, in “Design Principles and Practices”, 2020, 14, 1, pp. 1-14.
- Mason 2022: Mason M., *The Contribution of Design Thinking to Museum Digital Transformation in Post-Pandemic Times*, in “Multimodal Technologies and Interaction”, 2022, 6, 9, 79. DOI: <https://doi.org/10.3390/mti6090079>.
- Mason, Dziekan 2025a: Mason M., Dziekan V., *Museums and Design Practices*, London, Routledge, 2025.
- Mason, Dziekan 2025b: Mason M., Dziekan V., *Human-centred design practices in the digital museum*, in Mason M., Dziekan V. (eds.), *Museums and Design Practices*, London, Routledge, 2025, pp. 23-41.
- Mason, Dziekan, Parry 2025: Mason M., Dziekan V., Parry R., *Staging Post-Digitality: Interdisciplinary Perspectives on Museums, Digital Culture and Design Research*, in Allegretti G., Brunazzi P., Diatta A.L., Ghirardini S. (eds.), *Crossroads | Incroci: IV International Conference on Interiors and Exhibit Design*, Roma, Accademia Adrianea Edizioni, 2025, pp. 66-72.
- Mason, Vavoula 2021: Mason M., Vavoula G., *Digital cultural heritage design practice: a conceptual framework*, in “The Design Journal”, 2021, 24, 3, pp. 405–424.

- McEnaney 2019: McEnaney T., *The Sonic Turn*, in “Diacritics”, 2019, 47, 4, pp. 80–109.
- Morse 2020: Morse N., *The Museum as a Space of Social Care*, London-New York, Routledge, 2020.
- Nicolini 2012: Nicolini D., *Practice Theory, Work, and Organization: An Introduction*, Oxford, Oxford University Press, 2012.
- Oliveros 2005: Oliveros P., *Deep Listening. A Composer’s Sound Practice*, New York-Lincoln-Shanghai, iUniverse, 2005.
- Palmer, Rees 2010: Palmer A.R., Rees A. (eds.), *The Oxford Handbook of Auditory Science: The Auditory Brain*, Oxford, Oxford University Press, 2010.
- Parry 2013: Parry R., *The End of the Beginning: Normativity in the Postdigital Museum*, in “Museum Worlds”, 2013, 1, pp. 24–39.
- Parry, Dziekan 2021: Parry R., Dziekan V., *Critical Digital: Museums and Their Postdigital Circumstance*, in Giannini T., Bowen J. A. (eds.), *Art, Museums and Digital Cultures: Rethinking Change*, Lisboa, Universidade NOVA de Lisboa, 2021, pp. 16–26.
- Polanyi 2009: Polanyi M., *The tacit dimension*, London, Routledge, 2009 (last edition).
- Popple, Prescott, Mutibwa 2020: Popple S., Prescott A., Mutibwa D. (eds.), *Communities, Archives and New Collaborative Practices*, Bristol, Policy Press, 2020.
- Reckwitz 2002: Reckwitz A., *Toward a theory of social practices: A development in culturalist theorizing*, in “European journal of social theory”, 2002, 5, 2, pp. 243–263.
- Renel 2019: Renel W., *Sonic Inclusion: Opposing Auditory Normalism in Design*, PhD thesis, Royal College of Art, 2019.
- Renel 2022: Renel W., *The Auditory Normate: Engaging Critically with Sound, Social Inclusion and Design*, in Drever J., Hugill A. (eds.), *Aural Diversity*, London-New York, Routledge, 2022, pp. 55–63. DOI: <https://doi.org/10.4324/9781003183624-6>.
- Romeo Pitone, Harvie-Clark 2023: Romeo Pitone R., Harvie-Clark J., *Decolonising Museum Soundscapes: A Practice-Based Enquiry*, in “Proceedings of the Institute of Acoustics”, 2023, 43, 3, pp. 2619–2626. DOI: <https://www.doi.org/10.61782/fa.2023.0905>.
- Rosas Pérez et al. 2025: Rosas Pérez C., Galbrun L., Payne S.R., Dickson A., Stewart M.E., *More Than Noise: Lived Experiences of Autistic People in Real Life Acoustic Environments*, in “Applied Acoustics”, 2025, 233, pp. 1–14.
- Schatzki, Knorr-Cetina, von Savigny 2001: Schatzki T.R., Knorr-Cetina K., von Savigny E. (eds.), *The Practice Turn in Contemporary Theory*, London-New York, Routledge, 2001.
- Schulze 2018: Schulze H., *The Sonic Persona: An Anthropology of Sound*, Bloomsbury Academic, 2018.
- Schulze et al. 2027: Schulze H., Cortez A., De Visscher E., Rognoni G.R. (eds.), *The Bloomsbury Handbook of Sound in Museums*, London-New York, Bloomsbury Academic, 2027 (forthcoming).
- Sound in Museums 2025: Sound in Museums*, International conference, National Museum of Music, Mafra, Portugal, 17–19 October 2025. Available at: <https://2025.soundinmuseums.com/>.
- Star, Griesemer 1989: Star S.L., Griesemer J.R., *Institutional ecology, translations and boundary objects: Amateurs and professionals in Berkeley’s Museum of Vertebrate Zoology, 1907–39*, in “Social Studies of Science”, 1989, 19, 3, pp. 387–420.
- Thompson 2024: Thompson M., *Mapping tinnitus*, in “The Senses and Society”, 2024, 19, 1, pp. 44–66. DOI: <https://doi.org/10.1080/17458927.2023.2271351>.
- Thompson, Biddle 2013: Thompson M., Biddle I. (eds.), *Sound, Music, Affect. Theorizing Sonic Experience*, London-New York, Bloomsbury Academic, 2013.
- Thormählen, Brooks, Stephens 2022: Thormählen W., Brooks J., Stephens M. (eds.), *Sound*

Heritage: Making Music Matter in Historic Houses, London, Routledge, 2022.

Thulin 2016: Thulin S., *Sound Maps Matter: Expanding Cartophony*, in “Social & Cultural Geography”, 2016, 19, 2, pp. 192–210.

van der Bijl-Brouwer, Dorst 2017: van der Bijl-Brouwer M., Dorst K., *Advancing the strategic impact of human-centred design*, in “Design Studies”, 2017, 53, pp. 1-23. DOI: <https://doi.org/10.1016/j.destud.2017.06.003>.

Vavoula, Mason 2017: Vavoula G., Mason M., *Digital exhibition design: boundary crossing, Intermediary Design Deliverables and processes of consent*, in “Museum Management and Curatorship”, 2017, 32, 3, pp. 251-271. DOI: <https://doi.org/10.1080/09647775.2017.1282323>.

Vermeeren et al. 2018: Vermeeren A.P.O.S., Calvi L., Sabiescu A., Trocchianesi R., Stuedahl D., Giaccardi E., Radice S., *Future Museum Experience Design: Crowds, Ecosystems and Novel Technologies*, in Vermeeren A.P.O.S., Calvi L., Sabiescu A. (eds.), *Museum Experience Design: Crowds, Ecosystems and Novel Technologies*, Cham, Springer International Publishing, 2018, pp. 1-16.

Vohra et al. 2025: Vohra S., Slark C., Hunt J.J., Dziekan V., *The Sensational Museum's Art of Multisensory Storytelling*, in “International Public History”, 2025, 8, 1, pp. 19-28. DOI: <https://doi.org/10.1515/iph-2025-2002>.

Vygotsky, Cole 1978: Vygotsky L.S., Cole M., *Mind in Society: Development of Higher Psychological Processes*, Cambridge, MA, Harvard University Press, 1978.

Weisser et al. 2019: Weisser A., Buchholz J.M., Keidser G., McMahon C.M., *Complex Acoustic Environments: Review, Framework, and Subjective Model*, in “Trends in Hearing”, 2019, 23, pp. 1-22.

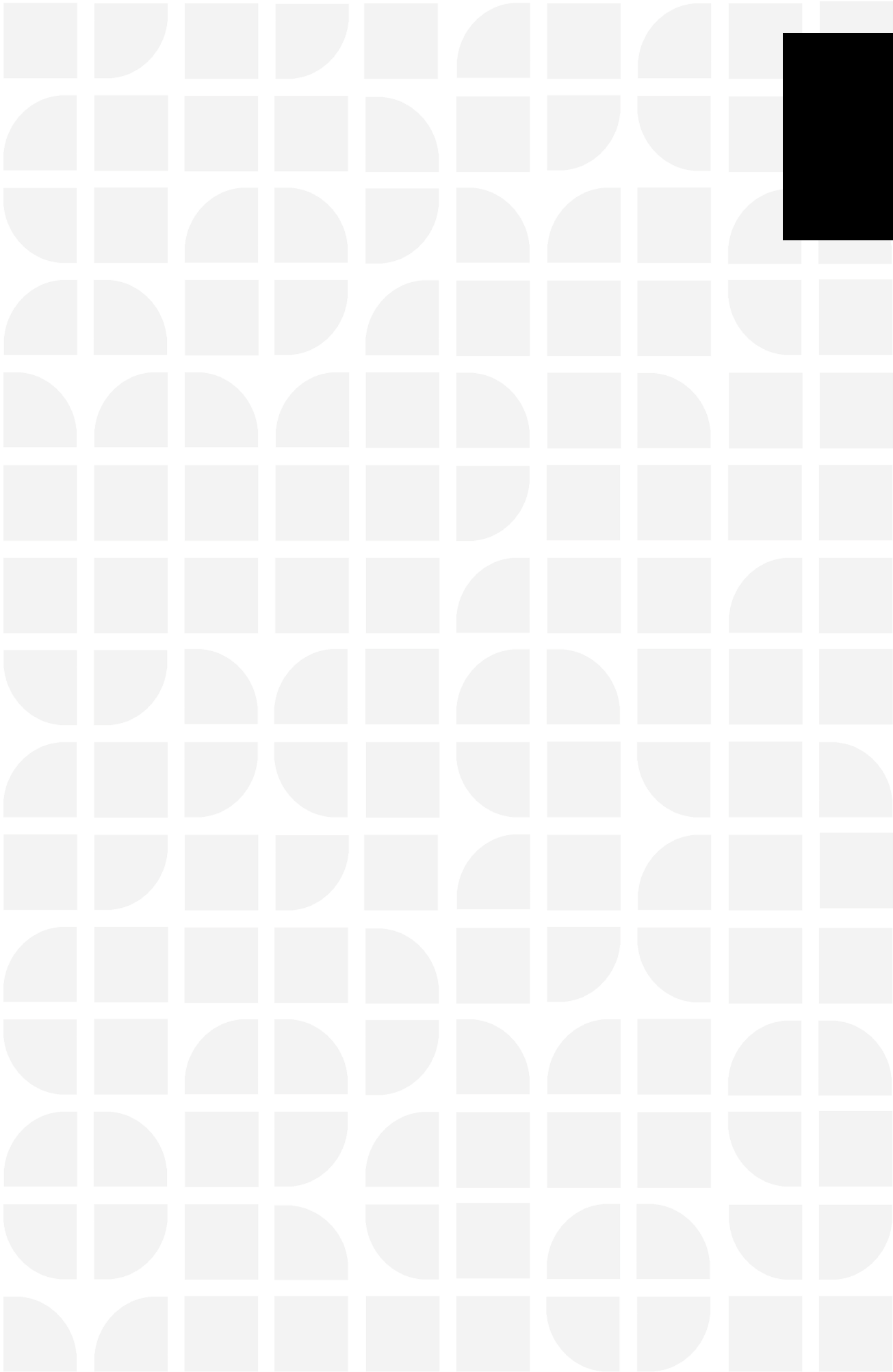
Westerkamp 2007: Westerkamp H., *Soundwalking*, in Carlyle A. (ed.), *Autumn Leaves. Sound and the Environment in Artistic Practice*, Paris, Double Entendre, 2007, pp. 18-27.

Wiens, de Visscher 2019: Wiens K., de Visscher E., *How Do We Listen to Museums?*, in “Curator: The Museum Journal”, 2019, 62, 3, pp. 277–281.

Zardini Lacedelli 2027: Zardini Lacedelli S., *The Digital Audio Space as the Museum*, in Cortez A., De Visscher E., Schulze H., Rognoni G.R. (eds.), *The Bloomsbury Handbook of Sound in Museums*, Bloomsbury Academic, 2027 (forthcoming).

Zardini Lacedelli, Stack, Jamieson 2021: Zardini Lacedelli S., Stack J., Jamieson A., *Curating Sound in a Platform World: Insights from the #SonicFriday Project*, Museums and the Web 2021 (MW21), 2021. Available at: <https://mw21.museweb.net/paper/curating-sound-in-a-platform-world-insights-from-the-sonicfriday-project/>.

Zhang, Trocchianesi 2023: Zhang Y., Trocchianesi R., *Perspectives of Sound: Promoting Social Inclusion Under the Principle of “Access for All” in Museums*, in “Diid. Disegno Industriale Industrial Design”, 2023, Digital Special Issue 1, pp. 384-393. DOI: <https://doi.org/10.30682/diiddsi23t2q>.



Sonificazione e Tecnologie Interattive per il Welfare Culturale

Antonio Camurri, Andrea Cera

Keywords:

Interactive sonification, Expressive movement, Soundscape, Multimodal Interactive Systems.

ABSTRACT:

This article discusses the role of sound in the museum experience and, more broadly, in the field of cultural welfare. Sound can be both harmful and beneficial to health, depending on the acoustic, cultural, and emotional context: from exposure to harmful noise to scenarios in which sound plays a rehabilitative support role. Sound design, soundscape design, and interactive sonification can play a fundamental role in the creation of active experiences of artistic content within cultural welfare contexts characterized by active participation, psychological wellbeing, and health. Within this framework, we present the guidelines related to the design of interactive sonification in interactive systems, as applied in *DanzArTe – Emotional Wellbeing Technology*, a protocol and interactive system that offers an embodied experience of visual arts through the interactive sonification of the affective qualities of one's own movement.

In questo articolo viene discusso il ruolo del suono nella fruizione museale e più in generale nel settore del welfare culturale. Il suono può essere sia dannoso che positivo per la salute, in funzione di contesto acustico, culturale ed emotivo: dalla esposizione a rumori nocivi a scenari in cui il suono ha ruolo di supporto riabilitativo. Il sound design, la progettazione del paesaggio sonoro e la sonificazione interattiva possono giocare un ruolo fondamentale nel progetto di esperienze attive di contenuti artistici e culturali, in scenari di welfare culturale caratterizzati da partecipazione culturale, benessere psicologico e salute. In questo scenario, presentiamo le linee guida relative al progetto della sonificazione interattiva in sistemi interattivi, utilizzate in *DanzArTe – Emotional Wellbeing Technology*, un protocollo e un sistema interattivo che offre un'esperienza embodied di arti visive attraverso la sonificazione interattiva delle qualità affettive del proprio movimento.

Antonio Camurri:

Antonio Camurri è Professore Ordinario presso il DI-BRIS-Università di Genova (Scuola Politecnica), dove insegna nelle lauree magistrali in Computer Engineering e Digital Humanities. I suoi interessi di ricerca includono sound and music computing, human computer interaction, affective computing, automated analysis of non-verbal expressive movement, sistemi multimediali e multimodali interattivi per le arti performative, cultural welfare, terapia e riabilitazione. È fondatore e direttore scientifico di InfoMus-Casa-Paganini. antonio.camurri@unige.it

Andrea Cera

Andrea Cera ha ricevuto una formazione in musica classica (pianoforte e composizione) al Conservatorio di Padova, e si è specializzato in computer music presso l'IRCAM-Centre Pompidou. Collabora con Casa Paganini-InfoMus in progetti di ricerca su cross-modalità e sonificazione del movimento, e con IRCAM e Renault, per la progettazione di suoni per auto elettriche. andreawax@yahoo.it

1. Introduzione

Il rapporto tra suono e salute è paradossale: il suono può sia ferire che guarire. Il problema degli effetti negativi del suono sull'essere umano è noto fin dall'antichità, fin dal VII secolo a.C., quando apparvero le prime ordinanze contro il rumore in Grecia e, in seguito, a Roma.¹ Nel XVIII secolo, Bernardino Ramazzini,² padre della medicina del lavoro, descrisse le malattie causate dall'esposizione ripetuta di artigiani a rumori forti o meccanici. Seguendo una prospettiva simile, gli usi terapeutici della musica sono stati descritti in molte culture fin dall'antichità: ad esempio, si hanno resoconti di usi terapeutici della musica nell'antico Egitto,³ fino alle sistematizzazioni avvenute in epoca rinascimentale e barocca, per esempio nell'opera di Athanasius Kircher.⁴ Secoli dopo, le stesse forze acustiche ed ambientali che possono causare stress o affaticamento vengono reinventate come strumenti di riabilitazione e cura. Il fondamento teorico di questa revisione parte dall'opera fondamentale di Raymond Murray Schafer, *The Tuning of the World*,⁵ che ha reso popolare la nozione di *soundscape* (paesaggio sonoro), ovvero l'ambiente acustico in cui siamo immersi. Il contributo chiave di Schafer è stato quello di evidenziare l'impossibilità del silenzio e di invocare una rinnovata consapevolezza ecologica del suono come fenomeno sia culturale che ambientale. L'impulso di Schafer ha avviato un ampliamento dell'ambito di indagine sulla qualità sonora dell'ambiente, seppur in forma libera, informale e artistica, a partire dalle attività del *World Soundscape Project*, che includevano campagne di registrazione, passeggiate sono-

re, composizioni e concerti ispirati al concetto di paesaggio sonoro. Nelle ultime due decadi, mentre il concetto di paesaggio sonoro entrava in una fase di revisione e critica,⁶ diversi ricercatori hanno iniziato a studiare le differenze e le sensibilità individuali che potrebbero spiegare modi diversificati di reagire allo stesso paesaggio sonoro, introducendo strumenti di valutazione individuale come il *Noise Sensitivity Questionnaire*.⁷ Il paradigma di questa ricerca può essere esteso ai settori della fruizione artistica e culturale (ad esempio nei musei), in diversi settori della salute, interrogandosi su come gli ambienti sonori possano influenzare l'esperienza estetica, il benessere fisiologico ed emotivo, in particolare tra le popolazioni vulnerabili e anziane. Il framework di Schafer suddivide il paesaggio sonoro in tre componenti: *Keynotes*, *Signals* e *Soundmarks*. Le *Keynotes* costituiscono il sottofondo acustico continuo di uno spazio, i *Signals* sono i suoni in primo piano che attirano l'attenzione e i *Soundmarks* sono suoni unici o simbolici associati a un luogo specifico, come le campane di una certa chiesa o il canto degli uccelli locali, e sono soprattutto vettori di memoria, identità e appartenenza.

L'offerta diversificata che la comunità scientifica e artistica del *sound design* ha creato negli ultimi anni può essere riassunta attraverso queste tre componenti, allineandole a tre distinte aree di ricerca applicata: composizione del paesaggio sonoro (progetti in cui vengono presi in considerazione il sottofondo, le *Keynotes*, di una particolare applicazione), sound design (progetti in cui gli eventi in primo piano, i *Signals*, sono al centro dell'attenzione, come

ad esempio il progetto di un logo sonoro di un brand; o la sonificazione di un flusso di dati) e progetti in cui elementi culturali, personali o simbolici (che corrispondono ai *Soundmarks* in un paesaggio sonoro), hanno un ruolo principale nella definizione dei contenuti sonori. Ogni ambito interagisce con gli altri nel contesto più generale della progettazione del sound design per il welfare culturale, dai musei a scenari riabilitativi e terapeutici.

1.1 Sonificazione interattiva e propriocezione

Una ulteriore componente fondamentale è relativa al ruolo del suono per aumentare la percezione delle qualità espressive del movimento, sia del proprio movimento che del movimento osservato in altre persone, ad esempio in un contesto di interazione sociale. Questo ruolo del suono – ovvero la *sonificazione interattiva* di qualità espressive del movimento individuale o di un gruppo – consiste nella traduzione dinamica, contestuale e adattiva di qualità del movimento (ad esempio la fluidità con cui una persona si muove) in suono. Non si tratta di composizione musicale, ma di una forma di amplificazione della percezione attraverso il canale sensoriale uditivo, che trasforma le informazioni cinestetiche multimodali in segnali uditivi.⁸ Nel nostro particolare approccio, la sonificazione è modellata sulle caratteristiche del nostro sistema percettivo di *cross-sensory correspondence*.⁹ Le caratteristiche a-modalità del sistema percettivo consentono di percepire una qualità del movimento (*mid-level quality*, come ad esempio la fluidità) attraverso diversi canali sensoriali: visivo, udi-

tivo, aptico. Ad esempio, un modello di sonificazione della fluidità del proprio movimento può amplificare la propriocezione di questa qualità, creando un biofeedback virtuoso che facilita il miglioramento della fluidità del proprio movimento, in risposta a un feedback uditivo in continua evoluzione e adattamento.

1.2 Un caso d'uso museale

I visitatori di un'area espositiva assumono spesso un comportamento caratterizzato da una esperienza superficiale e frettolosa con opere d'arte esposte. Consideriamo ad esempio una sala in cui è esposta un'opera di arte visiva classica che rappresenta la Madonna seduta con il bambino nel proprio grembo. È possibile utilizzare la tecnologia, sempre più veloce, per rallentare (*Slow Mood*) l'esperienza del visitatore e renderla più profonda, apprezzare il gesto affettivo e lo sguardo di una madre che accoglie nel grembo il proprio bambino? Nel canale YouTube¹⁰ è disponibile una playlist di brevi video in cui il sistema *DanzArTe* propone una esperienza interattiva basata sulla sonificazione del gesto affettivo.

1.3 Multilayered Conceptual Framework

I fondamenti di questa ricerca hanno origine nel *Multilayered Conceptual Framework for Multimodal Interactive Systems*,¹¹ successivamente sviluppato nei progetti europei *ICT DANCE*¹² e in *H2020 FET PROACTIVE EnTimeMent*.¹³

Questa ricerca ha portato allo sviluppo di modelli computazionali per l'analisi e la predizione di qualità espressive del movimento

(*mid-level qualities*), tra le quali *leggerezza e fragilità*, *smoothness*,¹⁴ e *fluidità*,¹⁵ *entrainment*.¹⁶ La sonificazione di *mid-level qualities* è una componente fondamentale nel processo di *embodied interaction design* per la realizzazione di sistemi interattivi per i settori della salute e in particolare del welfare culturale. Grazie a modelli e tecnologie che integrano *machine learning* e modelli computazionali di espressività e di emozioni sociali, il nostro approccio supporta interazione affettiva e sociale non verbale, corporea e *embodied*, sia individuale che di gruppo.

2. Welfare culturale e tecnologie interattive

Il welfare culturale è un modello integrato per promuovere il benessere e la salute di individui e comunità, attraverso pratiche basate sulle arti visive e performative e sul patrimonio culturale, verso un concetto di salute globalmente intesa come ricostituibile armonia nella relazione tra le funzioni fisiche, intellettuali, emotive e sociali della persona.¹⁷ Il welfare culturale si fonda sul riconoscimento dell'efficacia di specifiche attività culturali, artistiche e creative come fattori che promuovono la salute, il benessere e la coesione sociale, favoriscono l'invecchiamento attivo, contrastano la depressione e il declino psicofisico, promuovono l'inclusione delle persone con disabilità, emarginate o svantaggiate, supportano le relazioni tra caregiver e pazienti e mitigano le patologie degenerative. Le tecnologie possono rappresentare un formidabile catalizzatore per il benessere culturale, fornendo sia piattaforme abilitanti sia meccanismi di interazione per nuovi para-

digmi nell'esperienza dell'arte e del patrimonio culturale. Oltre a fornire contenuti per le tecnologie che supportano esperienze di benessere culturale, l'arte può suggerire modi e mezzi per umanizzare queste tecnologie. L'idea dell'arte come fonte di ispirazione per tecnologia che opera come mediatore tra l'essere umano e l'arte apre le porte a una nuova generazione di tecnologie per il benessere culturale basate sull'arte.

In questo contesto sono stati realizzati i sistemi *DanzArTe*¹⁸ e *RespirArTe*,¹⁹ ispirati da arti visive e performative, caratterizzati dalla integrazione nel processo di *interaction design* di sonificazione interattiva del movimento espressivo e strumenti di intelligenza artificiale. Nel seguito vengono presentati il paradigma generale *Slow Mood* che caratterizza i nostri progetti e il ruolo del suono e della sonificazione interattiva.

3. Il paradigma Slow Mood

Paul Valéry in *Nécessité de la Poésie* ha scritto che oggi ogni piacere è distrutto dalla fretta e annullato dalla velocità.²⁰ Concentrandoci sul patrimonio culturale e sulla fruizione dell'arte visiva, miriamo paradossalmente a sfruttare la potenza e la velocità della tecnologia contemporanea per riscoprire il lungo tempo necessario per sviluppare una relazione più profonda con contenuti appartenenti alla nostra storia artistica: una generalizzazione del caso d'uso descritto in precedenza. Nelle esperienze museali aumentate dalla tecnologia, e in generale in scenari di welfare culturale, il paradigma *Slow Mood* supporta la progettazione di forme di interazione innovati-

ve, non intrusive, anticipatorie/pre-dittive, per consentire un dialogo intimo con l'opera d'arte, condotto secondo un ritmo lento, inducendo una ideale liminalità,²¹ un *flow* ottimale,²² in risposta a problematiche come quelle del caso d'uso descritto in precedenza. Lo *Slow Mood* fonda le origini in progetti risalenti a fine anni '90 del secolo scorso. In un nostro articolo²³ viene proposto un sistema interattivo utilizzato in ospedale per supportare esercizi fisici per pazienti affetti da Parkinson, basato su un paesaggio sonoro interattivo immersivo, coinvolgente e stratificato (il bosco, il mare), oltre a un feedback visivo: l'analisi in tempo reale della fluidità nei movimenti è utilizzata per consentire al paziente di dipingere usando il proprio corpo sulle pareti circostanti e di creare paesaggi sonori naturalistici solo quando si muove in modo fluido, usando il corpo come un pennello. Esercizi di riabilitazione fisica solitamente frustranti vengono così trasformati in una sorta di installazione artistica, consentendo di modellare interattivamente contenuti artistici visivi e uditivi. Un approccio simile è stato adottato nei sistemi per il trattamento e la riabilitazione cognitiva e motoria dei bambini nel laboratorio congiunto *ARIEL-Augmented Rehabilitation* con l'ospedale pediatrico G. Gaslini.²⁴ Nel progetto europeo *Horizon 2020 ICT DANCE*,²⁵ il nostro centro di ricerca ha collaborato con Virgilio Sieni in una serie di eventi pubblici (Atlante del Gesto Genova)²⁶ che hanno coinvolto oltre 120 cittadini non-danzatori, partecipando alla (ri)scoperta delle proprie qualità espressive corporee, concludendosi in una serie di performance collettive pubbliche.²⁷ In *DANCE*, le misure in tempo rea-

le e la sonificazione delle qualità espressive di *fragilità* e *leggerezza* del movimento di uno dei partecipanti (il leader) avevano l'obiettivo di coinvolgere e guidare gli altri partecipanti verso la comprensione, l'esplorazione e l'espressione delle stesse qualità nei loro movimenti di gruppo.²⁸ La sonificazione interattiva è utilizzata nella riabilitazione da condizioni di dolore cronico²⁹: gli stimoli uditivi generati dall'analisi di qualità del movimento hanno il ruolo di aiutare a rendere i movimenti fluidi e sicuri e di distrarre il paziente da possibili disagi legati alla sua condizione. Nell'ambito del progetto europeo *Horizon 2020 ICT WHOLODANCE*,³⁰ abbiamo sviluppato la sonificazione interattiva di qualità del movimento per supportare il processo di apprendimento del movimento nella danza.

*DanzArTe Emotional Wellbeing Technology*³¹ è un nostro recente progetto su welfare culturale e inclusione sociale che proponiamo nel seguito come caso di studio per approfondire i nostri principi di sonificazione. *DanzArTe* mira a supportare un'esperienza attiva, amplificare la propriocezione e percezione del movimento, creando un contatto fisico con opere di arte visiva classica, fornendo una possibile soluzione alle problematiche descritte in precedenza nel caso d'uso di fruizione museale: una pratica amatoriale collettiva e autonoma, un'esperienza *embodied* in grado di stimolare emotivamente la memoria e il movimento fisico.³² Da una prospettiva differente, potrebbe essere considerato come un progetto per provocare esperienze trasformative.³³ Sul canale YouTube sono disponibili video demo del progetto.³⁴

Nel complesso, la ricerca dimostra che il programma *DanzArTe* ha migliorato la resilienza e il benessere psicologico soggettivo dei partecipanti, i quali lo hanno giudicato come un'esperienza creativa, stimolante e coinvolgente.³⁵ I risultati suggeriscono, infatti, che il programma migliora la salute e il benessere psicologico percepiti dalle persone che partecipano alle sessioni di *DanzArTe*.

4. Sonificazione interattiva del movimento espressivo: linee guida

Il nostro modello di sonificazione interattiva delle qualità del movimento individuali e di gruppo adottato in *DanzArTe* e in altri progetti si basa su corrispondenze cross-modalità³⁶ delle qualità del movimento con il suono prodotto dal movimento, a diversi livelli di astrazione e scale temporali.³⁷

I criteri e le linee guida principali per il nostro modello sono descritti nei seguenti punti:

Corrispondenza cross- e multi-modale tra movimento e suono a più livelli di astrazione. Un modello a quattro livelli di astrazione e scale temporali differenti rappresenta movimento e suono: livello fisico (segnali dai sensori), *low-level*, *mid-level* e *high-level*.³⁸ Nello stesso modello, la sonificazione è integrata nei 4 livelli che si differenziano per scale temporali e componenti sonore.³⁹

La sonificazione integra paesaggi sonori ambientali in evoluzione dinamica seguendo caratteristiche di movimento in lenta evoluzione legate principalmente al contesto e allo storyboard interattivo. I *mid-level* e *high-level*, caratterizzati da scale

temporali più ampie (rispettivamente circa 0.5-3s e 5-15s), includono strategie per modulare lentamente le caratteristiche dei paesaggi sonori di sottofondo. Un modello di sonificazione a più scale temporali integra semplici eventi sonori, flussi sonori complessi e paesaggi sonori simulati e modulati dinamicamente in modo naturalistico e tecniche di modellazione.⁴⁰ Infine, un principio importante nello strato *high-level* consiste nel progettare una sonificazione con uno storyboard interattivo che preveda un dissolvimento progressivo: ad esempio, nel caso di sonificazione per l'apprendimento del movimento, il progressivo apprendimento provoca una corrispondente riduzione fino alla scomparsa della sonificazione e di eventuale altro feedback visivo. In *DanzArTe*, errori nell'interpretazione espressiva del movimento producono la sovrapposizione alla proiezione del dipinto di un "manichino" (un agente 3D derivato dai disegni preparatori dell'artista, nel nostro caso Luca Cambiaso), risultando in una amplificazione uditiva e visiva che supporta l'apprendimento.⁴¹ Con il miglioramento del movimento, i feedback visivo e sonoro si riducono progressivamente.

Lentezza e continuità nelle curve dinamiche corrispondenti a caratteristiche mid-level. La fluidità del movimento è una delle più importanti qualità di livello intermedio,⁴² caratterizzata da una scala temporale di 0.5-3s. La sonificazione della fluidità riflette questo respiro temporale, contribuendo a suggerire nei partecipanti movimenti lenti e fluidi.

Sonificazione a bassa intrusività. L'obiettivo degli approcci di sound design basati sull'enfasi del primo

piano sonoro (*Signals*, nei termini di Schafer) è evocare un significato esplicito, che, dal punto di vista dell'analisi della scena uditiva, dovrebbe essere rilevabile e riconoscibile il più chiaramente possibile dagli utenti. Nel nostro approccio, la sonificazione vuole evitare di perturbare il *flow* ottimale durante l'esperienza, rimanendo a un livello di ascolto semi-cosciente: la sonificazione emerge senza effetti di sorpresa, potenzialmente intrusivi o fastidiosi, giocando con il confine tra primo piano e sfondo (tra *Signals* e *Keynotes*). Questo vincolo influenza varie caratteristiche del modello di sonificazione: impone la necessità di un flusso sonoro di sfondo a una scala temporale molto lenta, come strato stabile attraverso il quale gli eventi di sonificazione possono emergere in modo controllato, evitando contrasti e sorprese. Il nostro approccio mira a evocare, incoraggiare, e persino suscitare implicitamente o semi-coscientemente determinate qualità del movimento, tra cui la fluidità⁴³ o la sincronizzazione del comportamento in una diade o in un piccolo gruppo di utenti. La sonificazione interattiva delle qualità del movimento mira a indurre i partecipanti a raggiungere le qualità di movimento desiderate:⁴⁴ ad esempio, incoraggiando progressivamente la riduzione di fragilità o rigidità nel movimento, verso una esecuzione fluida e continua, o portando una coppia che esegue un'azione congiunta ad aumentare il livello di sincronizzazione o di "entrainment", come ad esempio nel caso del dipinto di Luca Cambiaso *Battesimo di Cristo*, in cui i partecipanti a coppie vedono attraverso i corpi il gesto affettivo di Giovanni Battista mentre battezza Gesù.

Design sottrattivo: nel nostro approccio, la salienza è creata dalla sottrazione, anziché dall'aggiunta di suono. Un paesaggio sonoro continuo, costantemente presente (in lenta evoluzione seguendo le qualità del movimento dell'utente a diverse scale temporali) dall'inizio alla fine di una sessione, può scomparire brevemente in determinate circostanze, per creare un momento saliente, per suscitare attenzione.

Silenzio. È un caso particolare di design sottrattivo. Il linguaggio musicale include esplicitamente una notazione per il silenzio: i simboli di pausa indicano l'assenza di un suono per una durata definita. Nella nostra architettura di sonificazione sia il primo piano che lo sfondo tendono ad essere continui, molto lievi nella presenza, e a supportare il flusso dell'esperienza, ma punteggiati da silenzi significativi. Alcuni di questi silenzi si verificano in primo piano, altri si verificano sullo sfondo. L'uso di uno sfondo artificiale è anche finalizzato a migliorare la liminalità⁴⁵ in termini di comfort acustico, mascherando rumori indesiderati (ad esempio provenienti dall'esterno).

Inoltre, la progettazione della sonificazione prevede che la rilevazione di caratteristiche come ad esempio impulsività, rigidità e fragilità nel movimento portino a una sottrazione di caratteristiche della sonificazione per amplificarne l'efficacia: questo contribuisce a indurre, spesso in modo semi-conscio, la produzione di movimenti fluidi, che a loro volta alimentano la ricchezza timbrica della sonificazione. L'uso del silenzio rappresenta infine un altro esempio di gioco al confine tra sfondo e primo piano: l'interruzione improvvisa di uno sfondo sonoro (*Key-*

note) tende a diventare un evento vero e proprio (*Signal*).

Polifonia e tecniche di orchestrazione per la sonificazione di diadi e piccoli gruppi. Nel caso di più utenti, o di un movimento congiunto di un partecipante con un agente umanoide virtuale (i manichini in *DanzArTe* derivati dai disegni preparatori dei dipinti di Luca Cambiaso),⁴⁶ le tecniche di orchestrazione, così come il timbro e l'evoluzione del contenuto armonico, hanno l'obiettivo di ottenere flussi di sonificazione distinti e chiaramente percepibili, oppure di progettare una sonificazione univoca e chiaramente percepibile di una unica caratteristica del gruppo, come ad esempio il livello di coinvolgimento del gruppo di utenti o tra un utente e un agente virtuale. In *DanzArTe* la sonificazione dei movimenti del manichino e quella dell'utente presentano "firme" chiaramente distinte, mentre lo sfondo crea un fattore unificante.

5. Conclusioni

I principi descritti nell'articolo delineano un approccio trans-disciplinare sviluppato nell'ambito dei settori museale, della salute e in generale del welfare culturale, adottato in *DanzArTe* e in altri casi: nel progetto europeo *ICT STARTS ReSilence*⁴⁷ per la progettazione di tecnologie per il trattamento e il contrasto della intrusività del paesaggio sonoro urbano; nel progetto *RespirArTe*⁴⁸ la sonificazione interattiva del movimento espressivo contribuisce alla creazione di una esperienza immersiva per promuovere la coordinazione tra respiro e movimento del corpo, scoprendo progressivamente l'emozione di meraviglia, sublime, evocata da dipinti di

paesaggio nei secoli XVII-XIX. Sviluppi in corso di realizzazione riguardano una più profonda integrazione di modelli di IA nel processo di sviluppo di *interaction design* e nei sistemi risultanti: ad esempio, modelli di *multimodal machine learning* dell'interazione tra movimento e sonificazione; modelli generativi per la sintesi di movimenti espressivi (*implied expressive motion*) a partire da una postura saliente in un dipinto, per (ri)scoprire e vedere attraverso i movimenti del proprio corpo il gesto affettivo nel dipinto.

Ringraziamenti

Il progetto *DanzArTe* è stato supportato da Fondazione Compagnia di San Paolo - Cultural Wellbeing Lab e dal progetto europeo *HE FET PRO-ACTIVE EnTimeMent*. Il progetto *RespirArTe* è stato parzialmente supportato dal progetto *RAISE* (PNRR, Mission 4, Component 2, Investment 1.5). Desideriamo ringraziare i revisori anonimi per i preziosi suggerimenti.

Endnotes:

- 1 Crocker 1981.
- 2 Ramazzini 1713.
- 3 Thaut 2015.
- 4 Chiu 2025; De Martino 1961.
- 5 Schafer 1977.
- 6 Ingold 2001.
- 7 Schütte, Marks, Wenning et al. 2007.
- 8 Zaferiou, Hirsch, Bacani et al. 2025.
- 9 Spence 2020.
- 10 <https://www.youtube.com/Infomuslab> (ultima consultazione il 18/06/2026).
- 11 Camurri, Volpe, De Poli et al. 2005
- 12 <https://dance.dibris.unige.it> Camurri, Volpe, Piana et al. 2016; Niewiadomski, Mancini, Cera et al. 2019.
- 13 <https://entiment.dibris.unige.it>; Bieńkiewicz, Smykovskyi, Olugbade et al. 2021; Beyan, Karumuri, Volpe et al. 2021.
- 14 Niewiadomski, Mancini, Cera et al. 2019.
- 15 Piana et al. 2016.
- 16 Bieńkiewicz, Smykovskyi, Olugbade et al. 2021
- 17 Sacco 2017; Cicerchia 2022.
- 18 Camurri, Seminerio, Morganti et al. 2024.
- 19 Corbellini, Ferrari, Gasparotti et al. 2026.
- 20 Valéry 1939, p. 96.
- 21 Bell 2002.
- 22 Csikszentmihalyi 2008.
- 23 Camurri, Mazzarino, Volpe et al. 2003.
- 24 <https://ariel.unige.it>.
- 25 <https://dance.dibris.unige.it>
- 26 <https://it-it.facebook.com/atlantedelgestoGenova> (ultima consultazione il 18/06/2026).
- 27 Niewiadomski, Mancini, Cera et al. 2019.
- 28 Vaessen, Abassi, Mancini et al. 2018.
- 29 Singh, Piana, Pollarolo et al. 2016.
- 30 <https://cordis.europa.eu/project/id/688865/results> (ultima consultazione il 18/06/2026).
- 31 Cera, Canepa, Ferrari et al. 2022; Camurri, Seminerio, Morganti et al. 2024; Barbagelata, Morganti, Seminerio et al. 2024.
- 32 Cera, Canepa, Ferrari et al. 2022; Camurri, Seminerio. Morganti et al. 2024; Barbagelata, Morganti, Seminerio et al. 2024.
- 33 Chirico, Pizzolante, Kitson et al. 2022.
- 34 <https://www.youtube.com/user/InfoMusLab> (ultima consultazione il 18/06/2026).

- 35 Barbagelata, Morganti, Seminerio et al. 2024.
- 36 Spence 2020; Stanton, Spence 2020.
- 37 Camurri, Volpe, De Poli et al. 2005; Camurri, Volpe, Piana et al. 2016.
- 38 Camurri Volpe, De Poli et al. 2005; Camurri, Volpe, Piana et al. 2016.
- 39 Schafer 1977.
- 40 Fraisse 1983; Botteldooren, De Coensel 2009.
- 41 Camurri, Seminerio, Morganti et al. 2024.
- 42 Albornò, Cera, Piana et al. 2016; Camurri, Volpe, Piana et al. 2016.
- 43 Albornò, Cera, Piana et al. 2016;
- 44 Thaler, Sunstein 2021.
- 45 Bell 2002.
- 46 Camurri, Seminerio, Morganti et al. 2024
- 47 <https://www.resilience.eu> (ultima consultazione il 18/06/2026).
- 48 Corbellini, Ferrari, Gasparotti et al. 2026.

References:

Albornò, Cera, Piana et al. 2016: Albornò P., Cera A., Piana S. et al., *Interactive Sonification of Movement Qualities - A case study on Fluidity*, in "Proceedings of Ison 2016", 2016, pp. 28-33.

Barbagelata, Morganti, Seminerio et al. 2024: Barbagelata C., Morganti W., Seminerio E. et al., *Resilience improvement through a multicomponent physical and cognitive intervention for older people: the DanzArTe emotional well-being technology project*, in "Aging Clin. Exp. Res.", 2024, 36:72, pp. 1-10. <https://doi.org/10.1007/s40520-023-02678-3>.

Bell 2002: Bell G., *Making Sense of Museums – the Museum as Cultural Ecology*, in "Intel Labs", 1, 2002, pp. 1-17.

Beyan, Karumuri, Volpe et al. 2021: Beyan C., Karumuri S., Volpe G. et al., *Modeling Multiple Temporal Scales of Full-Body Movements for Emotion Classification*, in "IEEE Transactions on Affective Computing", 2023, 2, 14, pp. 1070-1081. DOI: <https://doi.org/10.1109/TAFFC.2021.3095425>.

Bieńkiewicz, Smykovskiy, Olugbade et al. 2021: Bieńkiewicz M.M., Smykovskiy A.P., Olugbade T. et al., *Bridging the gap between emotion and joint action*, in "Neuroscience & Biobehavioral Reviews", 2021, 131, pp. 806-833. DOI: <https://doi.org/10.1016/j.neubiorev.2021.08.014>.

Botteldooren, De Coensel 2009: Botteldooren D., De Coensel B., *Informational masking and attention focussing on environmental sound*, in "NAG/DAGA Proceedings", 2009, pp. 399-402.

Camurri, Mazzarino, Volpe et al. 2003: Camurri A., Mazzarino B., Volpe G. et al., *Application of multimedia techniques in the physical rehabilitation of Parkinson's patients*, in "Journal of Visualization and Computer Animation", 2003, 5, 14, pp. 269-278. DOI: <https://doi.org/10.1002/vis.324>.

Camurri, Seminerio, Morganti et al. 2024: Camurri A., Seminerio E., Morganti W., Canepa C., Ferrari N., Ghisio S., Cera A., Coletta P., Barbagelata M., Puleo G., Nolasco I., Costantini C., Senesi B., Pilotto A., *Development and validation of an art-inspired multimodal interactive technology system for a multi-component intervention for older people: a pilot study*, Front. Comput. Sci. 5:1290589, 2024. DOI: <https://doi.org/10.3389/fcomp.2023.1290589>.

- Camurri, Volpe, De Poli et al. 2005: Camurri A., Volpe G., De Poli G., Leman M., *Communicating expressiveness and affect in multimodal interactive systems*, in “IEEE Multimedia”, 2005, 1, 12, pp. 43-53. DOI: <https://doi.org/10.1109/MMUL.2005.2>.
- Camurri, Volpe, Piana et al. 2016: Camurri A., Volpe G., Piana S. et al., *The Dancer in the Eye: Towards a Multi-Layered Computational Framework of Qualities in Movement*, in “Proceedings of 3rd International Symposium on Movement and Computing (MOCO)”, 2016, pp.1-7. DOI: <https://doi.org/10.1145/2948910.2948927>.
- Cera, Canepa, Ferrari et al. 2022: Cera A., Canepa C., Ferrari N. et al., *Interactive sonification of expressive gesture: the DanzArTe - emotion wellbeing technology project*, in “XXIII Colloquium on Musical Informatics - AIMI”, 2022, pp. 79-86.
- Chirico, Pizzolante, Kitson et al. 2022: Chirico A., Pizzolante M., Kitson A. et al., *Defining transformative experiences: A conceptual analysis*, in “Frontiers in Psychology”, 2022, 13, p. 790300. DOI: <https://doi.org/10.3389/fpsyg.2022.790300>.
- Chiu 2025: Chiu R., *Music and Health*, in Poole K., Honisch E.S., Zanovello G. (eds.), *Music and Health*, London-New York, Routledge, 2025. DOI: <https://doi.org/10.4324/9780367347093-RERW263-1>.
- Cicerchia 2022: Cicerchia A., *Indicators for local policies of cultural welfare: content, dimensions, and quality criteria*, in “City Territ Archit”, 2022, 9, 32. DOI: <https://doi.org/10.1186/s40410-022-00179-w>.
- Corbellini, Ferrari, Gasparotti et al. 2026: Corbellini N., Ferrari N., Gasparotti C. et al., *Slow Mood, Aesthetic Resonance, and Embodied Interaction: Design Principles for Art-Aided Rehabilitation*, in “Proc. Intl. Workshop Movement and Computing (MOCO)”, 2026, pp. 1-5. DOI: <https://doi.org/10.1145/3802842.3802862>.
- Crocker 1981: Crocker M.J., *Noise control. Past experiences and needs*, in “Proceedings of the Inter-Noise and Noise-Con Congress and Conference, NoiseCon81”, 1981, pp. 11-16.
- Csikszentmihalyi 2008: Csikszentmihalyi M., *Flow: The Psychology of Optimal Experience*, New York, Harper Collins, 2008.
- De Martino 1961: De Martino E., *La Terra del Rimorso*, Milano, Il Saggiatore, 1961.
- Fraisse 1983: Fraisse P., *Perception and Estimation of Time*, in “Annual Review of Psychology”, 35, pp. 1-37. DOI: <https://doi.org/10.1146/annurev.ps.35.020184.000245>.
- Ingold 2001: Ingold T., *Four objections to the concept of soundscape*, in Ingold T., *Being alive: Essays on movement, knowledge and description*, London-New York: Routledge, 2001, pp. 136-139.
- Niewiadomski, Mancini, Cera et al. 2019: Niewiadomski R., Mancini M., Cera A., Piana S., Canepa C., Camurri A., *Does embodied training improve the recognition of mid-level expressive movement qualities sonification?*, in “Journal on Multimodal User Interfaces”, 2019, 3, 13, pp. 191-203. DOI: <https://doi.org/10.1007/s12193-018-0284-0>.
- Piana et al. 2016: Piana S., Staglianò A., Odone F., Camurri A., *Adaptive body gesture representation for automatic emotion recognition*. ACM Transactions on Interactive Intelligent Systems (TiiS), 2016, 6,1, pp. 1-31. DOI: <https://doi.org/10.1145/2818740>.
- Ramazzini 1713: Ramazzini B., *De Morbis Artificum Diatriba*, Modena, Capponi, 1713.
- Sacco 2017: Sacco P.L., *Health and Cultural welfare: A new policy perspective?*, in “Economia della cultura”, 2017, 27, 2, pp. 165-174.
- Schafer 1977: Schafer R.M., *The Tuning of the World*, New York, Knopf, 1977.
- Schütte, Marks, Wenning et al. 2007: Schütte M., Marks A., Wenning E., Griefahn B., *The development of the noise sensitivity questionnaire*, in “Noise & health”, 2007, 9, 34, pp. 15-24. DOI: <https://doi.org/10.4103/1463-1741.34700>.
- Singh, Piana, Pollarolo et al. 2016: Singh A., Piana S., Pollarolo D., Volpe G., Varni G., Tajadura-Jiménez A., CdeC Williams A., Camurri A., Bianchi-Berthouze N., *Go-with-the-*

Flow: Tracking, Analysis and Sonification of Movement and Breathing to Build Confidence in Activity Despite Chronic Pain, in “Human–Computer Interaction”, 2016, 31, 3-4, pp. 335-383. DOI: <https://doi.org/10.1080/07370024.2015.1085310>.

Spence 2020: Spence C., *Simple and complex crossmodal correspondences involving audition*, in “Acoustical Science and Technology”, 2020, 41, 1, pp. 6-12. DOI: <https://doi.org/10.1250/ast.41.6>.

Stanton, Spence 2020: Stanton T.R., Spence C., *The influence of auditory cues on bodily and movement perception*, in “Frontiers in Psychology”, 2020, 10:3001. DOI: <https://doi.org/10.3389/fpsyg.2019.03001>.

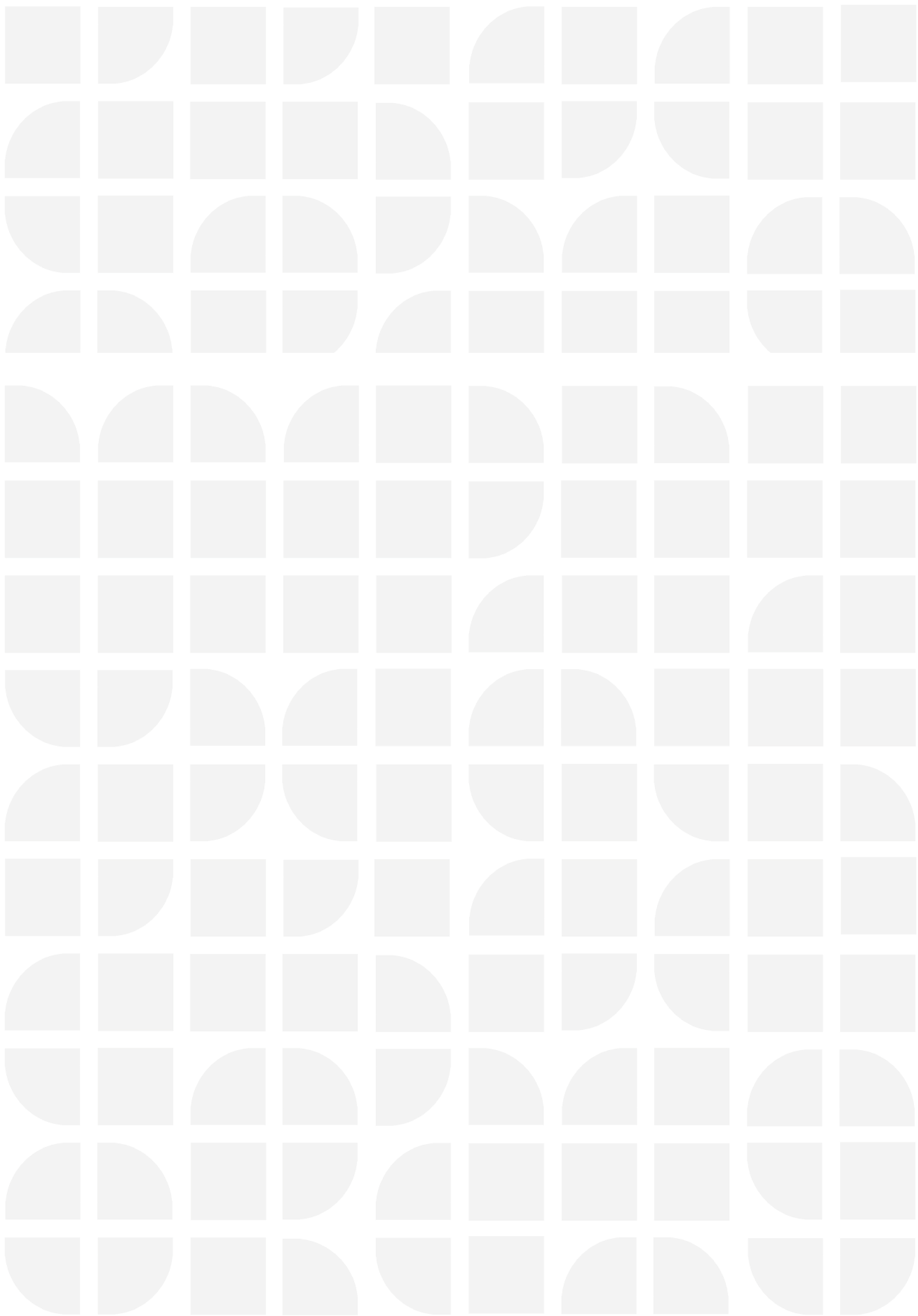
Thaler, Sunstein 2021: Thaler R.H., Sunstein C.R., *Nudge: The final edition*, London, Penguin, 2021

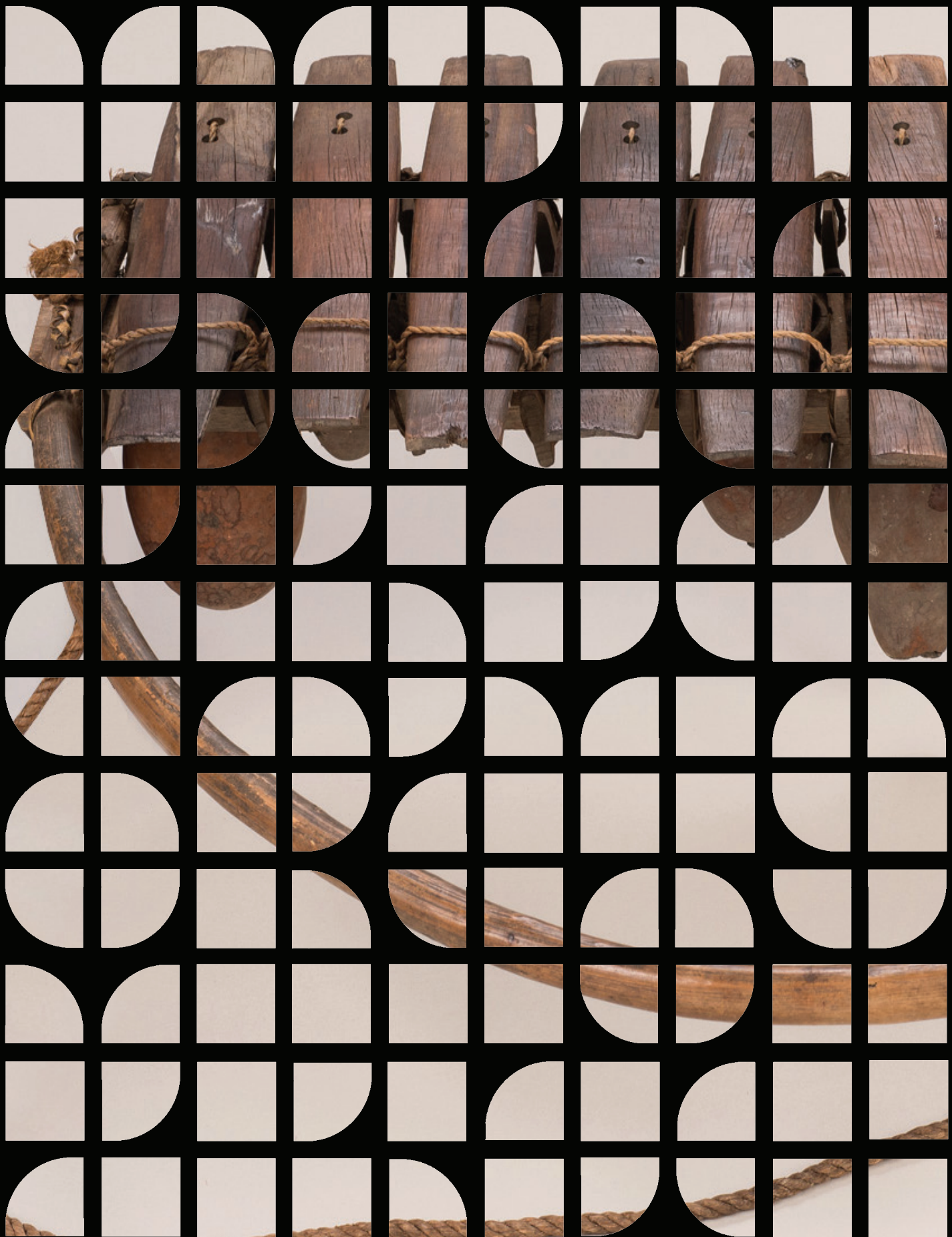
Thaut 2015: Thaut M.H., *Music as therapy in early history*, in Altenmüller E., Finger S., Boller F. (eds.), *Progress in Brain Research*, Amsterdam, Elsevier, 2015, 217, pp. 143-58. DOI: <https://doi.org/10.1016/bs.pbr.2014.11.025>.

Vaessen, Abassi, Mancini et al. 2018: Vaessen M.J., Abassi E., Mancini M., Camurri A., de Gelder B., *Computational feature analysis of body movements reveals hierarchical brain organization*, in “Cerebral Cortex”, 2018, 29, 8, pp. 3551–3560. DOI: <https://doi.org/10.1093/cercor/bhy228>.

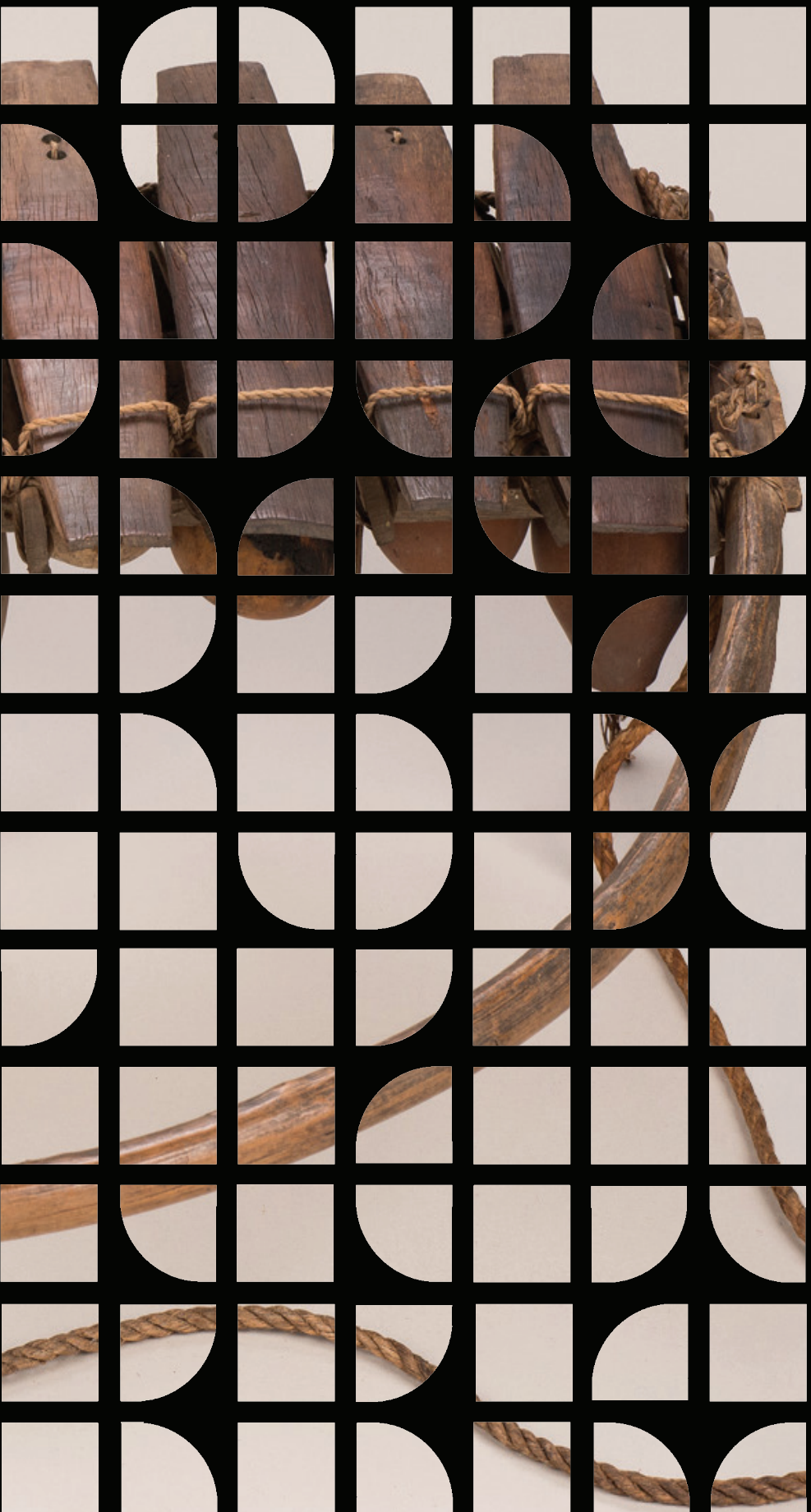
Valéry 1939: Valéry P., *Nécessité de la Poésie*, in *Œuvres de Paul Valéry*, Éditions N.R.F., Paris, 1939, 11, pp. 87-103.

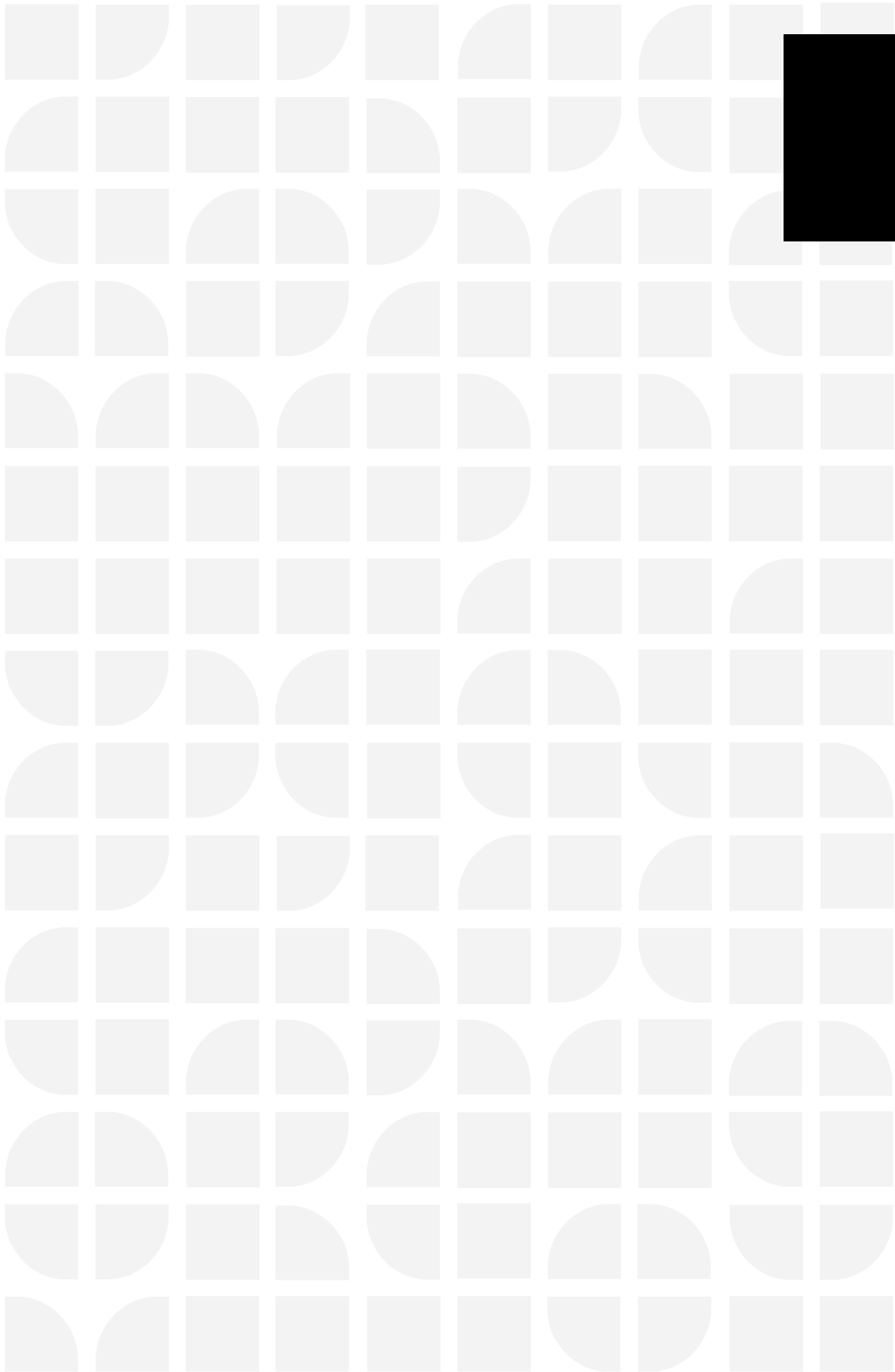
Zaferiou, Hirsch, Bacani et al. 2025: Zaferiou A., Hirsch Z., Bacani T., Dahl L., *A review of concurrent sonified biofeedback in balance and gait training*, in “Journal of NeuroEngineering and Rehabilitation”, 2025, 22, 1, 38, <https://doi.org/10.1186/s12984-025-01565-4>.





sections.





Sounds Off: Silence and Sound Absence in Museums

Chiara Cecalupo

Keywords:

Silence, Museums, Interpretation, Perception, Museum Narrative.

ABSTRACT:

This essay intends to contribute to this international reflection on silence in museums by focussing holistically on all the meanings of silence in the museum, and the various entangled ways in which it can be interpreted. Silence can be an experience integrated into museum visits. Silence can be political and the connections between silence, remembrance and forgetting give silence the force to influence what we choose to remember. Silence can be inclusive. Silence in museums can be liberating, when offering an escape from the constant sensory stimulation of contemporary life. By transcending a sense of responsibility to constantly engage and entertain, silence in museums can allow deeper thought processing and reflection. Case studies will present practical applications of the theoretical framework and the article will therefore offer an overview of the role of the absence of sound in museums by focussing on display, museum narrative, museum perception, and the visitor experience. The broader aim is, in fact, to help define the role that silence in a museum can play during a visit and in visitors' perception of the heritage on display.

Questo saggio intende contribuire alla riflessione internazionale sul silenzio nei musei concentrandosi in modo olistico su tutti i significati del silenzio nel museo e sui vari modi in cui esso può essere interpretato. Il silenzio può essere un'esperienza integrata nelle visite ai musei. Il silenzio può essere politico e le connessioni tra silenzio, ricordo e oblio conferiscono al silenzio la forza di influenzare ciò che scegliamo di ricordare. Il silenzio può essere inclusivo. Il silenzio nei musei può essere liberatorio, quando offre una via di fuga dalla costante stimolazione sensoriale della vita contemporanea. Trascendendo dal senso di responsabilità di coinvolgimento e intrattenimento costante, il silenzio nei musei può consentire un processo di pensiero e una riflessione più profonda. I casi di studio presenteranno applicazioni pratiche del quadro teorico e l'articolo offrirà quindi una panoramica sul ruolo dell'assenza di suoni nei musei, concentrandosi sull'esposizione, la narrazione museale, la percezione del museo e l'esperienza dei visitatori. Il più ampio obiettivo è infatti quello di servire alla definizione del ruolo che il silenzio in museo può avere nello svolgimento della visita e nella percezione che i visitatori hanno del patrimonio esposto.

Chiara Cecalupo

Chiara Cecalupo is a researcher in museology, history of collections, and the reception of Christian antiquity. She is currently Marie Curie Fellow at the University of Malta. Her research focuses on museum history, Christian museums, and reception of archaeology in the Mediterranean, with an interdisciplinary perspective and attention to archival sources of collection history and promotion. She has collaborated with several universities and museums in Italy, Spain, Malta, Vatican City, and Germany.

CC BY 4.0 License

<https://creativecommons.org/licenses/by/4.0/>

©Chiara Cecalupo, 2026

<https://doi.org/10.60923/issn.3034-9699/26207>

I. Introduction

A reflection on silence in museums is necessary at present, when sensory experience has become central to both the visit and the very concept of museum enjoyment. While there are many case studies on silence as part of the preservation and transmission of knowledge and memory, broader reflections on silence in museums remain limited. However, two notable works will be referred to frequently in this essay: Lucy and Anderson¹ on the impact of silence on visitors' perception, and Mason and Sayner² on the motivations behind the exhibition design and choice of communicative silence as content in a museum. Also mentioned are works on silence as the basis for the behaviour of the "good museum visitor" – both from a historical perspective, as traced by van Kessel,³ and from a contemporary view of the museum as a sacred place, as theorised by Duncan.⁴ This reflection stems from various ideas about the role of silence in museums; it transcends the field of museum studies to touch on the fields of memory studies, politics and cultural philosophy.

In general, reflection on silence as a historical and philosophical field is extremely long-established, spanning from Plato to the great philosophers of the twentieth century.⁵ Silence can be perceived as a neutral absence of sound or a deliber-

ate choice not to speak. Indeed, intentional silence, whatever the reason behind it, is not an absence of speech but rather a hidden way of speaking. It is widely agreed that silence is neither passivity⁶ nor inactivity, but a socially constructed space with multiple purposes.⁷ Similarly, it is recognised that silence is an integral part of the learning and memory process, and has an intrinsic link with the act of storytelling itself.⁸ Furthermore, silence can be a cognitive tool for mediating between past and present, accompanying a specific narrative, and for performative forms of storytelling.⁹

In the museum environment specifically, the relationship between sound, silence and exhibition space influences and is influenced by the perceptions of museum visitors and their role within it. There are various types and forms of silence in the multifaceted complexity of the museum space; their effects are linked to how visitors perceive them, and to the processes of memory and understanding that are activated for each person within the museum. The silent response in a museum or by a museum can be automatic, or difficult to promote or process, in a world where the written or spoken word is the primary and dominant means of transmission and learning.¹⁰ The museum exhibition's use of silence within it becomes a curatorial or political choice (who is silent, who is silenced, who silences, what is silenced?)¹¹ that can completely change the visitor's experience in the museum.

An important work that can guide us theoretically in considering silence in the museum is Jay Winter's 2010 essay. Since his first formula-

tion of the aspects of silence, Winter has been a useful compass for navigating the theme of silence in museums. He sees three types of silence in the game of memory: liturgical silence, political silence, and essentialist silence.¹² Since silence is that space beyond words, it should not be simply equated with oblivion. When it touches on universal and eternal themes (as proposed by Winter: loss, pain, sacrifice, and redemption), it is a matter of liturgical silence – a concept certainly borrowed from religious traditions, where what must be processed and remembered is contemplated as if in a sacred place.¹³ This is accompanied by political or strategic silence, which is intended to address social conflict by silencing that conflict of rupture, as a gesture of healing or cooling.¹⁴ This is a largely circumstantial use of silence, which can be quickly transformed according to circumstances. The third type, essentialist silence, arises from a consideration of the privilege of being able to “speak or remain silent” about an event as a directly interested party, given that a visceral connection with personal experience is sometimes difficult to convey.¹⁵

This multifaceted view of the concept of silence certainly helps to overcome the assumption that silence is an absence of speech; it becomes the basis for reflecting on the silence of museums precisely because it presents its three main aspects. In a sense, Winter’s work goes beyond the concept of silence as a tool for transmitting the past as a sign of “ethnicity, healing, acknowledgement, recognition and forgiveness” – this is a religious and moralising approach that remains very much present in theme

parks, museums and historical sites around the world.¹⁶ For Winter, silence is a wide-ranging socio-cultural practice,¹⁷ and some of its various aspects that he identifies are highly relevant to a broader discussion of silence in museums: he emphasises its commemorative aspect (as a collective representation of a shared event, often simplified in its transmission, which can happen in any museum)¹⁸ and its aspect of political protest or omission (such as the exclusion of problematic aspects, or the inclusion of what was silenced in the past).¹⁹ Accordingly, the museum can become one of the various “memory agents”, by communicating selected events and themes in myriad ways.

II. Silence in the museum: theory and practice

From the theoretical basis presented so far, develops a more practical analysis of how silence can become central to the museum discourse. Given the above premises, this essay will analyse, with some illustrative examples, the various expressions of silence in museums through its four main manifestations: Silence as a formal and behavioural choice in the layout and development of the visit; Silence as a choice of content; Silence as a tool to help visitors; and Silence as the subject of the layout.

The first way in which the concept of silence enters (and thrives in) the museum environment is undoubtedly formal and behavioural, in terms of both the layout and the practical aspects of the visit. This perspective, which could apparently be reduced to a simple analysis of behaviour and conventions, instead intertwines very profound themes

that have been central to museums for at least two centuries: it concerns the concept of the museum perceived as a secular sacred place, the separation of objects from their context in the museum selection process, and the classism inherent in the concept of museum visits in the Western world. A decisive issue is the desire to bring the museum closer to a sacred place – or rather, the tendency to interpret the museum as the only sacred place in the secular world.

This theme has been extensively explored in the past,²⁰ and touches on every aspect of the museum as an institution. To start with the museum architecture of the second half of the eighteenth century in Europe: most of the museums built at that time, at least until the innovations of the twentieth century, were shaped by the concept of the classical temple. The architectural aesthetics of large façades, with pediments and columns, fitted into the urban landscape like neoclassical photographs of a new secular centre for worshipping the arts. What happened inside reflected this declaration of intent: visitors were expected to behave as they would in a sacred place. In this almost liturgical code of conduct – to refer back to Winter's terminology – silence is at the centre. The exhibits must be contemplated in silence, and visitors must walk in silence through the rooms. This silence aligns very well with a romantic and late-romantic vision of the museum as a place of re-semanticisation of objects and of social distinction; however, it clashes decisively with the contemporary view, which wants the museum to be a living place, for communities, for education and enjoyment. The role of

museums has expanded socio-culturally, as was clearly expressed by the International Council of Museums in 2022.²¹ Their definition of museum follows the framework of accessibility and inclusion, rooted in the Universal Declaration of Human Rights adopted by the United Nations General Assembly in 1948; it was supplemented by the United Nations Convention on the Rights of Persons with Disabilities, who must not be excluded from cultural participation opportunities.

With regard to this first point, the concept of the museum as a place of violent rupture between the object and its context in the past is now widely accepted. Since Napoleonic times, there has been heated debate in Europe about museum exhibitions as a destructive act for a work of art, which is detached from its context of production and reference and transported to a new environment. In this new environment, the object must be re-semanticised, but in this process it becomes ethereal and detached. The break with context that takes place in the museum has also been seen as a “silencing” of objects – a loss of meaning and function that affects their communicative power, thus reducing them to silence.²² This static quality led great thinkers of the nineteenth century to conceive and define the museum as a church or a cemetery (two places, incidentally, intimately devoted to silence).²³ In this sense, the silent response of observation and contemplation in museums is historically rooted in the concept of the museum as a sacred place and a decontextualised collection: in the Enlightenment and then in the nineteenth century, the contemplation of art could not be described by words.

It is greater than words, and therefore requires silence and a certain purely visual romantic sublimation. This ideal intellectual involvement has over time come to permeate the entire imagery of the “duties” of the perfect visitor; of how a visit to the museum “should” be properly enjoyed.

II.1 Silence and Visitors

This notion of how to visit and what to enjoy in a museum thus introduces the silent contemplation (which therefore excludes any request for vocal commentary) as the foundation of the painful and still unresolved issue of classism in museum visits. Only those who know how to behave properly, enjoying what they see in silence, are fit to visit museums. This is an ancient social convention, but one that is not relegated to the past: since the late eighteenth century, when the Louvre opened to the public, groups of visitors have lamented the lost pleasure of the elitist visit;²⁴ and even today, noisier visitors are stigmatised by those who share the rooms with them. A small addition: it has been pointed out that, in the contemporary period, a further variation on this liturgical aspect of silence has been added – namely, the nostalgic value of the past as an authentic time,²⁵ a golden age to be looked upon with respect and regret, and which is intimately accessible only to a select few intellectuals.

The first interpretation of silence and museums is therefore linked to formal expectations and visitor behaviour: silence is a central part of the museum experience, which is almost required of visitors; they expect to have to perform it, and per-

ceive it as almost obligatory.

Such a conception of art as a sacred and ennobling experience, which elevates the visitor above the chaos of contemporary life, has become the basis for some contemporary exhibitions. An interesting example is the Museum der Stille in Berlin, which was founded in 1994 by Russian painter Nicolai Makarov, and is located in an apartment in a central and busy area of the city. Makarov was inspired by other art venues that aim to reconnect paintings with the concept of the sacred, prayer, and spiritual elevation – such as Michelangelo’s Sistine Chapel or Mark Rothko’s Houston Chapel. The museum is spread over a few rooms, all painted in shades of red, with soft lighting and, above all, a prevailing silence – the common thread that links the exhibition and the museum’s aims. The first room is dedicated to the exhibition of white architectural models of spaces designed for silence, created by various international architects since 2014. The central room, known as the “Silence Room”, houses three large works by Makarov; in particular, a smoky grit landscape in front of which visitors can sit on a wooden bench, where even the low light contributes to the work of art. Beyond the exhibition itself, it is the motivations behind this museum experiment that make it an interesting case study for analysing silence in a museum. These reasons are explained by Makarov himself on the museum’s website, where one can also take a virtual guided tour of the rooms.²⁶ Here he states that art has a duty to attract the gaze of visitors in order to elevate their souls through contemplation: viewing the work in silence reconnects the viewer with their most

spiritual side. This yearning for calm, reflection and tranquillity is what humanity aspires to and seeks in the viewing of art. It is therefore a contemplative view of the work – and consequently of the museum, which becomes a “secular meditation room”,²⁷ and makes silence the protagonist of the museum experience.

II.2 Silence as a Content

The second approach to interpreting the concept of silence in museums is that of content, which is mainly created by curators, reference communities, stakeholders and political authorities. We have already mentioned the severing of the links between object and context as one of the aspects that makes the museum a sacred place, and therefore a perfect example of the liturgical silence, as defined by Winter. However, the following discussion deals with the aspects of political and essentialist silence, and integrates well with the most recent studies on memory processes.

In a very simplistic way, silence has often been presented in the past as the result of forgetting (more or less voluntary), and speech as the main symptom of remembering (also more or less voluntary). Thus, silence and speech have been perceived as two almost antithetical elements in the transmission of the past, and memory (both collective and personal) is often regarded as a passive act, consequential to the act of remembering. However, as recent studies remind us,²⁸ remembering and forgetting are two processes mediated by the way the past is transmitted, and they often end up transcending it. This mnemonic

process in contemporary times is a dynamic act, which can change meaning over time,²⁹ depending on its context, precisely because it is a collective act. Indeed, it is now clear that silence is an integral part of the processes of memory, since, as we shall see, it takes various forms and serves various purposes. This makes it a central theme today, both in memory studies and in the philosophy of culture.³⁰ How this silence enters the museum is a very complex but decidedly clear issue, which starts precisely from a series of deliberate curatorial choices that make silence a choice of content (or non-content) that is to be read in a socio-political and essentialist mode, according to Winter's classifications.

The ways in which museums use silence in a political and social context were recently analysed by Mason and Sayner in 2019.³¹ The authors start from the correct assumption³² that silence is a social construct and a non-verbal act of discourse that also becomes a performative act within the discourse itself. On this basis, they identify a series of ways in which silence is produced in the museum space. The first is a museum silence that follows on from the silence of the sources and material in the collection; it is linked both to the concept of the museum as an expression of nation states and elites, and to the endemic exclusion of sections of the population from historical recording and narration. These two factors are reflected in the intentionality of recording and collecting stories, and translate into a partiality of museum discourse as a mirror of the partiality of historical production. This is therefore a structural silence, which comes

from the past and then becomes part of the second type of silence in a museum identified by Mason and Sayner: deliberate silence. This is the result of external pressures that may be linked to the museum's public or private funding, and to current politics – whether liberal and democratic or not – which are more or less explicit or very subtle.

II.3 Silence and Society

Closely related to this are the third and fourth points, namely the museum's deliberate adherence to "society's silences" (i.e. active choices not to remember specific events or people), and the use of ambiguous and/or ambivalent language to address uncomfortable or complex issues.³³ In this regard, a reflection on the political role of silence in museums is extremely apt. This silence has also been defined as strategic in the context of political and historical persuasion. In the socio-political sphere, the boundary between the transmission of historical memory and the choice of silence is often arbitrary and immutable, due to various conflicting narratives. It may be³⁴ a silent community that aims to avoid dissent, or to encourage processes of revision or reconstruction of the past and present; or an "adversarial" silence that follows the current political agenda by removing historical issues perceived as unfavourable; or silence as a formal tool of reconciliation between groups; or silence as a form of political and social prohibition or taboo. In any of these uses, however, a type of silence can be clearly identified that favours a particular social order or political group, and thus appears as a tool for limiting democracy. This

latter concept is expressed in all its gravity precisely in the museum, one of the places par excellence for practising democracy. But if this process seems unnatural in the museum setting, it is not particularly rare. Consider how museum exhibitions remain silent on political and social issues that have not yet been metabolised or addressed in historical and archival discourse (e.g., periods of dictatorship or more recent catastrophes), and especially all those "colonial and post-colonial silences"³⁵ that remain scarcely resolved by European museums.³⁶ Museum silence can therefore also reflect a broader social and political denial, or a "discourse" of omissions supported by groups currently in power.

Following Mason and Sayner's line of thought, a fifth aspect is that of silence due to a presumed lack of materials (in collections or archives) and knowledge to address a specific theme in museums. The danger of this tendency is that by not looking at sources and objects beyond their canonical narratives, museums may be perpetuating convenient or simplistic silences. The sixth point, which will be addressed more fully in the last part of this essay, concerns silence as a museographic choice and exhibition content. This is a performative, aesthetic silence, but one that is an integral part of the exhibition and an important element of the visitor's experience. This is the case, for example, with memorials,³⁷ where silence creates a physical and aesthetic experience of memory, in which remembrance, emotion and historical narrative are very closely connected.

The last two points are also linked to

this horizon of spaces of silence that is deliberately set up in museums. First, there are cases in which silence is deliberately chosen as a means of remembrance, respect and commemoration.³⁸ This way of directing thought, especially in museums dealing with sensitive issues, is also close to Winter's liturgical concept, and that of the museum as a church. At the same time, silence perpetuates certain behavioural norms that are considered appropriate synonymous with personal involvement in certain circumstances – an empathy required of the individual, which is to be expressed through silence. Finally, there is the case of museum silences caused by communities or groups choosing to remain silent about their history, and this choice is respected by the museum. This is a matter of respecting specific sensitivities and sacredness, or painful breaks with the past, which the communities in question are reluctant to talk about and share.³⁹ In these circumstances, it is not only necessary to take into account the weight of the museum's communicative intention in respecting the wishes of individuals and communities (how much, and how, can or should one share with a wider audience? – as Mason and Sayner rightly ask).⁴⁰ In addition, we must remember that some strong beliefs about words as a therapeutic, emancipatory and conflict-resolving gesture are particularly Western phenomena, and are not accepted by all human groups.⁴¹

The multifaceted aspects of silence as a choice of content therefore find their most complex and rich expression in museums, and have a great impact on the private experience and public "usefulness" of the museum. Equally impactful, howev-

er, is what could be defined as the use of silence in the museum as an aid to the visitor. This refers not so much to the attention paid to sound overstimulation in the museum, or the volume of any background noise in the rooms, but above all to the creation of "quiet spaces" in many museums around the world. These are given different names, but have the common goal of offering visitors a quiet space for sensory decompression after and during their visit.⁴² The crucial shift from collection-centred to visitor-centred museums and exhibitions has led in recent years to greater attention to the holistic well-being of visitors, as well as their education. This new focus has not only allowed for new theoretical reflections on how visitors move through museum spaces and what they get out of them; it has also become an opportunity to experiment with new and good practices to improve the physical and spatial experience in museums.⁴³ Among these, quiet rooms are becoming increasingly common. They are generally designed for visitors with sensory issues and sensory processing disorders, but are accessible to all. They are particularly useful for certain categories of visitors who, for valid reasons (permanent or temporary), find themselves in need of a place sheltered from the rest of the museum.

A very recent comprehensive study of quiet spaces in museums⁴⁴ has conducted a preliminary analysis of the methodologies and types of spaces, and how visitors and museum educators respond to the existence and use of these spaces. The study analyses this perception⁴⁵ without focusing on the layout of the spaces themselves (usually enclosed spaces with

comfortable seating, low lighting, light-coloured walls, and no background noise, games or leisure objects). The emphasis is on how people perceive the experience of these places, which – despite normal variations and discrepancies recorded in the analysis – are essentially very similar, and help us to identify the role of the museum in these spaces of silence. This perception is divided into five categories, linked to five different needs that drive the use of these quiet spaces. First, restoration perception is linked to the need for calm and silence during the visit; then, of course, there is the factor of inclusion, which affects a wide range of visitors and needs, and makes these spaces of quiet and silence truly inclusive and accessible to all. This is followed by the need for processing of emotions (emotions present before the visit, or even triggered by the museum experience, depending on the background and sensitivity of the individual visitor); there is also the need for situatedness, which makes visitors feel part of the museum experience without uprooting them from the present. Finally, it is necessary to incorporate variation in the quiet spaces themselves: there is no single solution for everyone, but these spaces must be designed according to the needs and availability of the museum. In any of these experiences, however, silence is transformed into an inclusive tool in museum quiet spaces, for people to process their emotions and reflect as part of the phenomena of learning and engagement. Silence thus becomes an effective tool to help the museum successfully fulfil its tasks within contemporary society.⁴⁶

Therefore, although the quiet space

addresses a common need for silence and shelter, it can be interpreted in various ways – as demonstrated by the numerous examples that have now emerged in museums around the world. However, it is interesting to present a case which is unique in its simplicity, and represents the first experiment of its kind in Maltese museology. This is the inclusive visit project for visitors with autism at the Cathedral Museum in Mdina (Malta), launched in 2019 with a range of dedicated activities.⁴⁷ These include specific activities related to silence, such as special opening dates to ensure a calm and quiet visit, as well as the provision of noise-cancelling headphones. In addition, a “safe room” has been set up between the entrance and the central courtyard, especially for visitors looking for a quiet space to calm down. It is a small room with natural but soft lighting, equipped with comfortable seating and games, available to anyone who requests it. This space is the first and only example of its kind in Maltese museums;⁴⁸ over the years it has become a point of reference for certain types of visitors, as an effective bridge between Maltese museum culture and society.

II.4 Exhibition of Silence

This brings us to the last type of application of silence in museums: namely, silence as an object of exhibition. This is not a widespread type: for example, I am not aware of any museums specifically dedicated to the history and current affairs of deaf individuals, whereas there are museums for blind and visually impaired people⁴⁹ that are entirely based on the concept of darkness (in

this regard, it would be very interesting to carry out a global survey and census of institutions for the deaf in Europe, in order to identify any museums or collections within these institutions). However, there is one small but very interesting museum that focuses on the experience of silence as a lifestyle choice.

In the upper part of the village of Fara Sabina in Lazio (central Italy) stands the monastery of Santa Maria in Castello, belonging to the Order of the Poor Clares. It is one of five cloistered convents for women that were conceived by the Venerable Francesca Farnese, following the example of St Clare's teachings. The Fara monastery's foundation dates back to 1672 and is attributed to Cardinal Francesco Barberini, who also contributed to the definition of the Constitutions.⁵⁰ These historic constitutions, in force until 1963, placed silence at the centre of the monastic experience from the very beginning: they clarify that in the "Monastery of the Solitude of Santa Maria di Fara", silence is total and fundamental, and helps to keep the world out. In fact, the constitutions stipulated that it was forbidden to speak or write to the outside world, or even to communicate with fellow sisters except through tablets and conventional signs, while almost all the life and work of the individual nuns took place within their cells. Silence is therefore fundamental to the identity of the order. It is an ascetic exercise that characterises its history, and must be "communicated" and passed on to visitors as a reflection of cloistered life. To this end, the Museum of Silence of the Order of the Poor Clares was set up and opened, and now forms an integral part of the visit to the open part

of the monastic enclosure. This visit includes the kitchen and the ancient refectory from the fifteenth and seventeenth centuries, the choir and some incorrupt bodies of nuns: in general, all areas characterised by the practice of silence.

The museum is located in a large rectangular room dating back to the fifteenth century, which was originally part of the church of Santa Maria in Castello and was later incorporated into the seventeenth-century building as a parlour. Accessible from the outside, this was therefore the threshold between the world and the cloister, the last point before silence. This room features a beautiful fresco on one short side depicting a Madonna della Misericordia (Our Lady of Mercy) from the fifteenth century. The layout and location of the museum exploits this threshold position between inside and outside:⁵¹ when you enter, you go directly from light into darkness and silence. The visitor experience therefore unfolds in a game of light and silence. The room remains in darkness, except for beams of light that occasionally illuminate the 21 individual objects displayed in wall-mounted showcases around the room's perimeter. These lights are turned on to show visitors, step by step, the path of cloistered life according to the main themes of the monastic community: prayer, silence, discipline, sewing, pharmacy, cooking, and work. Each theme is illustrated with very common objects that are unique in bearing witness to the life of the Poor Clares in silence.⁵²

An extraordinary example that truly embodies this extreme vow of total silence is a wooden tablet with a

list of commands, from the simplest to the most mortifying, used by the sisters for non-verbal communication. After each object has been illuminated, a series of projections is activated on the vaulted ceiling, with scenes of hands using that particular object. This shows visitors – without speech, or only with small sounds made naturally by the actions – how to use objects that are very simple, but which belong to a world so distant that they too have become mute.

Silence is therefore the common thread that links the place to the lives of the women who lived there and the objects they used, in a cycle of repetition that is always the same and always silent, reflecting the cloistered life over the centuries. In this unique museum space, everything revolves around experience: by transcending the typical visitor aids (captions, panels, etc.), the focus is entirely on the intellectual and, above all, emotional perceptions of a cloistered life devoted to silence. The aim is therefore to arrange a place and a series of objects to convey the physical experience of silence, and make it as much as possible the centrepiece of a museum exhibition.

III. Concluding thoughts

At the end of this essay, we have gained a clearer picture of the role of silence in the contemporary museum. This overview, within a volume dedicated to its exact opposite (i.e. sound and noise), can help us to untangle the various sensory and performative aspects of the visitor's experience in museums. Whether the silence is liturgical, political, inclusive or content-related, understanding the reasons for using it, and its impact, can greatly help professionals to create museums that are increasingly aware of its risks and potential. The overview provided here may well prove useful in guiding future discussions, particularly in exploring in greater depth the museum experiences of both specific social groups and visitors with specific disabilities.

Endnotes:

- 1 Lucy, Anderson 2025.
- 2 Mason, Sayner 2019.
- 3 van Kessel 2015.
- 4 See the seminal work of Duncan 1995.
- 5 Arnold-de Simine 2016, Kattago 2016.
- 6 Branden 1997.
- 7 Hobuß 2016, p. 95.
- 8 Munroe 2016.
- 9 Munroe 2016.
- 10 Bonshek 2016.
- 11 Munroe 2016.
- 12 Winter 2010, pp. 3-7.
- 13 Winter 2010, p. 4.
- 14 Winter 2010, p. 5.
- 15 Winter 2010, p. 8.
- 16 Winter 2010, pp. 9-10.
- 17 Winter 2010, p. 13.
- 18 Winter 2010, p. 20.
- 19 Winter 2010, pp. 22-28.
- 20 Among the others Duncan 1995; Duncan, Wallach 2004; Buggeln 2012.
- 21 <https://icom.museum/en/resources/standards-guidelines/museum-definition/> (last access: 04.01.2026).
- 22 van Kessel 2015, pp. 170-171.
- 23 van Kessel 2015, pp. 175-176.
- 24 van Kessel 2015, pp. 171-172.
- 25 Thorpe 2016.
- 26 <http://museum-der-stille.de/en/> (last access 04.01.2026).
- 27 “säkularisierten Andachtsraum” (Peter Raue).
- 28 Dessingué, Winter 2016.
- 29 Bijl 2016.
- 30 Hobuß 2016, p. 95.
- 31 Mason, Sayner 2019.
- 32 After Jensen 1973 and Winter 2010.
- 33 Mason, Sayner 2019, pp. 9-11.
- 34 Knutsen 2016.
- 35 Bijl 2016.
- 36 Among the others see Appadurai 2025, Grechi 2023, and von Oswald, Tinius 2020.
- 37 Munroe 2016.
- 38 Vinitzky-Seroussi, Teege 2010.

- 39 Colwell 2015.
- 40 Mason, Sayner 2019, p. 16.
- 41 Bonshek 2016, p. 33.
- 42 Famà et al. 2024, p. 221, and in general Collettivo Architutti 2023.
- 43 Shettel 2008; Forrest 2013.
- 44 Lucy, Anderson 2025.
- 45 Lucy, Anderson 2025, pp. 6-16.
- 46 Lucy, Anderson 2025, pp. 15-17.
- 47 <https://metropolitanchapter.com/mdina-cathedral-museum/tourist-information/autism-friendly-museum/> (last access: 04.01.2026).
- 48 Although quiet rooms are not uncommon at major national cultural events such as the Malta Book Festival.
- 49 Like Museo Omero in Ancona or Museo Tolomeo in Bologna, just to name two seminal examples in Italy.
- 50 <https://www.clarisseremite.com/monastero.html> (last access: 04.01.2026).
- 51 As described by the authors of the exhibition: <https://www.spaziconsonanti.com/museo-del-silenzio> (last access: 04.01.2026).
- 52 Redazione Thema 2017.

References:

- Appadurai 2025: Appadurai A., *The Museum, the Colony, and the Planet: Territories of the Imperial Imagination*, in “JCAF Journal: Interdisciplinary Knowledge from the South”, 2025, 1.
- Arnold-de Simine 2016: Arnold-de Simine S., *Between memory and silence, between family and nation: remembering the First World War through Digital Media*, in Dessingué A., Winter J. (eds.), *Beyond Memory. Silence and the Aesthetics of Remembrance*, London, Routledge, 2016, pp. 143-162.
- Bijl 2016: Bijl P., *Colonial and postcolonial silences: listening to Kartini in the Netherlands*, in Dessingué A., Winter J. (eds.), *Beyond Memory. Silence and the Aesthetics of Remembrance*, London, Routledge, 2016, pp. 15-30.
- Bonshek 2016: Bonshek E., *Making museum objects: a silent performance of connection and loss in Solomon Islands*, in Dessingué A., Winter J. (eds.), *Beyond Memory. Silence and the Aesthetics of Remembrance*, London, Routledge, 2016, pp. 31-52.
- Branden 1997: Branden W.J., *John Cage and the architecture of silence*, in “October”, 1997, LXXXI, pp. 80–104.
- Buggeln 2012: Buggeln G.T., *Museum space and the experience of the sacred*, in “Material Religion”, 2012, 8, 1, pp. 30–50.
- Collettivo Architutti 2023: Collettivo Architutti, *Il Peba del Muse. Piano di Eliminazione delle Barriere Architettoniche fisiche sensoriali e cognitive del MUSE di Trento*, Trento, MUSE, 2023.
- Colwell 2015: Colwell C., *Curating Secrets*, in “Current Anthropology”, 2015, 56, S12, pp. 263–275.
- Dessingué, Winter 2016: Dessingué A., Winter J., *Introduction: remembering, forgetting and silence*, in Dessingué A., Winter J. (eds.), *Beyond Memory. Silence and the Aesthetics of*

Remembrance, London, Routledge, 2016, pp. 1-12.

Duncan 1995: Duncan, C., *Civilizing Rituals: Inside Public Art Museums*, London, Routledge, 1995.

Duncan, Wallach 2004: Duncan C., Wallach A., *The Museum of Modern Art as Late Capitalist Ritual: An Iconographic Analysis*, in Preziosi D., Farago, C. (eds.), *Grasping the World: The Idea of the Museum*, Aldershot, and Burlington, Ashgate, 2004, pp. 483-500.

Famà et al. 2024: Famà P., Degiovanni P., Franzoso K., Scandolari R., Zen A., *OPEN MUSE: progetti di inclusione della neurodiversità*, in Tutino S., Passerin d'Entrèves P., Miglietta A.M. (eds.), *Musei scientifici, ambiente, territorio. Nuove visioni, obiettivi, servizi, relazioni per comunità sostenibili* (Aosta, 18-21 ottobre 2022), in "Museologia Scientifica Memorie", 2024, 23, pp. 221-225.

Forrest 2013: Forrest R., *Museum atmospherics: The role of the exhibition environment in the visitor experience*, in "Visitor Studies", 2013, 16, 2, pp. 201-216, DOI: <https://doi.org/10.1080/10645578.2013.827023>.

Grechi 2023: Grechi G., *Decolonizzare il museo. Mostrazioni, pratiche artistiche, sguardi incarnati*, Milano, Mimesis, 2023.

Hobuß 2016: Hobuß S., *Silence, remembering, and forgetting in Wittgenstein, Cage, and Derrida*, in Dessingué A., Winter J. (eds.), *Beyond Memory. Silence and the Aesthetics of Remembrance*, London, Routledge, 2016, pp. 95-110.

Jensen 1973: Jensen V.J., *Communicative Functions of Silence*, in "A Review of General Semantics", 1973, 30, 3, pp. 249-257.

Kattago 2016: Kattago S., *The many sounds of Heidegger's silence*, in Dessingué A., Winter J. (eds.), *Beyond Memory. Silence and the Aesthetics of Remembrance*, London, Routledge, 2016, pp. 81-94.

Knutsen 2016: Knutsen K., *Strategic silence: political persuasion between the remembered and the forgotten*, in Dessingué A., Winter J. (eds.), *Beyond Memory. Silence and the Aesthetics of Remembrance*, London, Routledge, 2016, pp. 125-139.

Lucy, Anderson 2025: Lucy A., Anderson D., *Breaking the Silence on How Visitors and Educators Perceive Quiet Spaces in Museums*, in "Visitor Studies", 16 Feb 2025, pp. 1-21, DOI: <https://doi.org/10.1080/10645578.2024.2435075>.

Mason, Sayner 2019: Mason R., Sayner J., *Bringing museal silence into focus: eight ways of thinking about silence in museums*, in "International Journal of Heritage Studies", 2019, 25, 1, pp. 5-20, DOI: <https://doi.org/10.1080/13527258.2017.1413678>.

Munroe 2016: Munroe L., *11 Negotiating memories and silences: museum narratives of transatlantic slavery in England*, in Dessingué A., Winter J. (eds.), *Beyond Memory. Silence and the Aesthetics of Remembrance*, London, Routledge, 2016, pp. 175-194.

Redazione Thema 2017: Redazione Thema, *Ascolta il Silenzio e riscopri chi sei*, in "THEMA, magazine di Architettura, Arte Sacra e di Beni Culturali ecclesiastici", 20.11.2017, <https://themaprogetto.it/il-museo-del-silenzio-fara-in-sabina-rieti/> (last access: 04.01.2026).

Shettel 2008: Shettel H., *No visitor left behind*, in "Curator: The Museum Journal", 2008, 51, 4, pp. 367-375, DOI: [10.1111/j.2151-6952.2008.tb00323.x](https://doi.org/10.1111/j.2151-6952.2008.tb00323.x)

Thorpe 2016: Thorpe J., *Nostalgic histories of war: refugees in Austria-Hungary, 1914-2014*, in Dessingué A., Winter J. (eds.), *Beyond Memory. Silence and the Aesthetics of Remembrance*, London, Routledge, 2016, pp. 65-76.

van Kessel 2015: van Kessel E., *The Role of Silence in the Early Art Museum*, in Beyer A., Le Bon L. (eds.), *SILENCE. SCHWEIGEN. Über die stumme Praxis der Kunst*, Berlin München, Deutscher Kunstverlag GmbH, 2015, (PASSAGEN/PASSAGES, 47), pp. 169-182.

Vinitzky-Seroussi, Teeger 2010: Vinitzky-Seroussi V., Teeger C., *Unpacking the Unspoken: Silence in Collective Memory and Forgetting*, in "Social Forces", 2010, 88 (3), pp. 1103-1122.

von Oswald, Tinius 2020: von Oswald M., Tinius J. (eds.), *Across Anthropology. Troubling Colonial Legacies, Museums, and the Curatorial*, Leuven, Leuven University Press, 2020.

Winter 2010: Winter J., *Thinking about Silence*, in Ben-Zeev E., Ginio R., Winter J. (eds.), *Shadows of War*, Cambridge, Cambridge University Press, 2010, pp. 3–31.



Digitization for an Ethnographic Musical Instrument Collection

Adilia Yip

Keywords:

Digitization, Co-creation, Musical instrument collection, Digital replica, Congolese manza xylophone.

ABSTRACT:

The article discusses the co-design and co-creation of digital tools for re-sounding a colonial musical instrument collection, exploring how music technology supports decolonization and enriches curatorial narratives. In *ReSoXy: Re-Sounding the Xylophone Collections of RMCA* (2023–2026), the project aims to rediscover and revitalize the sounds and performance practices of the *manza* xylophone, a declined musical heritage of the Azande. With contributions from musicians, instrument makers and ICT experts, *ReSoXy* developed various virtual and MIDI instruments to emulate the *manza* listening and playing experiences. These tools are the agencies of co-creation and knowledge sharing, as they enable online collaboration with musicians – particularly in northern DRC – to create new music compositions for the declining *manza* culture, and foster dialogues on intangible cultural heritage preservation. The article reflects on the results of digitization of a museum musical collection, and to promote the decentralization of heritage research.

L'articolo discute la co-progettazione e la co-creazione di strumenti digitali per ridare voce a una collezione di strumenti musicali coloniali, esplorando il modo in cui la tecnologia musicale supporta la decolonizzazione e arricchisce le narrazioni curatoriali. In *ReSoXy: Re-Sounding the Xylophone Collections of RMCA* (2023–2026), il progetto mira a riscoprire e rivitalizzare i suoni e le pratiche esecutive dello xilofono *manza*, un patrimonio musicale in declino degli Azande. Con il contributo di musicisti, costruttori di strumenti ed esperti ICT, *ReSoXy* ha sviluppato diversi strumenti virtuali e MIDI per emulare le esperienze di ascolto e di esecuzione del *manza*. Questi strumenti costituiscono dei dispositivi di co-creazione e condivisione della conoscenza, poiché consentono la collaborazione online con musicisti – in particolare nel nord della RDC – per creare nuove composizioni musicali dedicate alla cultura *manza* in declino e favorire il dialogo sulla salvaguardia del patrimonio culturale immateriale. L'articolo riflette sui risultati della digitalizzazione di una collezione musicale museale e promuove il decentramento della ricerca sul patrimonio culturale.

Opening Picture:

Figure 1: The manza xylophone of Azande chief Guga in Guma (Bondo), MO.0.0.14308. RMCA Tervuren. Photo J.-M. Vandyck.

Adilia Yip

Dr. Adilia Yip is a percussionist and postdoctoral researcher (PhD in the Arts, artistic research and music performance). Investigating the intersection between traditional music and technology, she is the principal investigator of *ReSoXy* (RMCA, BELSPO BRAIN-be 2.0) and *PercAI: A Generative AI Model for the West African Balafon Polyrhythm* (Royal Conservatoire Antwerp). She is a lecturer of world music and African music and the co-founder of the intercultural music group The Bracket Percussion vzw.

CC BY 4.0 License

<https://creativecommons.org/licenses/by/4.0/>

©Adilia Yip, 2026

<https://doi.org/10.60923/issn.3034-9699/26208>

Deep within the archives of the Royal Museum for Central Africa in Tervuren (RMCA/ Africa Museum) lies a vast and largely forgotten musical heritage – over 9,000 musical objects, more than 37,000 sound recordings, photographs, metadata, ethnographical reports, and so on. The research project *ReSoXy: Re-Sounding the Xylophone Collections of RMCA* (2023-26) brings new focus to *manza*, a wooden, portable xylophone constructed in ten keys made in padouk wood (*pterocarpus*) and ten calabash resonators, mounted onto a fixed structure of a main board and small bridge boards laid between the keys. The *manza* xylophones were owned and performed by the chiefs of Azande clans and chiefdoms along the Uele River in the north of Belgian Congo (now: the Democratic Republic of Congo), the Azande regions like Yakoma, Guma (Bondo), Bili, Bambesa, Poko, Doruma, Niangara, and Dakwa.¹ Symbolizing the prestige power of the chiefs and notables, *manza* were performed in court rituals like enthronement and mourning of the death of a chief.

Collected over a century ago, the first instrument of the *manza* collection was acquired in 1907, and preserved in the Belgian Congo Museum, the former institution of RMCA (Fig. 1). Inaugurated in 1910, the museum was an inception of the *Colonial Section* of the 1897 Brussels World's Fair, which had attracted over one million visitors. Following this success, King Leopold II had decided to move this section to a new building called the "Palace of the Colonies" in Tervuren, situated on the outskirts of Brussels. The museum was the King's propaganda tool to promote his colonial project,

hoping to attract investors, and gain popularity and support from the Belgian people. The section's galleries contained stuffed animals, geological specimens, foodstuffs, and ethnographic and artistic objects from the Congo, including musical instruments. A human zoo was also set up in the park to exhibit Congolese people during the exhibition. Until today, the institution served as both a museum and a scientific research centre (Fig. 2).

Against the backdrop of colonization and the legacy of an ethnographical museum, *ReSoXy's* main goal is to rediscover and revitalize the sounds and performance practices of the muted musical objects² to reflect on the roles and meanings of a declined and declining cultural heritage through sound digitization and co-creation. Despite its prominence, the glory of *manza* was short-lived in the 20th century. The decline of the *manza* can be attributed to various social, political and cultural changes. Many precolonial musical traditions were discontinued and forgotten due to the abolition of patrimonial political powers,³ globalization and commercialization of music, and differential access to wealth, technology and educational training.⁴ The spread of Catholicism and migration have reshaped the cultural tradition and caused the marginalization of instruments.⁵ In the recent visit to Kisangani, the biggest city in the northern region of DRC, in June 2024, our interviews show that the memory of *manza* has faded since the last few decades, as well as, apparently, the loss of *manza* musicians who could have sustained the repertoire, and the skills of performing and building the instruments. *ReSoXy* aims to bring



1



2

Fig. 1:

The manza xylophone of Azande chief Guga in Guma (Bondo), MO.0.0.14308. RMCA Tervuren. Photo J.-M. Vandyck.

Fig. 2:

Royal Museum for Central Africa (RMCA), RMCA Tervuren.

back the sound and practice of *manza* that were disrupted, fragmented and erased to its stakeholders and communities through an interdisciplinary methodology of digitisation, co-creation and participatory action research. The project explores how music technology can enhance decolonization efforts and curatorial narratives, while investigates the potential of digital repatriation for intangible cultural heritage. In this context, digital repatriation refers not merely to the circulation of dig-

ital materials, but to the facilitation of access, agency, and creative engagement with displaced musical heritage.

Situated at the crosspoint of scientific, decolonial, curatorial, artistic and outreach goals, *ReSoXy* develops digital and virtual instruments to assist the analysis of the endangered *manza* practice and sound, fostering dialogues, reflections and knowledge sharing with the cultural stakeholders and communities. On the one hand, grounded on mu-

sic analysis and ethnomusicology, the project investigates endangered *manza* techniques and practices and reveals the colonial gaze embedded in scientific literature and colonial archives through the analysis and experimentation with the digital instrument replicas. Colonial acquisition and research practices often omitted or manipulated the identities, subjectivities and direct voices of communities, reinforcing Eurocentric and racial biases of the colonial expeditors, scientists and curators. For instance, Olga Boone (1936) imposed a standard model to summarize the diverse and incommensurable zig-zag tuning systems of the RMCA *manza* collection of twenty-six instruments. The *Diamang* collections in Angola were acquired with inappropriate intentions, coercion, and misinterpretation.⁶ Not all early recordings were made openly with apparent community consent. Some were gathered under what would now be considered ethically questionable, and those sacred songs would not normally be heard out of their ceremonial context or by the uninitiated,⁷ and collection objects might have exclusive cultural and social meanings.⁸

On the other hand, the digital tools and platforms are designed for the participation, dissemination and valorisation of the collections, as well as open access of research data that is restricted to the scientific communities. The instrument replicas are the agencies of sustainability, accessibility, and social impact, reconnecting the muted museum objects and archive recordings with a broad targeted participant group – African, diaspora and international

musicians, co-researchers and museum audience – in creative collaborations and interactive outreach activities. The museum objects and recordings should not simply be accessed and listened to – and only by scholars – but also re-incorporated into the living, contemporary cultures of the communities where the ownership is rooted.⁹ The digital tools and platforms in *ReSoXy* ideally enable us to reenact, represent and relearn the embodied playing techniques, and initiate creative projects with musicians in Africa and the diaspora to reengage and reimagine the sound of *manza* in contemporary music practices.

Sound sampling sessions

To serve both lines of investigation, the preeminent task of *ReSoXy* was to sample each sound of the *manza* xylophone keyboard. High fidelity sound samples are crucial to the making of digital and virtual instruments. The main purpose is to capture the tones – the fundamentals and partials – of the xylophones as realistic, and as faithful to the natural timbres as possible, so that the research team can postulate the listening and playing experience of these original museum musical objects, while the participating musicians can use these sound samples for writing new music for the *manza* in the upcoming research tasks of co-creation. That said, scientific data obtained by past RMCA music research are deemed inadequate for creative and outreach activities, as they obscure the potential to facilitate and communicate hands-on instrumental skills within the efforts of reconnecting, relearning and reimagining the musical objects



3

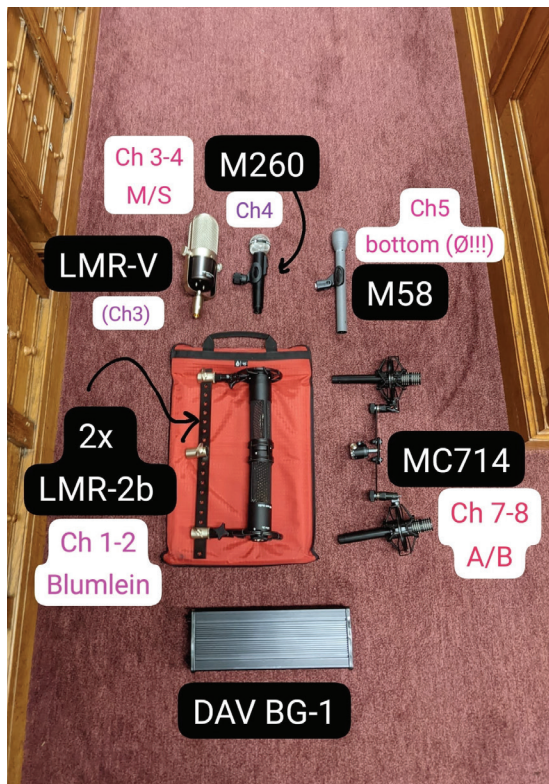
with diverse stakeholders and participants.

In the colonial times museum collections were acquired, preserved and studied as ethnographical objects rather than musical objects, thereby detaching them from their primary roles and functions of sound production and musical performance. As a result, the sonic material of the instruments – timbres, acoustics and performance practices – are largely absent from the museum literature and database. For instance, *Les Xylophones du Congo Belge* by Olga Boone (1936) focused solely on the pitch frequency measurements (in hertz) of 108 xylophones, in order to support studies of classification and geographical distribution of ethnic entities through musical instrument collections.¹⁰ Boone's research team did not record the sound of

the instruments, nor their musical patterns. Only a limited amount of field recordings and video footage¹¹ were collected during the colonial expeditions in the end of 20th century, and almost nothing was produced by colonial administrations who had contributed to the acquisition of a major part of the RMCA *manza* collection in the 1930's.

With the assistance of sound artist and producer Aiko Devriendt (Fig. 3), we recorded the instruments in four dynamic layers (soft, medium-soft, medium-loud, and loud) at a sample rate of 48,000 Hz and 24-bit resolution in WAV format. Multiple stereo recording techniques were employed to capture both direct sound and resonance, allowing the sampling process to preserve spatial, timbral, and dynamic nuances relevant to performance analysis.¹²

Fig. 3:
Aiko Devriendt
sat up the micro-
phones in recor-
ding session, June
2023 in RMCA.
Photo Adilia Yip.



Physical interface

Subsequently, the digitization process continued with the development of various interfaces to playback the *manza* sound samples and to visualize the instruments' embodied gestures and planes of movement. The choice of interfaces, whether physical or virtual, was determined by the project goals and the work packages planned for different stages of the project. The physical *manza* replica was primarily selected for the ethnomusiological and music-analytical line of investigation. This design – also referred to as a MIDI *manza* or a digital musical instrument – enables the reconstruction of traditional *manza* playing techniques and hands-on instrumental skills, with reference to historical photographs of *manza* musicians (Fig. 5) and archival sound recordings of live performances. The analysis confirmed that the musician holds two mallets in each hand and strikes two wooden keys simultaneously (i.e., octave pairs). For *manza* MO.0.0.14308, the left hand plays the octave pairs of C, A#, G, and the right hand plays G, F, C# (Fig. 6a and b). The movement planes¹⁴ of the *manza* is symmetrical, shared equally between the left and right hand, where the left hand strikes the left half of the keyboard, and the right hand strikes the part on the right.¹⁵ The physical replica thus operates not merely as a playback device, but as a heuristic tool for recovering embodied musical knowledge that cannot be inferred from systematic analysis or pitch frequency measurement alone.¹⁶

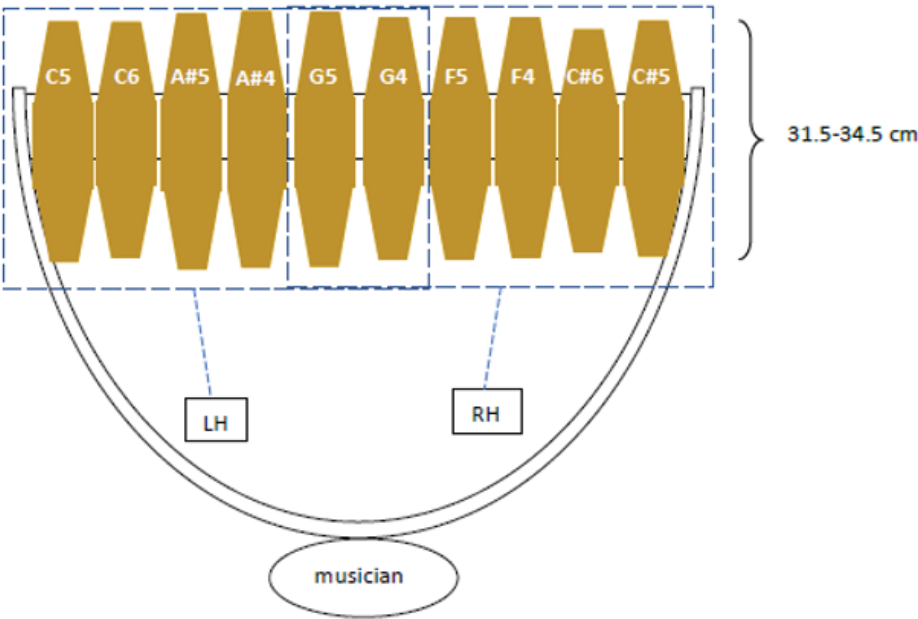
Between October 2023 and September 2024, *ReSoXy* invited master's student Oren Ronen to design

Five different types of microphones, including M260, M58, MC714, LMR-2b, and LMR-V (Fig. 4)¹³ were positioned at various angles around the *manza* according to each microphone's acoustic characteristics and function. The xylophones were played using three different types of mallets (hard rubber, soft rubber, and the original rubber mallets from the collection) to produce a range of timbres and articulations on the *manza* keyboards. Variations of the mallets' hardness, materials, and shapes resulted in different acoustic textures and tonal fundamentals. Beyond the acoustic fidelity, the sound sampling process functioned as a critical research intervention. By foregrounding timbre, resonance, and dynamic articulation – elements largely absent from colonial documentation – the recordings enable forms of musical knowledge that cannot be recovered through pitch measurements or object descriptions alone.

Fig. 4: Different microphones used in the recording session. Photo Adilia Yip.



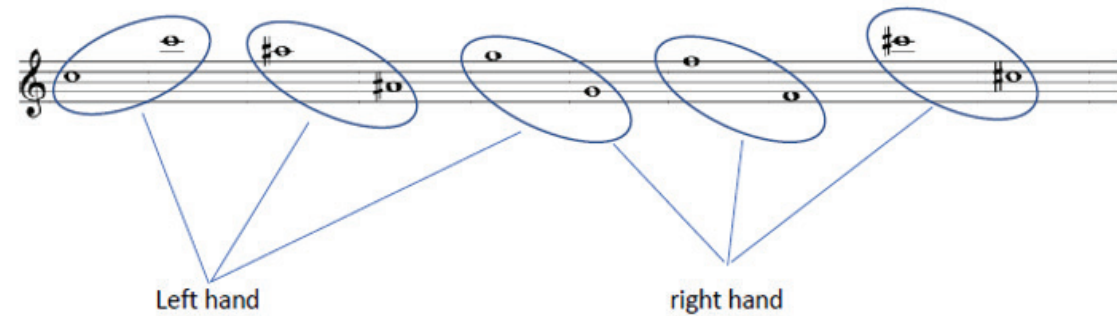
5



6a

Fig. 5:
Chief Senza
and his brother
Kanga playing
the manza at Bili.
RMCA archive
EP.0.0.14694.

Fig. 6a-6b:
Conceptuali-
zations of the
movement
planes of manza
MO.0.0.14308.
Yip 2023.

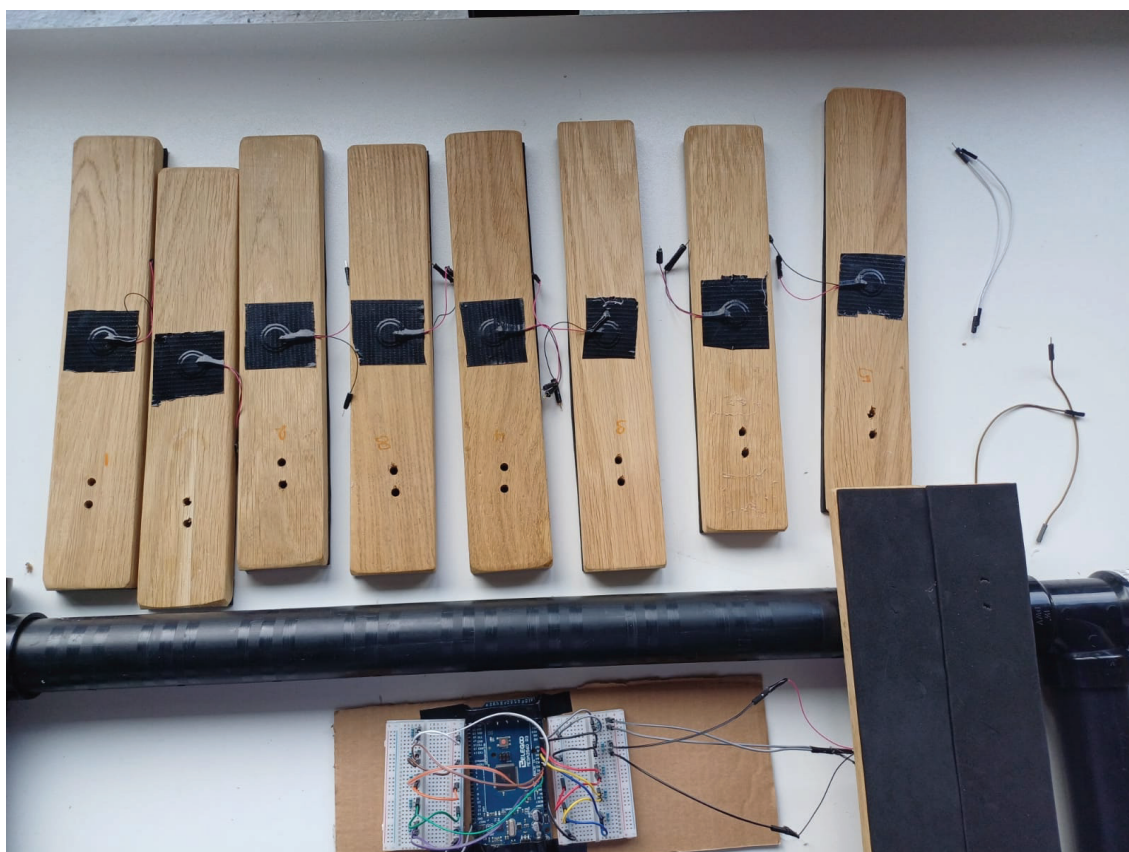


6b

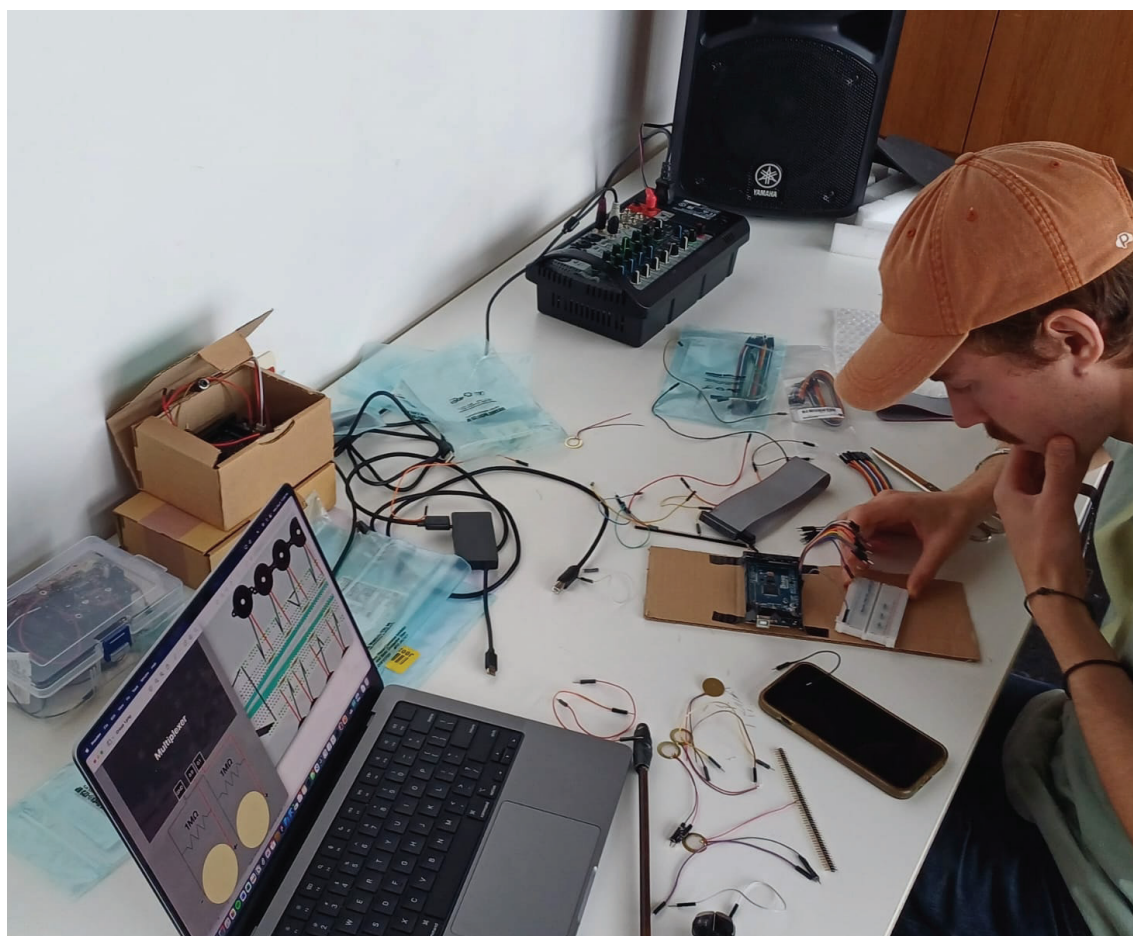
the digital system for the MIDI *manza*, under the guidance of professor Marcelo Wanderley from the Department of Music Technology at McGill University in Montreal, Canada (Fig. 7a and 7b). The MIDI *manza* employs a simplified wooden keyboard that imitates the physical shape and dimensions of the original instruments. As the natural sonority of the wooden keys are replaced by the playback of sound samples, it is unnecessary to add the resonators to the MIDI *manza*, or to shave the wooden keys to adjust the natural pitch of the material itself. The physical interface consists of ten thin wooden boards to represent the ten wooden keys of a *manza* xylophone. Each wooden key is installed with a piezo element, a transducer (sensor) that converts mechanical stress (pressure and vibration) into electrical voltage (electric signals). The ten piezo elements – one for each key of the *manza* keyboard – are connected to an *Arduino Mega 2560* microcontroller to trigger the playback of sound samples (i.e., ten sound samples recorded in four dynamic layers) via a *Pure Data* script running on a laptop. In this way, the MIDI *manza* can playback the sound samples of the entire museum collection of twenty-six instruments. This is an important feature, as each *manza* exhibits a distinct tuning, while adhering to a common set of tuning principles that are observed in the music analysis of *ReSoXy*. Furthermore, the team has also designed a physical frame structure that is low-budget, portable, and lightweight that can be stored in a handcarry-sized luggage for easy travel to performances, workshops, and presentations. The ten wooden keys are mounted onto a frame made

of simple recyclable materials, such as plywood, PVC tubes, Velcro tape, recycled foam¹⁷ and flannel cloth, which can be easily assembled and detached. With this design, the team aims to bring the physical replica to the source communities and fieldwork in DRC for knowledge sharing and co-creation of both sound and practice of the *manza* collection.¹⁸ Each wooden key is installed with a piezo element, a transducer (sensor) that converts mechanical stress (pressure and vibration) into electrical voltage (electric signals). The ten piezo elements – one for each key of the *manza* keyboard – are connected to an *Arduino Mega 2560* microcontroller to trigger the playback of sound samples (i.e., ten sound samples in four dynamic layers) via a *Pure Data* script running on a laptop. In this way, the MIDI *manza* is able to playback the sound samples of the entire *manza* collection of twenty-six instruments. This is an important feature, as each *manza* exhibits a distinct tuning, despite adhering to a common set of tuning principles that are observed in the music analysis of *ReSoXy*.

The application of physical instrument replicas in embodiment analysis also exists in earlier African musical instruments research investigations. As remarked by Wachsmann, the importance of studying the human experience of playing an instrument is to reveal *their experiencing*, a person's programs for sensing, thinking or dreaming.¹⁹ Blacking has played a similar model of Nyamulera notched flute of Uganda (also the recordings) that is preserved by The International Library of African Music (ILAM) to postulate the instrument organology and the playing techniques of eight tunes of



7a



7b

Fig. 7a-7b:
The wooden keys
and Arduino
microcontroller.
Oren Ronen wor-
king on the MIDI
manza. Photo
Adilia Yip.

the Butembo Nyamulera flute from north-eastern Belgian Congo.²⁰ For postulating the conception of musical scales and tuning systems of xylophone musicians in Central African Republic, researchers have modified the tuning of a synthesizer and extended the keys with wooden boards to simulate the original instruments and musical scales, thus, xylophone musicians were invited to justify the correctness of the tunings.²¹ In the analysis on the kalimba tunes from Nsenga, a Bantu-speaking people of south-eastern Zambia, Blacking concluded that the instrument doesn't seem to have musical patterns common to different melodies; but when the fingerings and rhythm are compared, some recurring patterns of fingerings appear, inextricably linked to different patterns of polyrhythm.²²

Virtual interface/ web application

Nevertheless, the MIDI *manza* remains dependent on the physical presence of both the researcher and the instrument itself, which limits the sustainability and accessibility of the collections and archives due to geographical distance and transportation constraints. While the material structure of the MIDI *manza* facilitates hands-on and embodied music experience, the research team was seeking alternative digital approaches that could improve the project's dissemination and social impact. Another concern related to the question of legitimate ownership of museum objects. In the temporary exhibition *ReThinking Collections* (2024), the curators aimed to emphasize that the ultimate goals of digitization are the dissemination and repatriation of intangible

cultural heritage and Indigenous knowledge systems associated with a declining yet prominent traditional African instrument, rather than conveying the wrong impression that the museum claims ownership over the musical object, its construction and performance practices. The team was seeking for a refreshed and interactive approach to promote the musical knowledge and skills of *manza* that lies beyond the common knowledge of most museum visitors. In addition, these designs should also acknowledge that digital interfaces embed curatorial values that are related to ownership, accessibility, and the ethical circulation of cultural knowledge. For instance, we studied some existing website applications like the *Gamelan Numérique* developed by the Philharmonie de Paris,²³ and different commercial smartphone applications for piano and guitar developed for learners of different ages.

Therefore, *ReSoXy* has brought these ideas to the ICT service²⁴ of RMCA to develop a *virtual manza*, and the result is an application using JavaScript and HTML5 codes that is playable on a touchscreen device that is almost the same size as the *manza* xylophone MO.0.0.14308. Additionally, the collection management photographer was asked to take new high-resolution, realistic photographs of the *manza* keyboards from a top-down perspective, with particular attention paid to reproduce the accurate colors and proportion of the instruments in these images. Resonators were deliberately excluded from these images, as the movement plane is defined solely by the keyboard surface. Sound samples were then mapped to the

corresponding image areas of each wooden key. Multiple sound samples are triggered during playback when more than one key is touched, reflecting the fact that the *manza* is typically played with two to four mallets simultaneously. Not only reading about the instrument and examining the object inside the glass exhibition showcase, visitors can thus interact with the instrument virtually through the touchscreen. A short animation play-along video was created to demonstrate the basic techniques of playing the *manza*. This animation was based on the research team's analysis of the archive recordings of the same instrument (Fig. 8).

To further support the goals of sustainability and accessibility, the *virtual manza* was subsequently transformed into a web-based application compatible with laptops and touchscreen mobile devices (Fig. 9). The website reuses the JavaScript and HTML5 codes developed for the *virtual manza* exhibition touchscreen, which is fully supported by web browsers. Although the team considered developing an iOS/Android application for the *virtual manza*, the team preferred a web-based solution due to its simpler implementation, broader cross-device accessibility, and lower development and maintenance demands. The application requires only 2 to 3 MB of disk space, consumes minimal system resources (e.g. RAM and CPU), and ensures a sustainable and lightweight front-end framework for online dissemination, particularly in regions with limited internet bandwidth. Maintenance of the *virtual manza* web application is also minimal. As long as JavaScript remains supported by web brows-

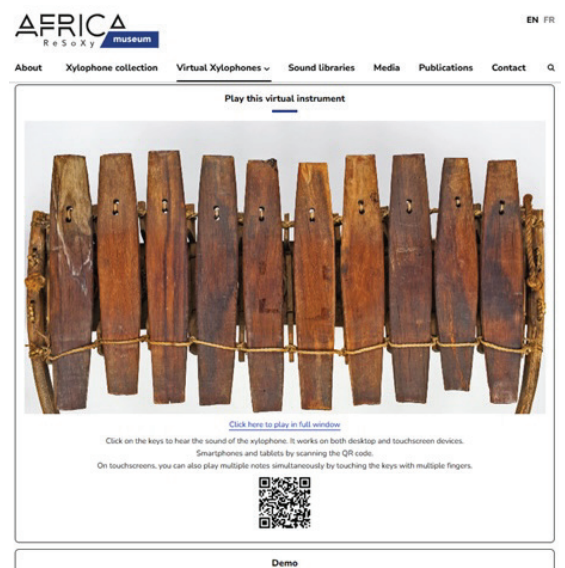


Fig. 8:
The touchscreen
virtual manza
(ReThinking
Collections 2024,
RMCA). Photo
Adilia Yip.

Fig. 9:
Website of
ReSoXy, [https://
resoxy.africamu-
seum.be/](https://resoxy.africamuseum.be/).

ers, the only required maintenance will concern the web server, such as security updates and backups, which will be handled by the museum's ICT service. The decision to prioritize a lightweight, web-based interface articulates a framework in which technological design, curatorial ethics, and artistic practice are inseparable.

Hence, the *virtual manza* web appli-

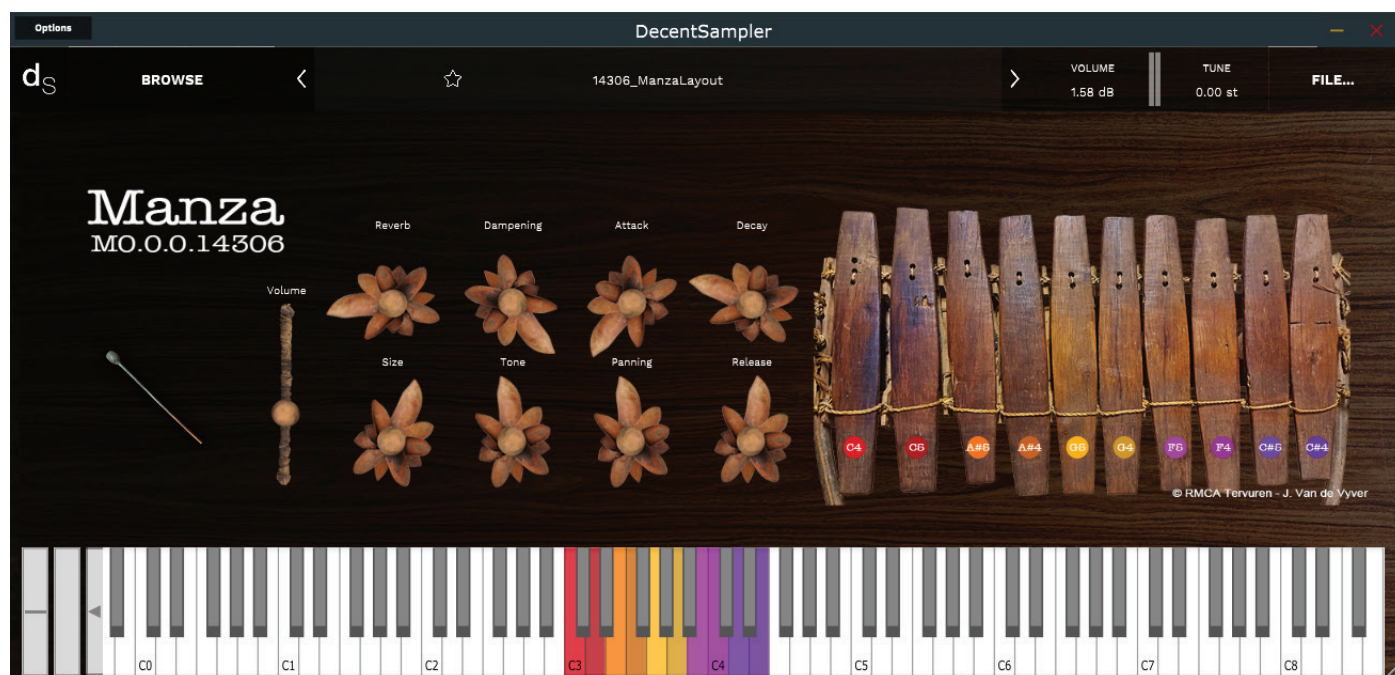


Fig. 10:
VST plugin.

cation serves as a central feature of the *ReSoXy* project website, complementing its role as an open-access platform that provides access to archival data, photographs, sound recordings, and related research publications. With the help of a student internship,²⁵ the team created a concise, and engaging short introductory video explaining the history of *manza*, as well as its construction, music theory, and performance techniques in accessible and non-specialist terms.²⁶ For local museum visitors, the research team has additionally developed a sound installation²⁷ featuring multiple *virtual manzas*, created by connecting three to four tablets or smartphones to a simple PA system. This configuration enables participants to collectively create music through interaction with the installation. Website visitors can download *manza* sound samples for use in their own creative projects. These samples are organized into separate .zip folders, each forming a sound library for a different *manza*. After a few months

of development, the website has successfully reached 2448 visits and downloads in January to December 2025.

To facilitate professional music creativity, the student internship has also developed a VST plugin (virtual studio technology) – a virtual instrument that operates inside the DAW (digital audio workstations)²⁸ – based on the open-source Decent Sampler template.²⁹ Through this adaptation, the *manza* sound samples and images are transformed into a virtual instrument that supports professional music production, and serves as a powerful tool for electronic music creation. As with the sound library, the VST plugin has been uploaded to the project website, accompanied by a clear instruction explaining the download and installation processes. Then, the VST plugin was sent to musicians in Africa for the creation of new music tracks and an online album. This initiative effectively extends the transmission of the “manza”’s sound and practices beyond geographical distances. These

audiovisual creative outcomes produced using the VST plugin (Fig. 10) and sound libraries are published on the project website and the project's official YouTube channel.³⁰ The research team hopes that these videos will inspire broader experimentation with the instrument's sounds and performance techniques. Together, digital repatriation, co-creation, and the reconfiguration of the museum contact zone form the conceptual framework through which *ReSoXy* reflects on a broader commitment to accessibility and decentralization, using technological solutions that would promote infrastructural and economic inclusions.

Co-creation

Drawing on Clifford's notion of the museum as a *contact zone*, *ReSoXy* approaches digitization and co-creation as means to reconfigure historically asymmetrical encounters between institutions and source communities. With the collections stored in the ex-colonizer's depots and glass exhibition showcases for about a century, returning objects to their homeland will not restore their original functions and practices, but likely, a mere relocation to other "cabinets of curiosities".³¹ In echo to Basu and Modest, returning the musical recordings, digitization, nor the physical musical objects and photographs would have been sufficient for the restoration and revival of the intangible knowledge systems. It is necessary to create a forum to bring together different stakeholders and interlocutors in an attempt to foster constructive dialogue and interchange,³² and to aim at the repatriation goals of reconciliation, sustainability and equity.³³ *ReSoXy* aims to create an al-

ternative museum contact zone,³⁴ a collateral interactive zone of *re-centering*³⁵ to democratize the curatorial control,³⁶ and open new creative and exchange opportunities for the collections.

In *ReSoXy*, co-creation denotes collaborative artistic and research processes in which musicians participate as co-authors of sound, meaning, and interpretation rather than as informants or end users. Aiming to foster a decentralized approach to reflect and recreate the meanings and roles of the disrupted musical cultures through musical and creative activities, to configure *a different same* for the captured musical objects,³⁷ co-creation is potentially the channel of sharing the narratives and *story-ing* of the stakeholder participants,³⁸ affirming the modes and practices of music creativity that are generated by the young generations for the collections, and indigenous knowledge systems that have been marginalized by the dominant Western cultural canons. The project team sends out the high-fidelity sound samples and various interfaces to musicians to reimagine and revive the disrupted transmission and continuation of *manza*. We seek answers for the following research questions through co-creation: How can digitisation re-connect the collections and the original owners and stakeholders, and what are the artistic results? What are the sound and performance of *manza* after decades of fragmentation, disruption and oblivion? In addition to decolonizing the museum collection, the co-creation partnerships aim to evaluate the functionality of the virtual and digital devices.

Since spring 2025, *ReSoXy* has invited two African musicians to develop projects using the digital devices and platforms. From our existing contacts, we engaged Adon Geel from Makhandha (Grahamstown), South Africa,³⁹ and Chris Mec Mr Tshongo Le Magnifique from Kisan-gani, DRC, and is currently active in Kampala, Uganda and Dar Es Salaam, Tanzania. Both musicians began their creative processes by experimenting with the web application, sound libraries, and VST plugins provided online by the *ReSoXy* research team. With different artistic backgrounds, visions, and skills, they created compositions and multimedia contents that reflect themes of Pan-Africanism as well as social and youth-related issues. Issues of museum collections were also discussed during the interviews. The resulting compositions revealed distinct musical designs, emotions, styles, and modes of presentation.

Adon Geel

With a background in sound technology, Adon Geel is a freeform producer and cultural practitioner affiliated with music organization Black Power Station in Makhandha, South Africa. The project was sponsored by the artist in residence program *AFRIMUS of RMCA* as the first test case on co-creation with African musicians using the digital tools of the museum musical collections. Geel's practice is central to sonic ethnography, in which his musical influences are rooted in indigenous music during his upbringing, and later, expanded through exposure to hip-hop and immersion in other genres such as jazz, soul, bossa nova, samba, highlife, and Afrobeat. Because hip-hop often involves

sampling, he became drawn to the original sources of these sounds, which led to the development of his broad musical interests. He engages deeply with sound sources, seeking to understand their cultural contexts and the communities from which they originate.

From his previous work in sound repatriation projects involving endangered sounds and musical recordings from the ILAM archive (International Library of African Music), he argues that musicians and researchers have the responsibility to interrogate archival narratives, historical contexts, and acquisition practices, and to clarify the original messages African ancestors sought to convey through these recordings and collections. That said, as the chiefs and their courts no longer exist, the project has difficulties to find an authoritative body who knows and preserves the *manza* culture, nor the reconstruction of its original musical forms. Geel's creative and decolonial processes were guided intrinsically by the tonalities and archive recordings of the *manza*. On one hand, his goal was to create a space of exchange that works with *manza's* specific sonic textures and elements in ways that complemented his personal sonic interpretation and the participating musicians' improvisations; on the other hand, the composition is a space of exchange among different Bantu cultures, languages, and musical instruments. His idea of decolonizing the *manza* collection is mainly about reinitiating the musical creativity of the instrument, and to disseminate its sounds and practice through performing the composition with his bandmates and in front of public audiences.



11

In June 2025, Geel has completed a five-minute music track entitled *Bantu Socializing: People Together* and a short video documentary explaining his inspirations and the creative process.⁴⁰ The composition symbolizes a melting pot of cultures and celebrates the Pan-African ideology of diverse ethnicities coming together as *one* Africa. Geel integrated multiple musical styles, including jazz, hip-hop, R&B, and soul, drawing inspiration from artists such as Robert Glasper and Kokoroko. Geel blended several languages, the Xhosa and Zulu languages of his own background and the Azande languages, rooted in the Bantu tradition. Despite the *manza* sound samples, he also incorporated the sounds of *uhubu*, a Xhosa musical bow, spoken audio, and Western instruments such as saxophone and bass guitar.⁴¹

Bantu Socializing was created by the sampled sound library *manza*

MO.0.0.14308, and later, the VST plugin for further musical creativity. Geel gave us very positive reactions about his experience of using both applications, and the download and installation processes also went smooth. With the sound library, Geel could modulate, re-tune and add sound effects to the original *manza* tones at ease using his DAW (Ableton) and the 64-pad MIDI controller (Fig. 11). He appreciates the VST plugin design for the possibility to playing and writing music for the non-Western instrument and tones using a MIDI piano keyboard, which is a feature incompatible with the presets of most MIDI instruments and virtual applications. The graphical representation and arrangement of the VST plugin emulate the bodily experience of playing the unique *manza* keyboard of five pairs of octave intervals. With these equipment and applications, Geel integrated the original *man-*

Fig. 11:
Adon Geel
experimenting
the *manza* sound
samples with the
64-pad controller.
Photo Adon Geel.

za tones of MO.0.0.14308 with the Western instruments in *Bantu Socializing*. On the one hand, he created a solo improvisation using the original *manza* tones; on the other hand, he adapted the *manza* sound samples to the Western equal-tempered tuning⁴² to compose the main melodic theme recurred throughout the composition, which supports the improvisations and dialogues played by jazz musicians. In the future, Geel wants to continue the project with a live performance of his band that is made up of saxophone, trumpet, bass, drums, and synthesizer.

Chris Mec Mr Tshongo Le Magnifique

Born and raised in Kisangani, DRC in 1996, Tshongo is a multi-talented young rapper, singer, songwriter, drummer, DJ trainer, and event organizer. His music journey began in a church choir at the age of 7, where he first discovered the healing power of music and the deep connection between rhythm and emotion. By the age of 12, he was battling in the streets – not with fists, but with words – channelling his energy into breakdancing and freestyle rap, influenced by rappers like Eminem. In May 2013, Tshongo moved to Uganda and joined the Hakuna Kulala collective, which brought him to the heart of East Africa's underground music revolution, and become a regular artist and event organizer for the Nyege Nyege Festival since 2017. Now based between Kampala (Uganda) and Dar es Salaam (Tanzania), he was invited to perform in festivals, clubs, and grassroots community shows across East Africa. Through his work as a

DJ trainer, Tshongo is dedicated to empowering the young generation of musicians, especially youth from marginalized communities.

ReSoXy has first commissioned Tshongo to create a composition using the *manza* VST plugin. Entitled *Yoka*,⁴³ meaning listen, hear, or understand, is a Lingala related word used in East African Bantu languages, often appearing in Congolese music. Written in Lingala, the song expresses the unfortunate life of a young man. The lyrics are based on a letter written by one of Tshongo's friends before his death. Born in Bongo and raised in Kisangani, the friend died young after drinking a ritual substance. In the letter, he expressed regret over his actions, explaining that he came from a poor family and did *some wrong things* to improve the situation, which ultimately ended tragically. By adapting this letter into song, Tshongo commemorates his friend while also highlighting the social challenges faced by youth in northern DRC. Since Tshongo's main work is not electronic music production, he often collaborates with music producers. For *Yoka*, he worked with Beni Beats Music Studio in Dar es Salaam, Tanzania, and together they downloaded and installed the VST plugin. The process was not smooth at first due to confusion about opening the VST plugin in the DAW, but the issue was quickly resolved after we checked the installation steps together in a video call and used the correct functions and directories of the DAW. They enjoyed using the VST plugin, as it is easy to follow the arrangement of the *manza* keyboard and improvise music with a sense of the *manza's*

instrument shape through playing the MIDI piano and the laptop.

Yoka inspired Tshongo to continue his research by working with young musicians in his hometown of Kisangani. In August 2025, he proposed to *ReSoXy* an extension of his solo project. He wants to support the principles of *ReSoXy* and the dissemination of the *manza* digital tools, seeing them as the agencies of promoting his community's cultural heritage and foster healing. Tshongo wants to bring *manza* to local young musicians and create a lasting, socially impactful album that would raise awareness of the tradition. The second phase of the collaboration took place in October 2025, when Tshongo returned to Kisangani to work with eight young musicians aged 25 to 38, including five performers (singers and rappers) and three studio producers from Bomci Records. Tshongo developed the beats and overall musical ideas for six tracks and invited the singers to record the vocal parts. He then asked the producers to compose the *manza* parts using the *manza* VST plugin, as they are more experienced in electronic music production and Tshongo had already worked with the plugin for *Yoka*. The producers learned the basic principles of *manza* from the *ReSoXy* website, and Tshongo communicated his ideas by demonstrating them through a smartphone mallet-percussion app. Tshongo organized six creative and recording sessions with the group over a three-week period in October, followed by a release concert at the end of his trip. Due to the complications while crossing the Uganda-DRC border Tshongo was forced to spend extra time to seek alterna-

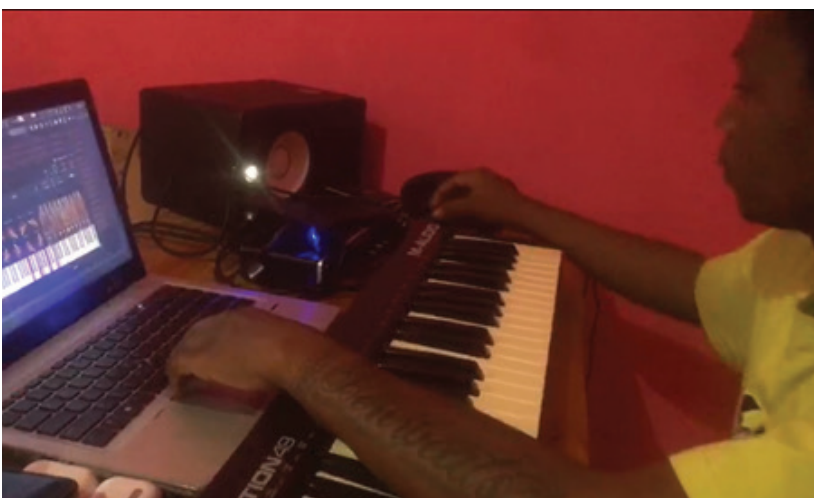
tive transportation routes through Bunya and Lake Albert. Therefore, the project is currently in the post-production stage. It is expected to be uploaded to Bandcamp in late summer 2026.

The project has launched a short-written interview with six out of eight participants in the project. In general, the interviewees seemed to know quite little about their traditional music and cultural practices but showed concerns over losing their traditional musical instruments and recordings to European museums, and they are interested in re-owning these materials. All of them claimed that European museums, mainly in Belgium and France, are preserving their traditional instruments, and they would like to get them back as these are part of their cultural heritage. Unfortunately, due to the short-written format of the interviews, I am unable to ask further about their ideas of repatriation.

However, the responses concerning traditional musical instruments revealed some confusion regarding the use of terms and the cultural origins of these instruments. The *djembe* and *balafon* appear to be well known among the interviewees; nevertheless, these instruments originated in West Africa, and their connection to traditional music in northern Congo is likely to be limited. Further investigations into the presence and usage of these instruments and related terms in northern Congo would be necessary to clarify the situation. In addition, none of the interviewees mentioned the *kpaningbo* xylophone, and only two participants referred to the *manza*. The *kpaningbo* is an instru-

ment of the Azande people, consisting of multiple loose wooden logs or boards with between five and fifteen keys, and it is still commonly used in Kisangani and among Azande communities today. Most interviewees were familiar with the *madimba* and *ngoma*, which did not originate in the northern region around Kisangani but are traditionally associated with peoples from the Kasai and Katanga regions of the Democratic Republic of the Congo (DRC).

Apparently, the interviewees' primary interests and professional focuses lie in Western popular music styles, instruments, and digital music applications. Apart from playing Western popular genres with guitar, rap and singing, some of the interviewees can play a traditional instrument, like *tam-tam* (wooden slit drum) and *likembe* (lamellophone), and some others have heard about *madimba* (xylophone) and *ngoma* (membrane drum). Most of them learned music through church activities, artist collectives, or family members and siblings. This situation reflects a combination of sociopolitical developments, including migration, modernization, Western cultural influence, and Pan-Africanism. The interviews also exposed weaknesses in the education and transmission of cultural heritage in the region, highlighting the need to improve both the teaching of traditional music and general awareness of it among younger generations (Fig. 12 and 13).



Conclusions

In a nut shell, *ReSoXy* has engaged with the *manza* collections of RMCA not merely as historical artifacts, but as a living sonic knowledge that was disrupted by colonial acquisition, racial biases, and archival silencing. By combining sound sampling, digital instruments design, ethnomusicological analysis, and participatory co-creation, the project repositions museum collections as sites of dialogue, experimentation, and ethical responsibility. The development of physical, virtual, and web-based interfaces demonstrates how music technology can support sustainability, accessibility, and critical reflection, while reconnecting the cultural practices with local communities. Rather than proposing digitization as a form of restitution in itself, *ReSoXy* emphasizes the necessity of social processes – collaboration, listening, and creative exchange – in the transmission of intangible cultural heritage of the music collections and archives. Through co-creation with musicians and communities across geographical distances, the project opens a decentralized *contact zone* in which new meanings, sounds, and narratives can emerge. In this way, *ReSoXy* suggests that the future of museum sound collections lies not in preservation alone, but in their capacity to be revived, reconnected, and reimagined within contemporary cultural life.

Fig. 12:
Poster of
Tshongo's concert
in Kisangani,
October 2025.

Fig. 13:
Beni
experimenting
with the VST
plugin. Photo
Chris Mec
Tshongo.

Credits

Special thanks to Aiko Devriendt, Oren Ronen, YiXuan Lyu, Adon Geel, Chris Mec Tshongo, and Mathieu Driessen for their contributions. Besides, *ReSoXy* would like to thank the institutional support from the Royal Museum for Central Africa (RMCA) and its ICT, collection management, and musicology teams. The project was supported financially by BELSPO Brainbe 2.0 and the Royal Conservatoire Antwerp.

Endnotes:

- 1 Boone 1936; Mumbanza 2016, p. 73. The term *manza* is commonly known as the name of a Ubangian language spoken by the Mandja people of the Central African Republic, as well as the name of the ethnic group itself.
- 2 Sachs 1939, cited in Pollens 1989, p. 590; Petitjean 2025; Hoyt 2024.
- 3 Linwood 1995, p. 198-199; Kahunde 2012, p. 200.
- 4 Seeger 2018.
- 5 Yip, Ramirez 2026.
- 6 Porto 1999; Valentim 2019.
- 7 Gray 1997.
- 8 Kahunde 2012, p. 202.
- 9 Madiba 2021.
- 10 Sciot 2018.
- 11 The sound archive DEKKMMA of RMCA preserves only fourteen audio recordings performed by two manza ensembles of Chief Guga in Bondo (Guma), and Chief Senza in Bili respectively. Both were recorded by Armand Hutereau in 1912 on wax cylinders, since the recordings of Chief Senza were mostly in bad quality and damaged.
- 12 Channel 1-2 is a set-up of Blumlein pair, whose two bi-directional microphones are at right angles to one another in close proximity, capturing a stereo image of the sound source with added ambience captured from the rear of the recording space. Channel 3-4 forms the Mid/Side (M/S) technique, with the cardioid (Mid) facing the sound source for center information and the figure-8 (Side) microphone perpendicular to it (90 degrees) to capture side ambience. Channel 5 captures the resonance at the bottom side of the instrument. Channel 7-8 is an A/B (Spaced Pair) technique that is spaced apart to capture a wide stereo image of the complete instrument and the tonal differences between the left and right side of the keyboard. This information was obtained from Aiko Devriendt, and website <https://rode.com/en-be/about/news-info/stereo-microphone-techniques> (accessed on 19/06/2026).
- 13 The DAV BG-1 in the photo is a microphone amplifier to improve the recording quality.
- 14 Coessens 2019. The concept of movement and spatial plane was coined by Kathleen Coessens to illustrate and compare the movement approaches of pianist and cellist.
- 15 Yip 2023.
- 16 A demonstration video of a *manza* pattern using the physical interface is available on the ReSoXy project website: <https://resoxy.africamuseum.be/en/xylophone-collection/MO.0.0.14308> (accessed on 29/01/2026).
- 17 The foam is added to the PVC tubes to absorb the excessive vibration while striking the wooden keys to trigger the piezo elements for generating the playback sound. A thin rubber layer is also stuck on the surface of the wooden keys to dampen the natural sound produced by striking on these wooden keys.
- 18 Due to the political instability, health concerns and budget, we hope the fieldwork in DRC can resume in 2026.
- 19 Wachsmann 1982, p. 198.
- 20 Blacking 1955.
- 21 Voisin 1994.
- 22 Blacking 1961.

- 23 https://pad.philharmoniedeparis.fr/gamelan.aspx?_lg=fr-FR (accessed on 19/06/2026).
- 24 Information and Communication Technology.
- 25 YiXuan Lyu was a student of the Asia-Europe curatorship postgraduate program at the University of Antwerp in academic year 2024-2025, who has also received training in graphic design and animation.
- 26 The video is available in French and English on YouTube Channel: <https://www.youtube.com/@TheManzaXylophoneProject> (accessed on 19/06/2026).
- 27 The sound installation was presented in the sound art festival *La Semaine Du Son. Oor* in January 2026 at the Musical Instruments Museum, Brussels; the jam session workshop *Echoes of the Ancients* took place in April 2025 at RMCA.
- 28 Some examples of DAWs are Reaper, Ableton Live, or FL Studio.
- 29 <https://www.decentsamples.com/> (accessed on 19/06/2026).
- 30 The copyright issues of sharing, downloading and accessing the materials will be in consultation with the reproduction department of RMCA. Project team will also consult elders and communities during co-creation and ethnography work packages.
- 31 Pretorius 2022.
- 32 Basu, Modest 2015.
- 33 Restitution Belgium 2021. Ethical principles for the management and restitution of colonial collections in Belgium. <https://restitutionbelgium.be/en/report> (accessed on 19/06/2026).
- 34 Clifford 1997; Mader 2022.
- 35 Mbembe 2015.
- 36 Pierroux, Bäckström, Brenna, et al. 2020.
- 37 Njami 2018.
- 38 Mackinlay 2016.
- 39 The project was sponsored by the artist in residence program *AFRIMUS* of RMCA.
- 40 The documentary: <https://youtu.be/6x1qCMZH5N4> (accessed on 19/06/2026).
- 41 The Uhubu sound samples and spoken audio are sampled from the ILAM sound archive and YouTube videos. The saxophone was played by Siyabulela Mfuku, and bass guitar by Bulelani Mfuku.
- 42 In Western music, a scale system called twelve-tone, or equal-temperament is commonly endorsed. This is in contrast to the scale of *manza*, a unique system of five pairs of octave intervals.
- 43 The music video of *Yoka* <https://youtu.be/lej1JrTbYE> (accessed on 06/07/2026).

References:

- Basu, Modest 2015: Basu P., Modest W., *Museums, Heritage and International Development*, London-New York, Routledge, 2015.
- Blacking 1955: Blacking J., *Eight Flute Tunes from Butembo, East Belgian Congo. An Analysis in Two Parts, Musical and Physical*, in "African Music: Journal of the International Library of African Music", 1955, 1, 2, pp. 36-52.
- Blacking 1961: Blacking J., *Patterns of Nsenga Kalimba Music*, in "African Music: Journal of the International Library of African Music", 1961, 2, 4, pp. 26-43.

- Boone 1936: Boone O., *Les Xylophones du Congo Belge*, Tervuren, Musée Du Congo Belge, 1936.
- Clifford 1997: Clifford J., *Museums As Contact Zones*, in Clifford J. (ed.), "Routes: Travel and Translation in the Late Twentieth Century", Cambridge, MA, Harvard University Press, pp. 188-219.
- Coessens 2019: Coessens K., *On the Sensorial of the Human Body in Performance. Sensorial Aesthetics in Music Practices*, Leuven, Leuven University Press, pp. 133-150.
- Gray 1997: Gray J., *Returning Music to the Makers: The Library of Congress, American Indians, and the Federal Cylinder Project*, in "Cultural Survival Quarterly", 1997, p. 4.
- Hoyt 2024: Hoyt S., *Un-Muting: Sonic Restitutions*. Performance and temporary exhibition at MARKK museum in Hamburg, 2024. <https://markk-hamburg.de/en/ausstellungen/un-muting-sonic-restitutions>.
- Kahunde 2012: Kahunde S., *Repatriating Archival Sound Recordings to Revive Traditions: The Role of the Klaus Wachsmann Recordings in the Revival of the Royal Music of Bunyoro-Kitara, Uganda*, in "Ethnomusicology Forum", 2012, 21, 2, pp. 197-219.
- Linwood 1995: Linwood J. M., *The Manufacture of Tuned Percussion Instruments in Indonesia and Africa. A Selective Study*, PhD dissertation, London Guildhall University. Calcutta House Library, 1995.
- Mackinlay 2016: Mackinlay E., *Decolonization and Applied Ethnomusicology: "Story-ing" the Personal-Political-Possible in our Work*, in Pettan S., Titon J.T. (eds.), *The Oxford Handbook of Applied Ethnomusicology*, Oxford Academic, 2016, pp. 379-397.
- Mader 2022: Mader R., *How to Curate a Contact Zone. Institutional and Transcultural Entanglements in the Art Mediation Project "Space For Encounters"(2016)*, in "INSERT. Artistic Practices as Cultural Inquiries", Issue 3, Participatory Critique: Transversal Boundary Crossings", 2022, <https://insert.art/ausgaben/participatory-critique/how-to-curate-a-contact-zone/>.
- Madiba 2021: Madiba E., *A Collaborative Approach to Revitalisation and the Repatriation of Isixhosa Music Recordings Archived at the International Library of African Music (ILAM) in South Africa*, in "Ethnomusicology Forum", 2021, 30, 1, pp. 52-62.
- Mbembe 2015: Mbembe A., *Decolonizing Knowledge and the Question of the Archive*, in "Africa is a Country", 2015, <https://worldpece.org/content/mbembe-achille-2015-%E2%80%9Cdecolonizing-knowledge-and-question-archive%E2%80%9D-africa-country>.
- Mumbanza 2016: Mumbanza S.M., *Le Kponingbo Des Zandé: Patrimoine Musical Dans une Organisation Socioculturelle Singulière*, Thèse de doctorat, Université Des Antilles, 2016.
- Njami 2018: Njami S., *Atelier de Dakar*, in panel "Ce que Restituer veut Dire", 2018.
- Petitjean 2025: Petitjean L., *Unmuting Musical Instruments Held in Ethnographic Collections: Towards a Sound Remediation?* in "Museum, Materials and Discussions. Journal of Museum Studies", 2025, 2, 1, pp. 267-287.
- Pierroux, Bäckström, Brenna, et al. 2020: Pierroux P., Bäckström M., Brenna B. et al., *Museums as Sites of Participatory Democracy and Design*, in Hetland P., Pierroux P., Esborg L. (eds.), *A History of Participation in Museums and Archives: Traversing Citizen Science and Citizen Humanities*, London – New York, Routledge 2020, pp. 27-45.
- Pollens 1989: Pollens S., *Curt Sachs and Musical Instrument Restoration*, in "The Musical Times", 1989, 130, 1760, pp. 589-594.
- Porto 1999: Porto N., *Manageable Past: Time and Native Culture at the Dundo Museum in Colonial Angola*, in "Cahiers d' Etudes Africaines", 1999, 39, 155/156, pp. 767-787.
- Pretorius 2022: Pretorius D., *Dead Living Things: A Cabinet Of Curiosities in the Postcolony*, in "de arte", 2022, 57, 2, pp. 33-60.
- Sachs 1939: Sachs, C. *Letter addressed "To the President and the Acting Director, Metropolitan*

Museum of Art, New York City,” dated 6 July 1939.

Sciot 2018: Sciot E., *Performing Science Amongst the Filing Cabinets. Women, Anthropology and Museums in Belgium (1930–1970)*, in “History and Anthropology”, 2018, 29, 5, pp. 620–644.

Seeger 2018: Seeger A., *Archives, Repatriation, and the Challenges Ahead*, in Gunderson F., Lancefield R.C., Woods B. (eds.), “The Oxford Handbook of Musical Repatriation, Oxford Handbooks”, 2018. <https://doi.org/10.1093/oxfordhb/9780190659806.013.8>.

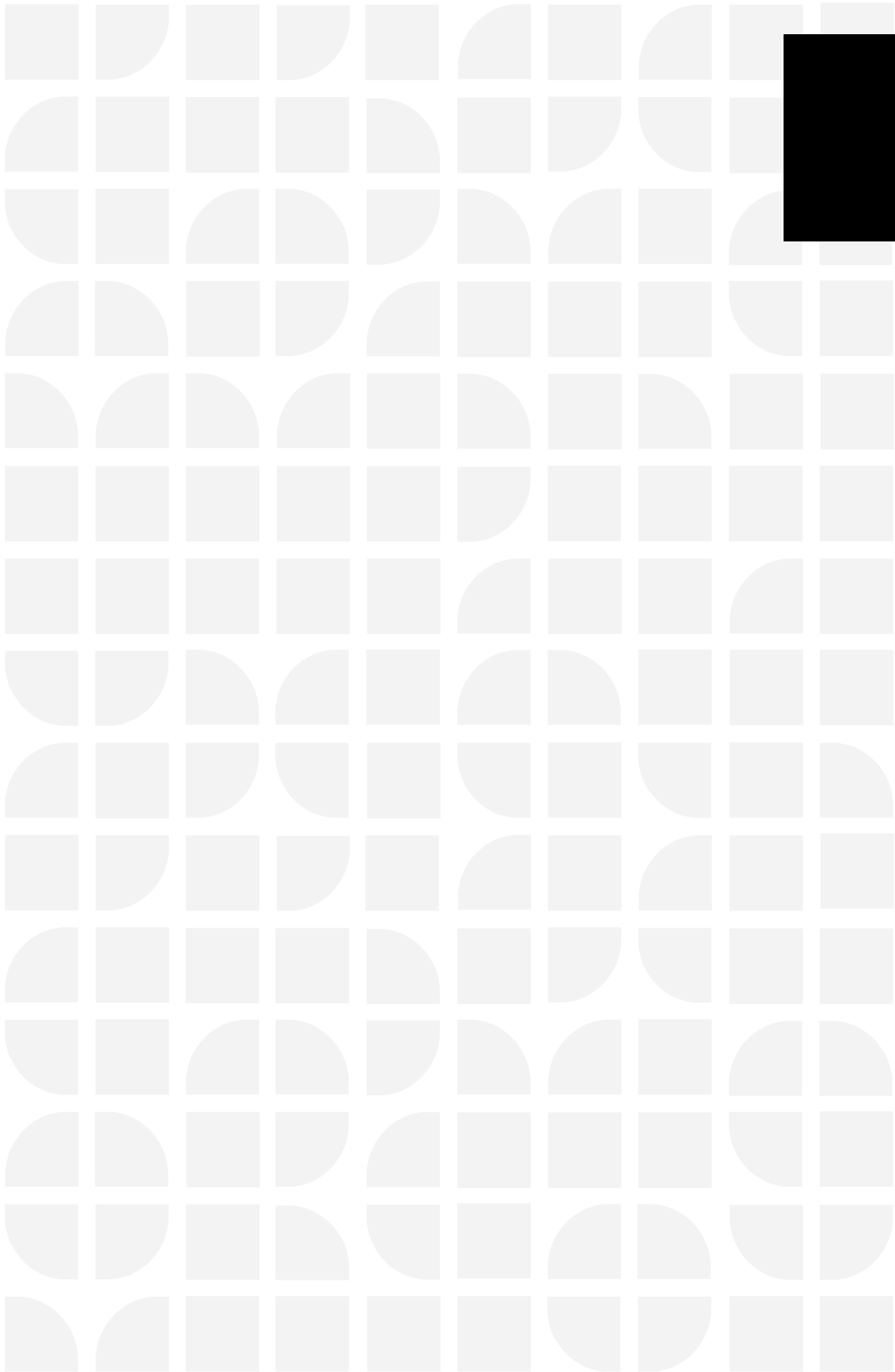
Valentim 2019: Valentim C.S., *Tribal Folk Music or Angolan Colonial Musical Heritage? A Critical History of the Missão de Recolha de Folclore Musical do Museu do Dundo, Diamang, 1950-1960s*, in “BEROSE International Encyclopaedia of the Histories of Anthropology”, Paris, 2019.

Voisin 1994: Voisin F., *Musical Scales in Central Africa and Java: Modelling by Synthesis*, in “Leonardo Music Journal”, 1994, pp. 85–90.

Wachsmann 1982: Wachsmann K., *The Changeability of Musical Experience*, in “Ethnomusicology”, 1982, 26, 2, pp. 197–215.

Yip 2023: Yip A., *Re-sounding the Azande Manza Xylophone Collection through a DIY Replica Instrument and Artistic Experimentation*, in Jähnichen G. (ed.), “Studia instrumentorum musicae popularis viii (New series)”, Berlin, Logos Verlag, 2023, pp. 205–226.

Yip, Ramirez 2026: Yip A., Ramirez L.N., *From Manza to Kpaningbo: The Pragmatic Shift of Xylophone Traditions in Azande*, in Ricquier B., Lambertz P., Mombaya N. et al. (eds.), *Exchange, Circulation and Mobility in the Congo Basin’s Riverscapes: People, Objects and Techniques on the Move*, Tervuren, RMCA publications, 2026 (forthcoming).



Entwining sound, space and narratives. Sound design approaches in exhibitions

Micol Riva

Keywords:

Sound-driven design, Exhibitions, Sound narratives, Approaches.

ABSTRACT:

This article explores the evolution of exhibition design, focusing on the integration of sound as a key narrative and experiential element. In recent decades, technological advances and discoveries in neuroscience have influenced the design of exhibition spaces, transforming them into multimodal experiences that go beyond mere visual engagement. Sound emerges as a central tool, capable of shaping the emotional, spatial, and narrative dimensions of exhibitions. Through case studies and interviews with exhibition and sound designers, I propose four sound design approaches – *transparent, relational, unexpected, and imaginary* – as strategies for amplifying narratives through non-verbal sounds and soundscapes. Balancing its informative and evocative roles, sound is a fundamental component in generating meaning and creating engaging, communicative, and memorable experiences.

Questo articolo esplora l'evoluzione dell'exhibition design, concentrandosi sull'integrazione del suono come elemento narrativo ed esperienziale. Negli ultimi decenni, i progressi tecnologici e le scoperte neuroscientifiche hanno influenzato il design degli spazi espositivi, trasformandoli in esperienze multimodali che superano il semplice coinvolgimento visivo. In questo contesto il suono emerge quale strumento centrale, capace di modellare le dimensioni emotive, spaziali e narrative delle mostre. Attraverso casi studio e interviste con progettisti e sound designer, propongo quattro approcci al design sonoro – *trasparente, relazionale, inaspettato e immaginario* – quali strategie per rafforzare le narrazioni attraverso suoni non verbali e paesaggi sonori. In equilibrio tra ruolo informativo ed evocativo, il suono diviene componente fondamentale per la generazione di senso e per la creazione di esperienze coinvolgenti, comunicative e memorabili.

Micol Riva

Research fellow at the Architecture and Urban Studies department of Politecnico di Milano on the project "FUTURSPACE. Future Spaces for Cinema and Entertainment". Between 2024 and 2025, she conducted research on "Sound Design and Cultural Heritage" at the Design department of Politecnico di Milano. She also works as a professional exhibition designer, pushing the boundaries of exhibition, narrative, and interaction through the design and development of installations and exhibitions.
(Orcid 0009-0006-8915-9393)

CC BY 4.0 License

<https://creativecommons.org/licenses/by/4.0/>

©Micol Riva, 2026

<https://doi.org/10.60923/issn.3034-9699/26209>

Multidimensional exhibition spaces

Exhibition design as a field of study¹ and as a practice² has undergone major changes in the past decades. On the one hand, technological innovations have radically changed how we perceive and interpret the world. The spread of digitally enhanced “sensitive and sensory, hybrid and phygital” spaces changed the way we transfer and share knowledge, build meaning, and live.³ As the digital and physical realities mingle, in the *postdigital*⁴ contemporary exhibition spaces, the *phygital* metaphor becomes “a narrative device” where *space, narrations and technologies* inform “space-based, multimodal storytelling mediated by blended experiences and devices”.⁵

On the other hand, scientific findings in cognitive and sensory studies have shown how human cognition is deeply rooted and embodied in our neural and sensory-motor system. The *embodiment* paradigm emphasises the mutually influencing relationship between *cognition, perception* and *action*.⁶

In the museum field, these discoveries fostered the adoption of multimodal and multisensory strategies to enhance the visitors’ experience, inducing the so-called “sensory turn”.⁷ Designers and professionals began to move beyond visual centrality, starting to “explore the aesthetic potential of the nonvisual senses”⁸ as a way to “make sense of the world, or translate sensory perceptions and concepts into a particular ‘worldview’”.⁹

Enhanced by these rather radical turns, museums have become increasingly “narrative”:¹⁰ cultural

spaces where *intangible cultural heritage, context, and communities*¹¹ are dramaturgically intertwined into a complex and dynamic relational system through a deliberate “act of direction”¹² orchestrated by designers.

Grounded in *percepts and concepts*,¹³ narrative acts as a foundational means for creating and interpreting human culture, fostering multiple layers of interpretation. Indeed, through storytelling, the exhibited artefact can enter into a “museological resonance”¹⁴ with the visitors, evoking “cultural forces”,¹⁵ raising attention, and generating new meanings. This resonance enables meaning-making and learning, preserving memories, and “encouraging personal reflection and public discussion”.¹⁶

These socio-technological and cultural shifts have inevitably impacted exhibition design practices, refocusing them from exhibiting technologies to crafting increasingly visitor-centred experiences¹⁷ and giving shape to hybrid, narrative, multimodal spaces. Exhibitions have thus become *performative-ly-driven* experiences¹⁸ in which “the visitor is simultaneously actor, director, spectator, and participant”.¹⁹

Developing within the three-dimensional physical space and progressing through a fluid time sequence,²⁰ open and nonlinear narratives transform exhibitions into real communicative acts. By leveraging the architectural space, artefacts, scenography and media as triggers of new behaviours, they enhance knowledge transfer and foster social awareness.

And sounds, with their elusive nature which crosses the boundaries between the physical and virtual, reality and imagination, cognition and emotion, have become key design tools that mold communicative spaces, fostering an “aural shift”²¹ in exhibitions.

Interlacing sources

To explore how sounds – especially non-verbal sounds and soundscapes – can be narratively used as design tools to enhance visitors’ engagement, I will cross-reference three main sources. These include scientific findings and insights from Sound Studies, Museum Studies, Exhibition and Narrative Design, and Cognitive and Sensory Studies; design approaches emerging from a series of semi-structured interviews I conducted over the past two years, and a qualitative analysis of practice-based case studies.²²

The semi-structured interviews drew on the “people, processes, and products” design research framework,²³ as applied in the *ASDP* project.²⁴ It included a structured section to gather information about professionals and a semi-structured section to collect insights into processes, communication challenges, languages, approaches, and tools designers use to incorporate sound as a design material in their practice.

With their consent, I interviewed sound designers from the fields of music, multimedia, cinema, VR, and sonic interaction, and exhibition designers who have worked on music-related exhibitions and multimedia interactive narratives, namely:

- Riccardo Castaldi, sound and exhibition designer;²⁵
- Andrea Cera, sound designer and researcher;²⁶
- Tommaso Leddi, musician and sound designer;²⁷
- Alberto Morelli, musician and sound designer;²⁸
- Max Viale, musician and sound designer;²⁹
- Uwe Brückner, exhibition designer;³⁰
- Ico Migliore, exhibition designer;³¹
- Franco Rolle, exhibition designer.³²

Based on grounded theory, Figures 1 and 2 illustrate the qualitative research process – from excerpts selection to *open coding* to *selective axial coding* –³³ that I used to analyse and classify the primary data obtained from the interviews.

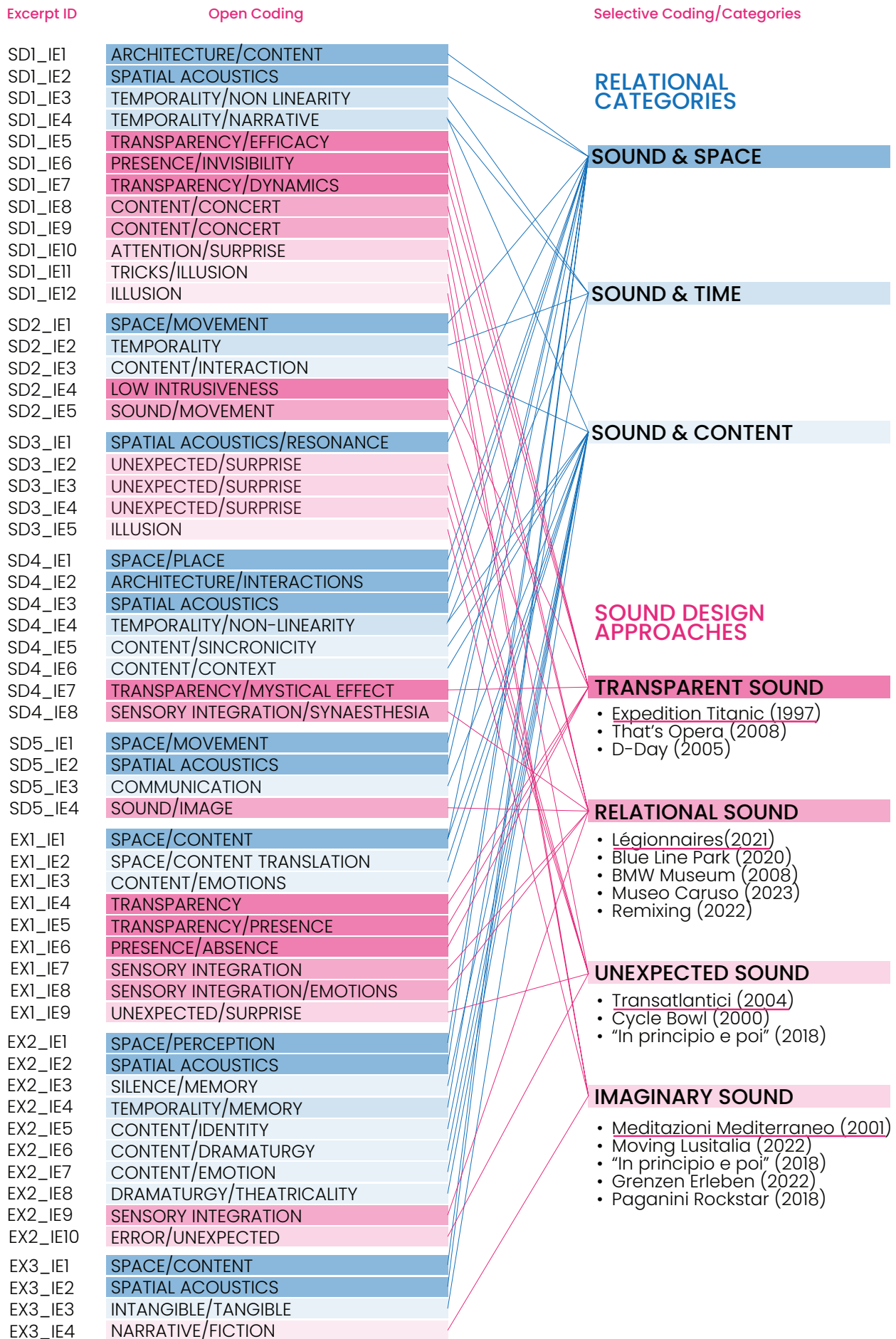
The case studies analysis covered multimodal narrative projects developed since the early 2000s, investigated through the lenses of curatorial and narrative strategies, listening experience, sound roles and functions, and design solutions. It included projects in which sound plays functional, communicative, narrative, and sensory roles, integrating seamlessly with the space, objects, displays, and media to achieve specific curatorial/cultural objectives.

Based on the data collected through the interviews, classified through the *selective axial coding process* outlined above, and the analysis of case studies, I have identified three main categories – *sound and space*, *sound and time*, *sound and content* – as well as four possible sound de-

ID	Interview Date	Interviewee name/role	Mentioned Case Studies	Approaches Excerpts Selection	Excerpt ID
SD1	7/8/2024	Riccardo Castaldi Role: sound & exhibition designer & co-founder Studio/Firm: The Bus		Un orecchio ai contenuti ed un occhio all'architettura	SD1_IE1
				in dialogo con il multimediale, la colonna sonora di una mostra è definita dall'architettura sia in termini di riverberazione che di separazione, isolamento dei contenuti sonori.	SD1_IE2
				La colonna sonora di una mostra è per sua natura non lineare, ma a partire da un medium totalmente lineare.	SD1_IE3
				Oltre ad essere utile a strutturare la visione, il sound design serve a far capire lo scorrere del tempo, a dare linearità a dei montaggi che sarebbero al contrario completamente pazzi, privi di senso, se fossero senza suoni.	SD1_IE4
				Il [sound] designer è senza un palco ma ha la possibilità di muoversi in un territorio nascosto, sottile, ma proprio per questo vantaggioso: il suo lavoro può arrivare ad essere del tutto trasparente ed estremamente efficace allo stesso tempo.	SD1_IE5
				La colonna sonora di una mostra deve essere a cavallo tra invisibilità e presenza, deve essere necessaria, altrimenti è meglio non ci sia, deve essere suggestione e indicazione al tempo stesso	SD1_IE6
				Una cosa positiva del sound è essere invisibile, ma essere invisibili non significa che tu non possa o debba essere dinamico, cioè non deve essere per forza tutto sotto il cappello di questa invisibilità.	SD1_IE7
				Molto spesso parliamo più di concerto dei contenuti. [...] c'è un aspetto importante di concerto: la concentrazione di contributi si può ottenere in molte maniere, non ultima quella di sincronizzare fra di loro i vari interventi, in modo tale che non si sovrappongano o, se si sovrappongono, ciò avvenga in maniera costruttiva per creare dei momenti carichi.	SD1_IE8
				Bisogna avere un approccio olistico per capire che quella sonorizzazione va a integrarsi in una situazione spaziale e contenutistica e visiva, e quindi deve fornire quello che manca e supportarla: nel complesso è inscindibile.	SD1_IE9
				[...] ogni tanto devi risvegliare l'attenzione del pubblico con un colpo di cannone e calcare la mano su determinate questioni che possono essere vissute in prima persona. [...] Sto pensando alla spazializzazione del suono, che può essere teatrale, cioè può farti voltare da una parte o dall'altra	SD1_IE10
				Per quanto riguarda il pubblico, quindi, è un lavoro che gode di questo suo essere nelle retrovie; bisogna sfruttarlo e godere di questa cappa di invisibilità che ti permette di fare dei trucchi.	SD1_IE11
				Come ci sono le illusioni ottiche, che sono all'ordine del giorno, ci sono le illusioni acustiche.	SD1_IE12
SD2	10/24/2024	Andrea Cera Role: sound designer & researcher Organisation: IRCAM-Paris	<i>D-DAY, le design aujourd'hui</i> , Centre Pompidou, Paris 2005	In ambito teatrale o nella danza, così come nelle mostre, l'aspetto spaziale è interessante: la rappresentazione tradizionale frontale tende ad appiattire lo spazio. [...] nelle mostre, per esempio, ciò che fai è proprio pensato per una funzione spaziale, cioè per colorare spazi diversi, per agevolare il passaggio da una stanza all'altra, per invitare una persona a spostarsi.	SD2_IE1
				La temporalità [nel design sonoro per le auto] è completamente fuori dal gioco e questa è una differenza enorme tra la musica e la composizione musicale dove il tempo è fisso e va da sinistra a destra, sostanzialmente. [...] il sound design è il grado estremo di lavoro puntuale su pochi secondi di suono, mentre la musica è molto più grezza da questo punto di vista [...]	SD2_IE2
				nel sound design il significato, l'immedesimazione, cioè quello che in musica succede tra pubblico e musicisti, avviene tra persone e oggetto, perché il suono di un'auto, o il suono che si sente in una mostra, o in una fiera, o nel salone dell'auto, crea un rapporto tra l'oggetto esposto e il soggetto, ed è un rapporto non tanto diverso da quello che c'è nella musica: una specie di rapporto emozionale e di scambio di senso.	SD2_IE3
				Ho sempre avuto un interesse anche per il concetto di bassa intrusività, [...]; un'idea di uso del suono non intrusivo che poi ha teorizzato. La mia pratica si chiama di 'low intrusiveness', non di 'no intrusiveness'; [...] quando la musica, il suono o il sound design vengono fruiti passivamente, secondo me c'è un obbligo etico di ridurre la loro intrusività al minimo necessario.	SD2_IE4
				Anche con Camurri abbiamo lavorato tantissimo sull'interazione tra suono e movimento. Abbiamo usato il suono per suggerire la lentezza, il controllo: una ricerca su come la fluidità è percepita e misurata dal sistema informatico con cui interagisci - una specie di exergame - e su come restituire un suono più o meno fluido a seconda di come ti muovi, per incitarci ad essere più fluido, più lento, più controllato. [...]	SD2_IE5
SD3	7/12/2024	Tommaso Leddi Role: musician & sound designer Studio/Firm: Studio Azzurro Produzioni	<i>Transatlantici. Scenari e sogni di mare</i> , Genova 2004 <i>Meditazioni Mediterraneo</i> , Genova, Palazzo Ducale 2001	Di fronte alle caratteristiche riverberanti di uno spazio, e dato un tema di progetto, di solito comincio ad avere delle visioni: [...] Se hai un posto che rimbomba e hai dei contenuti video potenzialmente rimbombanti, io fai rimbombare. Se tu invece volessi avere dei suoni utilissimi e senza eco, in uno spazio molto riverberante sei fregato. Bisogna andare a vedere i posti perché poi non nessuno può riportarti la verità sonora dei luoghi.	SD3_IE1
				Nella mostra sui transatlantici, per esempio, c'era tra le altre cose l'idea dell'onda anomala che mandava questi transatlantici sott'acqua, per cui c'era questo evento per cui, di colpo, si sentiva il fruscio di queste onde tremende che arrivavano dall'alto e da altre stanze. Questo in un museo è un tocco di classe perché produci anche qualcosa di inaspettato: accade qualcosa che unisce tutto improvvisamente, magari con un suono drammatico.	SD3_IE2
				tu non puoi dare quello che uno si aspetta e basta. [...] è una questione di misura che, nello stile della narrazione, va scelta di volta in volta fino a raggiungere il giusto livello.	SD3_IE3
				ci mancava qualcosa, [...] quell'astrazione, quel - come si può chiamare? - quella stranezza, quel contributo spiazzante. In quell'occasione ho registrato con la chitarra un sacco di loop, utilizzando non proprio la chitarra classica, ma usando magari le bacchette per suonare o mettendoci sopra degli oggetti e delle cose; una chitarra ritmica, macchinosa, insomma, e poi io con il computer componevo dei loop tutti asimmetrici.	SD3_IE4
				Ho avuto una grande lezione da Paolo Rosa, sempre nei transatlantici, con l'installazione dedicata alla coperta della nave. L'idea era che tu, come spettatore, ti sentissi come se fossi proprio lì, su una nave, con i suoni della nave, con i suoni del mare, con il vociere della gente, i richiami, perché lo scopo era trasportare le persone in quel tempo e in quello spazio con l'immaginazione.	SD3_IE5
SD4	7/22/2024	Alberto Morelli Role: musician & sound designer Studio/Firm: Studio Azzurro Produzioni	<i>"In principio e poi"</i> , Padiglione Vaticano, Biennale di Venezia 2018	Per i lavori installativi, [...] ci avviciniamo a quello che viene definito un lavoro site specific, cioè devi sempre fare i conti con quello che è il luogo [...] creare delle vere e proprie composizioni fatte di suoni, di "elementi musicali", di rumori e ambientazioni: tutti ingredienti, questi, che troviamo ovviamente anche nel cinema, ma che nell'ambito delle opere multimediali interagiscono con uno spazio che non è quello di una sala protocollata	SD4_IE1
				Nello spazio si incontrano poi altri problemi legati al suono, per cui è necessario fare ciò che in gergo viene comunemente definito fine tuning, cioè una sorta di accordatura che in realtà è un ulteriore aggiustamento in termini di mix sul campo [...] A monte si possono verificare le caratteristiche acustico-architettoniche dello spazio, ma il più delle volte, anche se esperisci il luogo prima, il luogo viene comunque modificato dall'allestimento.	SD4_IE2
				Per esempio, il fatto che io debba misurarmi con uno spazio che ha delle rifrazioni non significa necessariamente che sia un problema, al contrario può essere anche un'opportunità, e quindi io misuro le mie proposte a partire dallo spazio. [...] potenziare l'insorgenza di nuove modalità percettive che magari sollecitano più la propriocezione o il tatto rispetto alla vista, [...]	SD4_IE3
				l'installazione multimediale prima di tutto non è lineare [...] un'installazione è un ambiente in cui l'inizio e la fine corrispondono ai momenti in cui tu entri o tu esci, ma ciò non dipende da un inizio reale e definito: potresti ritornare il giorno dopo e riprendere quello che hai lasciato il giorno prima. Siamo cioè in un contesto che assomiglia molto a quello che è un paesaggio sonoro naturale. Faccio una passeggiata nel bosco: dove è l'inizio e dov'è la fine?	SD4_IE4
				devo organizzare la progettazione di queste composizioni in modo tale che i flussi non si soffochino uno con l'altro, come fossi un progettista di giardini che deve scegliere delle piante che possano vivere e dialogare fra di loro, senza soffocarsi l'una con l'altra, ma che possano essere anche percepite a colpo d'occhio insieme, nello stesso momento. Dal punto di vista sonoro è una situazione analoga: io devo contemplare la possibilità di poter ascoltare tutte queste cose da diversi punti di	SD4_IE5
				se devo fare un lavoro per un'esposizione, un progetto museale attinente al territorio, io devo necessariamente andare su quel territorio, studiare tutto quello che sono gli aspetti sonori musicali, le tradizioni del territorio stesso, a partire dalla lingua o dalle lingue - gli idiomi - fino alle musiche tradizionali e quindi anche tutto l'aspetto organologico, gli strumenti utilizzati all'interno di questo territorio, le storie di questo territorio, i paesaggi sonori del territorio, incluse anche le	SD4_IE6
				A proposito di Brian Eno: l'esperienza del viaggio diventa un'esperienza molto profonda, in cui non si dà nulla per scontato, e l'idea del viaggio in aereo diventa anche una sorta di esperienza di ascensione, sebbene temporanea, con tutto il portato "mistico" [...] un livello musicale aggiuntivo che aveva una caratteristica particolare dal punto di vista musicale, perché era estremamente sospeso, a volte quasi metafisico. [...] era un tappeto sonoro trasparente, discreto, che potevi ascoltare o lo penso che la multimedialità, inevitabilmente, soprattutto quando si interfaccia con lo spazio, comincia a sfiorare e a volte anche a toccare proprio la dimensione della sinestesia, [...] possiamo anche permetterci di adottare il termine sinestesia spostandolo in una dimensione che ha a che fare con la multisensorialità.	SD4_IE7
					SD4_IE8

ID	Interview Date	Interviewee name/role	Mentioned Case Studies	Approaches Excerpts Selection	Excerpt ID
SD5	6/24/2024	Max Viale Role: musician & sound designer Studio/Firm: Tokonoma	<i>Légionnaires</i> , Luxembourg, 2021	in una installazione, il progetto del sound designer deve prevedere il movimento dello spettatore nello spazio e quindi deve prevedere un progetto della diffusione del suono in quello spazio specifico.	SD5_IE1
			<i>Remixing Industrial Pasts</i> , Luxembourg, 2022	[Il sound designer] è colui che progetta la diffusione del suono nello spazio, tenendo in considerazione il linguaggio che si utilizza per quella determinata forma di comunicazione e poi, appunto, a seconda si tratti di cinema, teatro o installazione, il silenzio non esiste in natura. Soprattutto, quando tu fai delle opere installative, dove quindi devi dialogare con lo spazio, devi tenere presente che quello spazio lì non è silenzioso, non lo sarà mai.	SD5_IE2
			<i>Moving Lusitania</i> , Luxembourg, 2022	Anche se tu decidi di isolarlo acusticamente, è comunque una scelta estremamente determinante per la narrazione, quindi devi tenerlo in considerazione.	SD5_IE3
				in un'installazione devi tener presente che comunque non è possibile utilizzare il suono esclusivamente in modo didascalico o metaforico, oppure esclusivamente musicale. No, devi mischiare per forza di cose e, a seconda del progetto, nell'installazione deve esserci un equilibrio tra questi elementi. Pensiamo sempre a due elementi separati: immagine e suono. Non esiste, non esiste immagine senza suono.	SD5_IE4
EX1	4/17/2025	Uwe Brückner Role: exhibition designer & founder Studio/Firm: Atelier Brückner / Studio Uwe Brückner	<i>Expedition Titanic</i> , Hamburg Speicherstadt, Germany 1997	to cover projects that were very much related to content or to storytelling you need people who are skilled in transforming texts or content into spatial design.	EX1_IE1
			<i>RICORDI – That's Opera. 200 Years of Italian Music</i> , Bruxelles, Belgium 2008	Whenever you have a content or a text and you want to interpret this in a spatial or compositional design, it is a kind of translation into another language.	EX1_IE2
			<i>BMW Museum</i> , Munich, Germany 2008	you will recognize how important the sound is not to only support but to evoke or even to provoke certain emotions of the spectators. [...] Richard Wagner sort of perfectionated this idea of the 'character's sounds'. He dedicated certain sounds and certain compositions to the characters acting in his Operas. [...] I think the sound is a very fluid connecting character. It can be the cement, it can be the silicon, it can be the degrees, it can be the oil among all the other senses or aspects of design	EX1_IE3
			<i>Cycle Bowl</i> , Expo Hannover, Germany 2000	sound design always played a major role in my designs and very often I use sound design as a 'hidden champion': the main focus might not be on sound design but in the background sound design plays a major role in completing an impression.	EX1_IE4
			<i>Grenzen Erleben. Experiencing Frontiers</i> , Expo Biel, Switzerland 2022	I deeply believe in sound design as a necessary, undoubtful element of modern scenography. I think there is no modern Scenography with an inappropriate sound design [...] even in the absence of sound, if it is done on demand, and if it is done as a compositional element, a space or an object will still sound even if there is none.	EX1_IE5
				sound design is always there, even if it is absent.	EX1_IE6
				according to my definition of scenography, there is always more than one sense occupied or triggered in any kind of spatial design. [...] It is always many senses that are involved at the same time, synchronously, and very often good designs are playing with this kind of orchestration — as I call it — of different senses being activated, provoked or triggered by a good scenography.	EX1_IE7
				Sound Design is connecting the senses. Sound Design is perfect for filling the gaps between touching, hearing, looking. And the perception is a summary of all these different experiences that you collect in milliseconds. And Sound Design is the emotional glue between these different experiences	EX1_IE8
				If you create a space that people cannot define, or an installation, or a feeling where you have no equivalent and no comparison, very often the people are or become so curious that they come back to the same space to figure out what was the reason	EX1_IE9
EX2	3/19/2025	Ico Migliore Role: exhibition designer & co-founder Studio/Firm: Migliore+Servetto	<i>Blue Line Park</i> , Busan, Corea 2020	Da sempre integriamo la dimensione sonora negli allestimenti. [...] Un altro incontro importante è stato con Paolo Soleri: siamo stati con lui ad Arcosanti (Arizona, USA), e lì, per esempio, l'acustica, la percezione dello spazio e del territorio dal punto di vista acustico, così come la percezione dello scambio tra le persone è stata fondamentale.	EX2_IE1
			<i>Alcantara Chromophone</i> Palazzo Reale, Milan 2015, <i>Neutra: Monochrome Affinity</i> , Milano Design Week, Palazzo Visconti,	Per tornare a John Cage, il rumore dello spazio è un valore: la musica "perfettamente pulita" trasmessa al tuo orecchio non esiste.	EX2_IE2
				il silenzio, le pause, sono uno strumento sonoro potente per poter capire e memorizzare.	EX2_IE3
				L'altra variabile che inseriamo sempre nei progetti è quella del tempo, che fa sempre parte della musica, del ritmo — nel senso della leggibilità e della memoria —, dell'attraversabilità e di cosa accade durante la giornata. [...] Il tempo è una variabile molto complessa, ma è un materiale di progetto fondamentale di cui noi progettisti dovremmo tenere conto.	EX2_IE4
				ci siamo orientati verso un ambito che ci interessava molto, quello dell'identità intesa come raccontare storie [...] il tema dell'identità coinvolge tanti aspetti del progetto quali, per esempio, il racconto dei materiali intangibili come il tempo, il vuoto, la luce, la percezione degli spazi, la percezione cognitiva dei luoghi, che dal mio punto di vista è un argomento interessante.	EX2_IE5
				Il lavoro del progettista è un po' come il lavoro del regista: in studio ci occupiamo della drammaturgia, cioè capiamo che cosa vogliamo intercettare, come vogliamo incrociare le parti - perché il progetto è sempre un incrocio di parti- e quindi si cercano di immaginare i motivi per cui il suono è importante. Fondamentale è avere una visione drammaturgica dei contenuti e dello spazio, e poi capire se in quella drammaturgia servono partecipazioni, consulenze, persone che si	EX2_IE6
				Nei nostri progetti abbiamo senz'altro un approccio narrativo, ma soprattutto emozionale: l'emozione è ciò che ci si ricorda di più. Un conto è qualcuno che ti racconta una storia, ma c'è anche un aspetto molto emozionale che è ciò che permette poi di vivere una condizione di "emozione risvegliata", come con un grande rumore, o un grande silenzio. [...] Credo che la narritività non sia tanto legata alla musicalità, quanto piuttosto all'emozione.	EX2_IE7
				Il nostro processo progettuale e comunicativo è di fatto questo: dividere i progetti in scenari mappe e schizzi, dove lo schizzo rappresenta la fisicità, la mappa e lo scenario rappresentano invece quell'insieme di cose che succedono, le relazioni tra le cose, le azioni che si generano. Si torna dunque sempre alla drammaturgia, al tema della teatralità dei luoghi.	EX2_IE8
				La narrazione non è mai relegata a un solo senso: la narrazione dovrebbe essere integrata tra più sensi, e il sonoro è una parte di questi	EX2_IE9
				L'errore, poi, è fondamentale. [...] È quindi fondamentale lasciare questo margine, questa possibilità di trovare cose inaspettate.	EX2_IE10
EX3	3/3/2025	Franco Rolle Role: exhibition designer & co-founder Studio/Firm: NEO Narrative Environments Operas	<i>Paganini Rockstar</i> , Palazzo Ducale, Genova 2018	Il problema è come mettere in scena una storia nello spazio. [...] perdendo il concetto di "frame", di device [attraverso la fruizione online], si può lavorare su dimensioni di contenuti che hanno senso solo se sono collegati allo spazio, e le esperienze non servono solo per raccontare un contenuto, ma anche per raccontare una messa in scena. In questo caso, la parte audio deve essere trattata in modo molto specifico.	EX3_IE1
			<i>Museo Caruso</i> , Palazzo Reale, Napoli 2023	Oggi la tecnologia aiuta tantissimo, ma le scelte che stanno alla base del progetto dell'esperienza sonora intorno a un museo sono molto complesse perché, al contrario delle immagini, l'audio crea un inquinamento, di conseguenza crea enormi problemi nella gestione e nel controllo all'interno degli spazi, soprattutto nel caso di spazi unici non suddivisi in sale e spazi separati.	EX3_IE2
			<i>Renato Zero. La mostra</i> , La Pelanda, Roma 2014/15	Lavoriamo sull'intangibile come, ad esempio, la messa in scena della musica che è un bene intangibile per eccellenza. Come studio, siamo stati tra i primi a pensare al museo come luogo per la messa in scena di beni intangibili, il che comporta una serie di processi progettuali complessi, per trasformare un contenuto da intangibile a tangibile. [...] se non parti dai contenuti e non sai cosa significhi progettare e mettere in scena dei contenuti, e parti invece dal mezzo, il mezzo	EX3_IE3
			<i>Design / Opera</i> , Triennale, Milano 2013	Quindi il valore, il senso dei contenuti, è fondamentale; la natura dei contenuti è fondamentale. [...] il linguaggio è funzionale al racconto. È dal racconto che tutto deve partire, anche il linguaggio. Se l'allestimento è al servizio del contenuto, l'estetica e l'approccio cambieranno sempre, pur mantenendo una certa cifra "stilistica". [...] il linguaggio è funzionale al racconto. È dal racconto che tutto deve partire, anche il linguaggio. Se l'allestimento è al servizio del contenuto, l'estetica e l'approccio	EX3_IE4

Fig. 1:
Selection and encoding of interview excerpts. Source: the author.



sign approaches: *transparent, relational, unexpected, and imaginary*. To illustrate these approaches, I will focus here on four projects from the professional experience of the interviewed designers.

By combining my observations with the designers' insights and the scientific literature, these practical experiences provide exemplary models for creating effective sound narratives that help achieve complex communicative objectives, such as those required by contemporary exhibitions.³⁴

Far from exhaustive, these approaches are rather an exploration of some of the possibilities offered by sound as a design medium.

Listening-driven exhibitions. Communicating through sounds

Sound is inherently *relational*: it is part of a “system of relationships”³⁵ that interprets it as a *mediator* between the community of listeners and the environment.³⁶ Through sounds, we can engage with the environment at multiple “sensory, cognitive, emotional, and intellectual”³⁷ levels, make sense of our world, build identities, improve our sense of belonging, and strengthen social relationships.

Beyond semantic meanings, as in oral narratives, sound carries automatic spatial information³⁸ and evokes aesthetic and affective responses.³⁹ These are linked to the ability of sounds to elicit unconscious emotions, to trigger empathy⁴⁰ and to help recall memories.⁴¹

In *sound-driven/listening-driven*⁴² exhibitions, sound helps weave to-

gether *space, time, and narrative*⁴³ in a dramaturgy capable of entangling the exhibited artefacts with the audience. Echoing the title of an academic article of 2022,⁴⁴ *designing sound* narratives for exhibitions, therefore, truly *means designing relationships* between sounds and other design elements, such as space, light, moving images, visuals, documents, artefacts, and scenography.

Sound and Space

*An ear to the content and
an eye to the architecture*

(R. Castaldi)

Space in exhibitions plays a crucial role. In listening-driven museums, space and sound are “compositional parameters acting conjointly as ‘producers of space’”.⁴⁵ Be it *narrative, performative* or *simulated*,⁴⁶ or a blend of these three typologies, the architecture of the space strongly influences designers' approaches regarding the arrangement of artefacts on display, scenography, and the design of sound “in relation to narrative, atmospherics, and other museum elements”.⁴⁷ Addressing the *phygital* and multimedia exhibition context,

The problem is how to stage a story within the space. [...] by losing the concept of the ‘frame’ [as in digital screens, ndr], you can work on content dimensions that make sense only when connected to space. Moreover, spatial experiences not only

Fig. 2:
From Open to
Selective Axial
Coding of primary
data collected
through expert
interviews.
Source: the author.

convey [cultural] content but also recount a mise-en-scène. In this case, the sound component must be treated in a very specific way.

(F. Rolle)

This is especially true when the designers' auditory intention is not only to transfer knowledge, but also to generate *affective spaces*⁴⁸ capable of triggering the audience's *sense of place*.⁴⁹

The design of a "soundtrack" for an exhibition is strongly influenced by the narrative path as well as by spatial architecture:

An exhibition soundtrack is shaped by the architecture in terms of both reverberation and separation, that is isolation of sound contents.

(R. Castaldi)

It is the space that primarily orients design choices in terms of sound systems, acoustic control strategies, aesthetic languages, and sound production.

The spatial architecture can be either an intriguing inspiration or a challenge:

Faced with the reverberant characteristics of a space, and given a narrative theme, I usually start to have visions [...]. If you have an echoing place and potentially echoing video content, you make it rum-

ble. If you want very clean sounds without echo in a very reverberant space, you are screwed. You must go and listen to the places. No one can report the sonic truth of the places to you.

(T. Leddi)

What is crucial, anyway, is considering the mutual interactions between sound, space, and content. Ideally, designers should make the best use of the existing architecture, considering that, although the acoustics of the space can be verified upstream,

more often than not, [...] the space and how it sounds will be altered by the set up.

(A. Morelli)

Likewise, it is fundamental to consider the audience's listening experience and its movement within the space, and design consequently:

In design, space is fundamental. In exhibitions, for example, what you do is precisely designed for a spatial function, such as "colouring" different spaces, facilitating the passage from one room to another, or inviting a person to move.

(A. Cera)

Sound and Time

*The soundtrack of an exhibition
is, by its nature, nonlinear,
but it originates from a totally
linear medium.*

(R. Castaldi)

As well as space, the temporal factor influences the development of *narration*. Through the interplay of narrative and experiential times, sound designers can manipulate the audience's perceptions and listening experiences, allowing stories to expand and contract while offering multiple levels of interpretation. Time, indeed, is

*a very complex variable,
but it is a fundamental design
material that we designers
should consider.*

(I. Migliore)

Since our human “narrative thinking” structures the events in temporally meaningful episodes that we can compose, collect, and preserve in our memory,⁵⁰ sound – which is inherently temporal – can serve

*to make clear the passage
of time, giving linearity
to [video] montages that
would otherwise look like
complete nonsense without.*

(R. Castaldi)

Likewise,

*silence and pauses are
powerful auditory tools
for understanding and
memorising.*

(I. Migliore)

However, although it seems the opposite, the audience's listening and spatial experience in exhibitions is intrinsically nonlinear, but the result of a continuous and unpredictable relationship that challenges the designers' practice:

An installation is an environment in which the beginning and the end correspond to the moments you enter or exit, but this does not depend on a real, defined beginning: you could return the next day and pick up where you left off the day before. That is, we are in a context that closely resembles a natural soundscape. [...] (T)his means you must consider that there may be several stations generating flows of images and sounds. Unlike a documentary, a film or an animation, there will be constant interactions between these sources in ways that are not necessarily predictable.

(A. Morelli)

Sound and Content

Whenever you have content or text, and you want to interpret this in a spatial or compositional design, it is a kind of translation into another language.

(U. Brückner)

In exhibitions the sonic matter can assume a double form. Not only do sounds appear as displayed artefacts – such is the case of museums and exhibitions devoted to musical instruments, music production, cinema, telecommunications, and sound art – but rather they are embraced as a design and communicative tool.⁵¹ As mentioned earlier, sounds can foster interpretation, enhance engagement and learning, preserve memories, and elicit empathy and emotions.⁵²

In sound design, meaning and identification – i.e., what happens in music between the audience and the musicians – happens between people and objects. [...] the sound heard in an exhibition [...] creates a relationship between the exhibited object and the subject, and this is not so different from what originates in music: a kind of emotional relationship and exchange of meaning.

(A. Cera)

Meaning making, indeed, is fundamental, and narrative is a primary means of achieving it. Narrative, in turn, shapes and guides aesthetic approaches and languages:

Everything must start with the narrative, including the language. If the scenography serves the content, the aesthetics and approach will always change.

(F. Rolle)

Narrative also plays a significant role in building identities. It shapes various aspects of the project, especially the representation of

intangible elements such as time, void, light.

(I. Migliore)

It is thereby fundamental to have a dramaturgical vision of both content and space, that is designing sound and silence interactions with spatial and design elements to shape experiences of “awakened emotion” (I. Migliore):

You will recognise how important the sound is not only to support, but to evoke or even provoke certain emotions of the spectators. [...] Richard Wagner sort of perfected this idea of the ‘character’s sound’. [...] I think the sound is a very fluid connecting character. It can be the cement, it can be the silicon, it can be the degrees, it can be the oil, among all the other senses or aspects of design connecting them.

(U. Brückner)

In the exhibition ecosystem, sound in its multiple expressions of *music* (e.g. soundtracks, music compositions, mood music), *narrative* (e.g. scripts, theatrical presentations, readings, interactive dialogues, oral histories, interviews), and *ambient sound* (e.g. soundscapes, sound effects, natural sounds, concrete sounds)⁵³ lies at the heart of a complex interpretive system. And as a dramatic character, it can fulfil many expressive roles at the same time:

In an installation, you must keep in mind that you cannot use sound exclusively in a didactic, metaphorical, or musical way. You must necessarily mix things up and, depending on the project, there must be a balance between these approaches.

(M. Viale)

Moving between the informative, evocative, and aesthetic functions, the design of sounds influences the unfolding of narratives in the exhibition space, requiring sound designers to act as “garden designers”:

Like a garden designer [...] [a sound designer] must consider the coexistence of different auditory content that can be experienced from different “points of listening”, simultaneously.

(A. Morelli)

Sounds in action.

The *multiversional narrative*⁵⁴ of sounds

As we have seen so far, the designer’s work is that of a *translator* serving the communicative purposes of an exhibition project. A sort of *director* capable of intertwining time, space, and tangible or intangible content into a coherent and expressive form, leveraging the sound spatiotemporal, evocative, and emotional qualities to affect the audience’s perceptivity, knowledge, and memory.

But let’s *designerly*⁵⁵ and narratively explore *in practice*⁵⁶ some of the approaches that exhibition and sound designers can adopt to intentionally⁵⁷ *design the sound*, and *with the sound* for specific cultural and communicative listening purposes.⁵⁸

While I focus on narrative exhibitions, where the informative function plays undoubtedly an important role, I will especially concentrate on how the evocative, emotional, and empathetic roles of soundscapes and non-verbal sound can build, enhance, sustain, and integrate narratives.

Although these approaches are grouped under “classification hats” for clarity’s sake, in practice they frequently intermingle and blend, shaped by the communicative goals of each exhibition project.

1. Transparent Sounds

Very often, I use sound design as a 'hidden champion': the main focus might not be on sound design, but in the background sound design plays a major role in completing an impression.

(U. Brückner)

Among the approaches a sound designer can use to craft emotional and atmospheric soundscapes that enhance exhibition narratives and audience's engagement, there is that of the *transparent sound*.⁵⁹

Going beyond *causal listening*, sounds are either intentionally used to induce *empathetic and affective responses*⁶⁰ through timbre features or to create a sort of "sonic bridges", that coherently connect different spaces through the creation of an almost inaudible, nonetheless perceivable, soundscape.

*Expedition Titanic, Hamburg Speicherstadt, Germany, 1997*⁶¹

Expedition Titanic was one of the first multimedia narrative exhibitions in Europe. Dedicated to the story of the Titanic transatlantic, it took place in 1997 at the Speicherstadt in Hamburg and was designed by Atelier Brückner in collaboration with the renowned lighting designer and drama musician Rolf Derrer.

There, the scenography design strategy involved deconstructing the Titanic myth by creating a dramatic, emotional, associative atmosphere, from the ship construction to its wreckage. Without using texts, descriptions, or labelling to induce a particular interpretive view, the

narratives and dramaturgy relied solely on *choreographed* displayed artefacts, spatial images, dynamic lights, that were entangled by sounds and excerpts from the passengers' audio messages and reports.

In the core room, there were only two groups of objects, featuring champagne bottles and a leather shoe from a crew member, which were dialectically juxtaposed. They were showcased inside a "light space": the backlit translucent membrane which enveloped the room reflected in the floor and in the ceiling, blurring the edges, thus modifying the spatial perception to an "a-dimensional, not decipherable space". However, what most aroused the audience's emotions and gave rise to multifaceted interpretations was an ungraspable soundscape:

The main thing, but the most hidden at the same time, was the sound. It was a sound cave: in the back, we had subwoofers playing very low tones. You can feel these kinds of waves in your body: [...] [we played] in a range of bass, low tones that you can't hear, but still your body can feel. [...] the combination of this light space and the hidden sound created an atmosphere that made people stay no longer than three minutes in this room.

(U. Brückner)

The subtle interplay of sounds and lights, along with the two interacting groups of objects, created a kind of “pressure room” that shaped visitors’ behavior. The sound design induced a strong sense of discomfort, prompting people to leave the room quickly:

Sound and light waves [...] synchronously worked on these mystic feelings.

(U. Brückner)

The hidden, mystic effect described above represents a meaningful approach to soundscape design wherein the sonic presence plays on the edge between not being heard and, eventually, becoming conscious. A perspective on sounds that reminds Brian Eno’s *Music for Airports*: although opposite in intentions, he created a sort of suspended, meta-physical, transparent soundscape that you could listen to or not listen to (A. Morelli). A “low-intrusive” sound (A. Cera) or, as in this specific case, an intentionally intrusive sound that is nonetheless invisibly present. A strategy to “communicate without being noticed” (R. Castaldi), leveraging *pre-attentive modes of listening*⁶² to arouse immediate unconscious effects in the audience.

2. Relational Sounds. Sounds in Concert

*Very often we speak of
a concert of content.*

(R. Castaldi)

Another approach that designers use to create meaningful sonic in-

teractions between the exhibition narrative, spatial architecture, and scenography can be described as “sounds in concert”, paraphrasing the quote above. By using diffuse sound systems, such as loudspeakers or directional speakers, this approach treats the flow of vocal, musical, and ambient sounds along the exhibition path as if they were distinct voices in a symphony orchestra or opera. Depending on the acoustics of the architectural space, these elements may overlap and merge or may not. When they do, however, they should form a coherent sonic narrative in which all parts interweave constructively.

This relational interpretation of sound design allows for creating “scenarios” in which seemingly disconnected events occur simultaneously and “theatrically” (I. Migliore) in the same space, encouraging visitors’ actions, movements, and emotional responses. This design approach echoes the *dramatic performative strategy* proposed to label popular music exhibitions in which sound is theatrically presented through rhythmic, narrative, spatial, and expressive contrasts to achieve an emotional impact on the audience.⁶³

*Légionnaires, Musée Dräi Eechelen, Luxembourg, 2021*⁶⁴

Designed by Tokonoma and 2F Architettura in 2021, the *Légionnaires* exhibition at the Musée Dräi Eechelen in Luxembourg explored the history of Luxembourgish soldiers within the French Foreign Legion. By drawing upon personal testimonies, the exhibition illustrated the intrinsic contradictions and ambi-

guities between the Legion master narrative and Légionnaires' self-representation, trying to challenge the myth.

The spatial design guided the visitors from a brightly lit geometric entrance into a complex, fragmented scenography. This interior landscape housed a curated collection of artefacts, archival footage, and graphic materials. While six enveloping audiovisual installations defined the historical context along the perimeter, more intimate personal oral narratives emerged from vintage gramophone horns. These horns functioned as directional loudspeakers, offering visitors a personal and private listening encounter with the re-enacted memories of the Légionnaires. Meanwhile, a continuous, overlapping flow of different soundscapes, originating from the six perimetral audiovisual installations, pervaded every thematic zone, interweaving with the Légionnaires' personal accounts, architecture, exhibits, and visuals in a seamless experience.

This dramatic approach, which mingles personal stories and overlapping sonic soundscapes in a spatial symphony, allows for creating a diffuse atmosphere that establishes a "basic rhythm" throughout the exhibition path. It works like a *cinematic* soundtrack in which each element interacts, shaping the perceptual space and evoking a sense of identification and participation in the visitors.

3. Unexpected Sounds

*You cannot just give what
someone expects.
[...] it is a question of balance
that, depending on the nar-
rative style, must be chosen
each time until the desired
effect is achieved.*

(T. Leddi)

A third approach we can encounter in sound design practice-based experiences is what I call the "unexpected sound". Leveraging the functional and evocative power of sounds to suddenly interrupt the continuous flow of narratives, this approach enables designers to generate surprise in the percipients, raising their listening attention to specific exhibition contents or narrative moments.

Surprise plays a major role in cognitive and emotional reward. Although not always positive, there is a subtle tendency to feel rewarded through movement, novelty, and intellectual stimulation.⁶⁵

In (sound) narratives, wonder and surprise can be achieved by breaking the "before" and the "after", creating a discontinuity between two moments of a story. That is, a designer can either dramatically play with sound spatialization, *enveloping* the visitor in unique and memorable experiences⁶⁶ or drive the visitors towards uncertain territories using intense, sudden noises, which disrupt a calm atmosphere or the narrative flow.

*Transatlantici. Scenari e sogni di mare, Genoa, 2004*⁶⁷

A surprising, disorienting approach is what we encounter in *Transatlantici. Scenari e sogni di mare* (*Ocean liners. Seascapes and dreams of the sea*), a narrative exhibition designed by Studio Azzurro. A journey on Genoa shipbuilding tradition, which was presented in 2004 at Galata-Museo del Mare. Beyond reflecting the society that designed and built it, travelled on it, and at times scrapped or destroyed it, the transatlantic served as a metaphor for narrating macro-changes in European society through the 19th and 20th centuries. Divided into chapters, which took the form of *a setting, a sequence*, and, at times, *a documentary, an interactive experience, or a video environment*, it shaped an imaginative dialogue through the designed interactions of sounds, voices, objects, gestures, and movements of the spectators.

However, throughout this apparently “linear” journey, all of a sudden, a voice off-screen announced the tragedy: “... but the sea is tired of festivity”. The surprise effect was achieved through an audiovisual “rogue wave” (T. Leddi), suddenly arriving from above and from other rooms, and interrupting any other running narrative. Light turned blue, stories and oral testimonies stopped abruptly. Tremendous sound and visual waves engulfed all the rooms. The spatial perception changed, enhanced by deafening, vibrating, low-frequency sounds. The coming wave was so unexpected and surprising that the audience could do nothing but imagine, if not actually feel, it was sinking into pieces like a ship plunging under-

water, before falling back again into the main narrative “reality”.

This strategy of “surprise effect” stimulates the audience’s attention and enhance the listening experience:

Error is fundamental. [...] It is essential to leave this margin, this possibility of finding unexpected things.

(I. Migliore)

Leaving room for the unexpected can help achieve that narrative *climax* needed to make the experience memorable.

4. Imaginary Sounds

Just as there are optical illusions, which are commonplace, there are acoustic illusions.

(R. Castaldi)

Finally, the case study analysis and discussions with designers reveal a fourth approach to sound design that we can define as “imaginary sound”.

The crafting of illusory sound consists of “performing tricks”, taking advantage of that “cloak of invisibility” (R. Castaldi) made possible by the intrinsically elusive nature of the sonic matter.

In multimedia exhibitions, this effect relies especially on the mutually influencing relationship between sound and moving images. Within the so-called “audiovisual contract” in films, visual and auditory perception mutually affect, “lending each other their respective properties by contamination and projection”.⁶⁸

When the “visual stimuli ‘capture’ the sound”, we can produce different audio illusions.⁶⁹ However, this mutual interaction also happens among all sensory experiences and perceptions. This perceptual and cognitive “cross-pollination” enables the design of *cross-sensory* and *synaesthetic* experiences.⁷⁰ By orchestrating and deceiving several senses, this approach elicits emotional responses and constructs “seemingly real” scenarios.⁷¹

*Meditazioni Mediterraneo, Napoli, Castel Sant’Elmo, 2002*⁷²

Meditazioni Mediterraneo (Mediterranean Encounters) was an *ambient sensible* designed by Studio Azzurro in 2002. It was first presented in Castel Sant’Elmo in Napoli and staged again in Genoa in 2010, and Madrid in 2014. On these latter occasions, two new *étapes* were added: Siria, first, and La Mancha (Spain), later.

The first exhibition was structured around five large “unstable landscapes” recounting the stages of a journey through the Mediterranean Sea. It evocatively and metaphorically explored the concept of a *Mare Nostrum*, which marked, and it still marks, a geographical and cultural area. A space that embraced a rich mixture of ancient cultures, religions, and commerce, giving birth to a layered and shared identity, made of gestures, processes, relationships, materials, smells, sounds, colours, and voices.

One of the *étapes du voyage*, so-called “Colours entwine with sounds”, was dedicated to the Medina of Fes. A mingling of mazed alleys, pulsating buildings, where intense smells, flavours and eardrum rhythms were mixed with “guttural sounds of the

endless bawling”, all intertwined by the kaleidoscopic colours and hues of the Suk spices.⁷³

Surrounded by the rhythmic gestures of Moroccan artisans, a projected interactive carpet filled the central floor, tying the knots of contrasting feelings.

Walking on it, the audience’s shadows “erased” the texture of the carpet. Through their movements, people unveiled different top views of the spicy, colourful, and lively scenarios hidden underneath. Once each story was over, the magic: the threads of the carpet re-knotted themselves, the image became unstable, giving the impression of lifting you off the ground, ready to fly away.

Beyond the moving images, sounds were the real actors of deception:

*There were lots of speakers
all around and on the top,
so the sound spun around
when everything started
spinning, creating a vortex
that “lifted you up”.*

(T. Leddi)

An *ad hoc*-designed sound program interpolated people’s movement on the carpet through a camera, quantising it, and transforming the “flying carpet” sounds based on the audience’s kinetic speed. To enhance this illusion, at the end of the corridor, the usually uninterrupted muazzin’s voice stopped exactly when the carpet was flying.

As underlined by some scholars, “playing with the relationship between different sensory channels gives the opportunity to exploit the

power of contradiction in multisensory interaction”, inducing closer attention through emotional and perceptual stimulation.⁷⁴ Nonetheless, “Pretending is not lying [...]. For us humans, illusion corresponds to come into play. The creative game is made up of fiction, rules, framework, and context”.⁷⁵ And this is precisely what happens when the interaction of sounds, images, objects, smells, and interactive technologies is effective: the boundaries between the real and the virtual blur, making you feel as if you were right there, in that precise time and space, through imagination alone.

Conclusions

In recent decades, exhibition design has shifted from object-centered, visually dominant approaches to visitor-centered, multimodal experiences where sound plays a central communicative and narrative role. Advances in technology have enabled the creation of *phygital* spaces that blend sensory modalities and encourage active engagement and meaning making. In this context, sound is not simply decorative or supportive, but foundational: it shapes the space, guides the narrative flow, evokes emotion, and fosters memory and social connection, transforming exhibitions into immersive and performative environments. Consequently, an effective *sound-driven design* requires a holistic approach that considers spatial architecture, narrative structures, and visitors’ movements, balancing the informative, evocative, emotional, and aesthetic functions of sounds.

The scientific literature, interviews with sound and exhibition de-

signers, and the analysis of practice-based experiences have revealed that successful exhibitions treat sound as a *dramaturgical* tool. Seamlessly interwoven with visuals, artefacts, exhibiting systems, and space, sound can structure or amplify open-ended and nonlinear narratives, supporting both individual and collective interpretation. Addressing especially (non-verbal) sounds and soundscapes, and exploring sound design approaches that expand or enhance the exhibition narratives, I have proposed four possible strategies, accompanied by four exemplary cases:

1. *Transparent sounds*: an approach to soundscape design that leverages *pre-attentive modes of listening* and induces unconscious *empathetic and affective responses* in the audience⁷⁶, whilst going almost unnoticed.
2. *Relational sounds*: a dramaturgical and relational approach to sound design that creates a coherent sonic narrative by intertwining all the elements to shape the perceptual space, evoking a sense of identification and participation in visitors.
3. *Unexpected sounds*: an *enveloping*⁷⁷ sound design approach that leverages sound functional and evocative power to generate surprise and wonder, deceiving visitors’ expectations, and eliciting their cognitive and emotional sense of reward.
4. *Imaginary sounds*: a *cross-sensory* and *synaesthetic* strategy⁷⁸ that orchestrates multiple senses to create “seemingly real” imagery, enhancing visitors’ imagination and engagement.

These are just a few of the possible approaches that (sound) designers can embrace to create layered, memorable experiences and stimulate visitors' senses, emotions, and imagination. Nonetheless, they illustrate well the multisensory, cross-modal, and evocative potential of sound in *sound-driven* exhibition contexts.

A final, side note

As you may have noticed, this article contains no images. While it may seem a bold choice, I believe that neither photography nor audiovisual documentation can truly capture the complexity of listening within an exhibition space. In fact, this experience is intrinsically embodied, temporal, and deeply personal: qualities that make it nearly impossible to reproduce.

This condition raises a fundamental question: does it make sense to attempt a visual or audiovisual representation of a spatial listening experience – or any multisensory (exhibition) experience – for the sake of knowledge transfer and archival memory? If so, how can this be achieved, and what are the inherent limits? These questions remain open.

Certainly, compelling technologies exist. Binaural recordings⁷⁹, spatial sound field recordings, auditory augmented reality, and immersive multichannel audio recordings,⁸⁰ alongside virtual, augmented, and mixed reality technologies, can offer a general impression of atmospheres, emotions, and narratives. However, faithfully recreating a “lived experience” performed in space remains out of reach without an extraordinary investment of

technical expertise, time, and capital.

Perhaps, despite its limitations, the written or spoken word still remains our most evocative tool. Rich in metaphorical depth and deeply embodied, language might still be the best medium for suggesting the nuances of soundscapes and the temporalities of these situated embodied narrative experiences.

I believe this is an issue worth addressing, although not now nor here.

Acknowledgements

This article stems from the interdisciplinary research project “Sound Design and Cultural Heritage” (2023-2025), led by Prof. Raffaella Trocchianesi (P.I.), and funded by Politecnico di Milano.

I am truly grateful to all the interviewees for their precious contribution to the project, and to the reviewers for their valuable comments.

Endnotes:

- 1 For different perspectives on Exhibition Design as a field of study and its evolution over time, please confront: Hooper-Greenhill 1992; Dernie 2006; den Ouden 2016; Austin 2020; Achiam, Haldrup, Drotner 2021; Guy, Williams, Wintle 2024, just to mention a few scholars addressing this topic. For a thorough overview of the definitions of Exhibition Design over time, please refer to Borsotti 2020.
- 2 Drawing on Reckwitz and Barad's practice theory, in an article of 2012, Lucy Kimbell defines "design" – of which exhibition design is a branch –, as an *embodied, situated, contingent, and routinised set of practices* carried by professional designers who engage with *designs* (i.e., material outcomes). Under this lens, the building of knowledge through design is understood as a bodily and mental social accomplishment. See Kimbell 2012.
- 3 Bollini 2024, p. 617.
- 4 For a definition of "postdigital" in museums, both in design and organisational terms, see Parry 2013 and Parry, Dziekan, de Wild 2025. For a definition of "postdigital" in Information Architecture see Resmini 2015, p.111, where we read: "The post-digital world is a world of information that escapes the restrictions of two dimensions and takes its place in physical space, where it becomes a pervasive layer constantly reproduced, remixed and remodelled, whose architectures silently create new behaviours, new opportunities and new barriers" (my translation).
- 5 Bollini 2024, p. 613.
- 6 Following especially the discovery of *mirror neurons* in the early 1990s by Giacomo Rizzolatti's group at the University of Parma, numerous studies have been conducted on the neurophysiological basis of cognition and the mind, as well as on the strong interrelationship between perception, action, and cognition. See, for example, Gallese 2005; Gallese, Lakoff 2005; Iacoboni 2008; Gallese, Morelli 2024, p. 30; Seth 2023; Lakoff, Narayanan 2025, p. 59.
- 7 Levent, Pascual-Leone 2014, p. xvii.
- 8 Levent, Pascual-Leone 2014, pp. xvii-xviii.
- 9 Classen, Howes 2006, p. 200.
- 10 Drawing on its own research and artistic practice, Studio Azzurro – an Italian art collective dedicated since the early '80s to exploring the poetic and expressive possibilities of new technological languages – observes shifts in museum paradigms, from "museums as 'collections' to museums as 'narrative'". A change driven by the advent of virtual and digital culture and the inclusion of the "intangible" in the museum discourse. See Studio Azzurro 2011, p. 23.
- 11 Lupo 2013, pp. 92-104.
- 12 Borsotti 2017, p. 17, my translation.
- 13 Cristallo, Mariani 2023, pp. 25-38.
- 14 Kannenberg 2019, p. 292.
- 15 Greenblatt 1991, p. 42.
- 16 Bedford 2001, p. 28.
- 17 Mason, Vavoula 2021.
- 18 Cortez 2019, pp. 351-352.
- 19 Cortez 2019, p. 360.
- 20 Macleod, Hourston Hanks, Hale 2012, p. xxi.
- 21 Cortez 2019, p. 248.

22 These outcomes are part of the results of the interdisciplinary research project “Sound Design and Cultural Heritage”. Funded by Politecnico di Milano, the work was conducted between 2024 and 2025 and led by Prof. Raffaella Trocchianesi (P.I.). The aim was to explore and codify the role of sound and sound design in the cultural heritage field, particularly in relation to interactions and exhibitions.

23 Cross 2006, p. viii.

24 Between 2018 and 2021, Zattra and colleagues studied sound design both as a discipline in its own right and as a practice, through a project titled “Analysis of Sound Design Practices” [ASDP], which examined sound design through the lenses of Nigel Cross’ (2006) “People, Processes, and Products” using an ethnographic approach. See Zattra et al. 2022, pp. 297-323.

25 Riccardo Castaldi, sound and exhibition designer, is co-founder of the multimedia exhibition design studio The Buss (<https://www.thebuss.net/>). Interviewed on 8th July 2024, my translation.

26 Andrea Cera, sound designer and researcher, has a long-standing collaboration with IRCAM - Paris. Interviewed on 24th October 2024, my translation.

27 Tommaso Leddi, musician and sound designer, has been a long-time collaborator of the art collective Studio Azzurro (<https://www.studioazzurro.com/>). Interviewed on 12th July 2024, my translation.

28 Alberto Morelli, musician and sound designer, has been a long-time collaborator of the art collective Studio Azzurro. Interviewed on 22nd July 2024, my translation.

29 Max Viale, musician and sound designer, has extensive experience in the field of film music and has been a long-time collaborator of the multimedia design studio Tokonoma (<https://tokonoma.studio/>). Interviewed on 24th June 2024, my translation.

30 Uwe Brückner, exhibition designer, was co-founder of Atelier Brückner, and is founder of Studio Uwe Brückner (<https://studio-uwe-brueckner.com/>). Interviewed on 17th April 2025.

31 Ico Migliore, exhibition designer, is co-founder of the firm Migliore+Servetto (<https://architettimiglioreservetto.it/>). Interviewed on 19th March 2025, my translation.

32 Franco Rolle, exhibition designer, is co-founder of the exhibition design studio NEO [Narrative Environments Operas] (<https://www.neo.mi.it/>). Interviewed on 3rd March 2025, my translation.

33 Corbin, Strauss 2007.

34 From now on, to clarify the distinction between sources – citations from the scientific literature and citations from interviews as primary data – I will follow this rationale: the scientific literature and theoretical framework will be cited in end notes as before; quotations from the interviewees will be included in the body of the text, using, where possible, the long in-text citation format, with the authors’ names in parentheses. Finally, inspirational quotations derived from the interviews are instead presented in italics, right-aligned at the beginning of the chapter, with the authors’ attribution.

35 Truax 1984, p. xii.

36 Truax 1984, p. 11.

37 Wiens, de Visscher 2019, p. 278.

38 This is particularly true for people who are visually impaired or completely blind. Grond and Devos (2016) describe an interesting experiment that uses binaural audio recordings as a tool to enable sighted individuals to experience and understand how automatic auditory spatial processing works in blind people. See Grond, Devos 2016.

39 Among the various ways in which sounds evoke aesthetic and emotional responses in film and audiovisual media, see, for example, Chion 2009 and Pauletto 2012, 2017. For a more in-depth look at how sound influences aesthetic responses in Sonic Interaction

Design, see, for example, Rocchesso, Polotti, Delle Monache 2009.

40 Iacoboni 2008, pp. 96-130.

41 Arnott, Alain 2014, pp. 85-107.

42 *Sound-driven design* is a novel design framework understood as “a design practice informed by technology and listening in the multisensory dimension of interaction”. It is a design approach which interprets listening, and sound as its entangled “flip side”, “as catalyst of the design space”: “a way of knowing through sound, which implies active, bodily explorations with all the senses”. See Delle Monache, Misdariis, Özcan 2022. For an interpretation of exhibition design through this framework, see Riva, Trocchianesi 2025.

43 den Oudsten 2016.

44 The title of the article reads “Designing sounds means designing relationships”. See Luca, Misdariis, Calleo 2022.

45 Cortez 2023, p. 318.

46 Dernie 2006.

47 Everett 2019, p. 314.

48 Cortez 2019, p. 249, recalling Leonard 2014.

49 For a discussion on the use of soundscapes as design tools for *sonic place-making/listening behaviours* in the cultural heritage context see Udsen, Halskov 2022.

50 Breithaupt 2025, pp. 29-33, my translation.

51 Bubaris 2014, pp. 391–402.

52 For a more detailed discussion of the various roles sound can play as a means of communication, see Bedford 2001; Levent and Pascual-Leone 2014; Bailey, Broackes, de Visscher 2019.

53 Stocker 1995, p. 25.

54 Breithaupt 2025, pp. 207-223, my translation.

55 Nigel Cross, in his 2006 book *Designerly Ways of Knowing*, introduces the neologism “designerly” as an approach to knowledge that emphasises the importance of *Design* both as a culture and as a discipline in its own right, beyond the already established cultures/disciplines of the sciences and the arts/humanities. See Cross 2006.

56 Discussing about “designs-in-practice”, Lucy Kimbell (2012, p. 135) acknowledges “the emergent nature of design outcomes as they are enacted in practice [...] which can mean the outputs created during a process of designing, such as blueprints, models, specifications, and what is finally assembled in products and services”, adding that “the concept of designs-in-practice foregrounds the incomplete nature of the process and outcomes of designing”. See also note 2 of this article.

57 For a discussion on *auditory intention* within the framework of Sonic Interaction Design (SID) – suitable also for sound design in exhibitions – see Susini, Houix, Misdariis 2014.

58 Delle Monache, Misdariis, Özcan 2024.

59 Sounds, here, should be interpreted as “transparent” only in terms of perceptual effects, but not in semiotics terms, that is in terms of neutrality or objectivity of (sound) representation, since the designers’ communicative strategy in the following case study is clear, albeit implicit. Addressing the rhetoric of transparency of representation in visual semiotics, Valentina Manchia (2022) suggests that “text, no matter how objective it pretends to be, can always be traced back to the communicative strategies put in place to construct this effect of immediacy or transparency”. See Manchia 2022.

60 Tuuri, Eerola 2012, pp.139-142.

61 Unless otherwise specified, the descriptions of the exhibition and quotations are

taken from my interview with Uwe Brückner (see note 30). You can get an impression of what the exhibition looked like at the following links: <https://studio-uwe-brueckner.com/works/#titanic>; www.atelier-brueckner.com/de/projekte/expedition-titanic; www.youtube.com/watch?v=QiA_LqP5e14.

62 Tuuri, Eerola 2012, p. 141

63 Cortez 2019, pp. 353-356.

64 The descriptions of this exhibition are drawn from my interview with Max Viale (see note 29), discussions with my colleagues at Tokonoma studio, and my own visit to the exhibition. For further information, please consult Asili et al. 2021 in Camarda et al. 2021, pp. 230-239. Other textual, visual and audiovisual documentation can be retrieved here: <https://tokonoma.studio/works/legionnaires>; www.uni.lu/c2dh-en/articles/legionnaires/.

65 Breithaupt 2025, pp.126-127 and pp. 140-143, my translation.

66 Cortez 2019, p. 356.

67 The descriptions and quotes come from Studio Azzurro 2011, pp. 61-75. Quotations from my interview with Tommaso Leddi (see note 27) are marked in the body of the text. For additional visual and audiovisual material, see: www.studioazzurro.com/opere/transatlantici/.

68 Chion 1994, p. 9.

69 For a thorough examination of sound illusions that somehow echo Gestalt principles, such as *scale illusion*, *continuity illusion*, *stereo effect*, *pseudophone*, and *McGurk effect*, see Arnott, Alain 2014, pp. 92-96.

70 With synaesthetic experiences, here, I mean intentionally designed scenarios where one sense stimulates another, influencing the final perception of a scene, rather than a rare neurological condition in which stimulating one sense automatically and unconsciously triggers another. See also the following note.

71 This concerns our *embodied*, multimodal way of perceiving and interpreting the world. While synaesthesia is a specific neurophysiological condition (see previous note), in multimodal exhibitions it should be understood more broadly as a multisensory information-processing mechanism based on *cross-modal correspondences*, where “sensation and cognition are continuous and contiguous” (Marks 2011). Meaning extends through “corporeal reverberation” (Marks, Mulvenna, 2013) and, like metaphors and analogies, expands experience. At the heart of the creative process, metaphors and analogies not only generate new meanings but also shape our self-perception and structure our language (Lakoff, Johnson 1980).

72 The descriptions of the exhibition come from Studio Azzurro 2002, and from my direct involvement as a designer in 2010, on the occasion of the Genoa production. Quotates from Tommaso Leddi (see note 27) are marked in the body of the text. You can get an impression of what the exhibition looked like at the following link: www.studioazzurro.com/opere/meditazioni-mediterraneo/.

73 Studio Azzurro 2002, pp. 130-131.

74 Rocchesso, Polotti, Delle Monache 2009, p. 21.

75 Gallese, Morelli 2024, pp. 228-229, my translation.

76 Tuuri, Eerola 2012, pp.139-142.

77 Cortez 2019, p. 356.

78 Interesting approaches for applying synaesthesia and cross-modal correspondences to design can be found in Riccò 1999 and Haverkamp 2009 and 2010. Haverkamp, in particular, outlines the *synesthetic design approach* as a “vertical” integrating strategy of *cross-sensory coupling* based on a set of redundant and consistent *multisensory features*. Concerning *constitutional synaesthesia* or more common perceptual and conceptual associations that cross different sense modalities, see Marks 2011 and Marks, Mulvenna

2013. See also notes 70 and 71.

79 Such as the ones used by Grond, Devos 2016, see note 38.

80 See, for example, Brandenburg et al. 2023; Werner et al. 2021; Sloma et al. 2024.

References:

Achiam, Haldrup, Drotner 2021: Achiam M., Haldrup M., Drotner K., *Experimental Museology. Institution, Representations, Users*, London-New York, Routledge, 2021. DOI: <https://doi.org/10.4324/9780367808433>.

Arnott, Alain 2014: Arnott S.R., Alain C., *A Brain Guide to Sound Galleries*, in Levent N., Pascual-Leone A. (eds.), *The Multisensory Museum. Cross-Disciplinary Perspectives on Touch, Sound, Smell, Memory, and Space*, Lanham, Maryland, Rowman & Littlefield, 2014, pp. 85-107. DOI: <https://doi.org/10.5040/9798881816100.ch-6>.

Asili et al. 2021: Asili S., Chionetti E., Floris A., Ligi C., Macella M., Épilogue: la conception du projet de l'exposition multimédia «Légionnaires», in Camarda S., Reinert F., Sauer A., Scuto D. (eds.), *Légionnaires. Parcours de guerre et de migrations entre le Luxembourg et la France*, catalogo della mostra (Luxembourg, Musée Dräi Eechelen, 30 June-28 November 2021), Milano, Silvana Editoriale, 2021, pp. 230-239.

Austin 2020: Austin T., *Narrative Environments and Experience Design: Space as a Medium of Communication*, New York, Routledge, 2020. DOI: <https://doi.org/10.4324/9780367138073>.

Bailey, Broackes, de Visscher 2019: Bailey K., Broackes V., de Visscher E., *The longer we heard, the more we looked*. *Music at the Victoria and Albert Museum*, in "Curator: The Museum Journal", 2019, 62, 3, pp. 327-341. DOI: <https://doi.org/10.1111/cura.12334>.

Bedford 2001: Bedford L., *Storytelling: The Real Work of Museums*, in "Curator: The Museum Journal", 2001, 44, 1, pp. 27-34. DOI: <https://doi.org/10.1111/j.2151-6952.2001.tb00027.x>.

Bollini 2024: Bollini L., *Space as a Narrative Interface. Phygital Interactive Storytelling in the Field of Cultural Heritage*, in Zanella F. et al. (eds.), *Multidisciplinary Aspects of Design. Design! OPEN 2022*, 2022, Springer, 37, pp. 613-622. DOI: https://doi.org/10.1007/978-3-031-49811-4_58.

Borsotti 2017: Borsotti M., *Tutto si può narrare*, Sesto San Giovanni, Mimesis Edizioni, 2017.

Borsotti 2020: Borsotti M., *A brief journey through definitions of contemporary exhibition design: From display to narrative and back*, in "International Journal of Architectonic, Spatial, and Environmental Design", 2020, 14, 2, pp. 55-66. DOI: <https://doi.org/10.18848/2325-1662/CGP/v14i02/55-66>.

Brandenburg et al. 2023: Brandenburg K., Fascella C., Merten N., Profeta R., Sloma U., Thron T., Wollwert F., *Implementation of and application scenarios for plausible immersive audio via headphones*, in "Proceedings of 155th Convention of Audio Engineering Society", 2023, pp. 329-336. <https://www.proceedings.com/content/074/074047webtoc.pdf>.

Breithaupt 2025: Breithaupt F., *Il cervello narrativo. Cosa raccontano i nostri neuroni*, Roma, Lit Edizioni, 2025.

Bubaris 2014: Bubaris N., *Sound in museums – museums in sound*, in "Museum Management and Curatorship", 2014, 29(4), pp. 391-402. DOI: <https://doi.org/10.1080/09647775.2014.934049>.

Camarda et al. 2021: Camarda S., Reinert F., Sauer A., Scuto D. (eds.), *Légionnaires. Parcours de guerre et de migrations entre le Luxembourg et la France (Catalogo mostra)*, Milano, Silvana Editoriale, 2021.

Chion 1994: Chion M., *Audio-vision: sound on screen*, New York, Columbia University Press, 1994.

Chion 2009: Chion M., *Film: A Sound Art*, New York, Columbia University Press, 2009.

Classen, Howes 2006: Classen C., Howes D., *The Museum as Sensescape: Western Sensibilities and Indigenous Artifacts*, in “Sensible Objects: Colonialism, Museums and Material Culture”, 2006, 5, pp. 199-222. DOI: <https://doi.org/10.5040/9781474215466.ch-007>.

Corbin, Strauss 2007: Corbin, J.M., Strauss, J.M., *Basics of qualitative research: Techniques and procedures for developing grounded theory (3rd ed.)*, Thousand Oaks, CA, Sage. DOI: <https://doi.org/10.4135/9781452230153>.

Cortez 2019: Cortez A., *Performatively Driven: A Genre for Signifying in Popular Music Exhibitions*, in “Curator: The Museum Journal”, 2019, 62, 3, pp. 343-366. DOI: <https://doi.org/10.1111/cura.12330>.

Cortez 2023: Cortez A., *Sound as a producer of social spaces in museum exhibitions*, in “Curator: The Museum Journal”, 2023, 66, 2, pp. 317-328. DOI: <https://doi.org/10.1111/cura.12547>.

Cristallo, Mariani 2023: Cristallo V., Mariani M., *Interpreting Digital References. The Contribution of ‘Designerly Knowledge’ in the Connection between Percepts and Concepts*, in Bollini L., Guida F.E. (eds.), “PAD#24 Future Heritage. PAD Pages on Arts and Design”, 2023, 16, pp. 25-38.

Cross 2006: Cross N., *Designerly Ways of Knowing*, London, Springer, 2006. DOI: [https://doi.org/10.1016/0142-694X\(82\)90040-0](https://doi.org/10.1016/0142-694X(82)90040-0).

Delle Monache, Misdariis, Özcan 2022: Delle Monache S., Misdariis N., Özcan E., *Semantic models of sound-driven design: Designing with listening in mind*, in “Design Studies”, 2022, 83. DOI: [10.1016/j.destud.2022.101134](https://doi.org/10.1016/j.destud.2022.101134).

Delle Monache, Misdariis, Özcan 2024: Delle Monache S., Misdariis N., Özcan E., *Designing [The, With, Against] Sound [For]: Towards A Semantic-oriented Coding Scheme For Protocol Studies In Sound-driven Design*, in “Proceedings of the DRS2024: Boston”, 2024. DOI: <https://doi.org/10.1016/j.destud.2022.101134>

den Oudsten 2016: den Oudsten F., *Space.Time.Narrative. The exhibition as post-spectacular stage*, New York, Routledge, 2016 (second edition, eBook). DOI: <https://doi.org/10.4324/9781315242699>.

Dernie 2006: Dernie D., *Exhibition Design*, London, Laurence King Publishing, 2006.

Everrett 2019: Everett T., *A Curatorial Guide to Museum Sound Design*, in “Curator: The Museum Journal”, 2019, 62, 3, pp. 313-325. DOI: <https://doi.org/10.1111/cura.12305>.

Gallese 2005: Gallese V., *Embodied simulation: From neurons to phenomenal experience*, in “Phenomenology and the Cognitive Sciences”, 2005, 4, pp. 23-48. DOI: <https://doi.org/10.1007/s11097-005-4737-z>.

Gallese, Lakoff 2005: Gallese V., Lakoff G., *The brain’s concepts: The role of the sensory-motor system in conceptual knowledge*, in “Cognitive Neuropsychology”, 2005, 22, 3-4, pp. 455-479. DOI: <https://doi.org/10.1080/02643290442000310>.

Gallese, Morelli 2024: Gallese V., Morelli U., *Cosa significa essere umani? Corpo cervello relazione per vivere il presente*, Milano, Raffaello Cortina Editore, 2024.

Greenblatt 1991: Greenblatt S., *Resonance and Wonder*, in Watson S., Barnes A. J., K. Bunning (eds.), *A Museum Studies Approach to Heritage*, New York, Routledge, 1991. <https://www.jstor.org/stable/3824277>.

Grond, Devos 2016: Grond F., Devos P., *Sonic boundary objects: negotiating disability, technology and simulation*, in “Digital Creativity”, 2016, 27, 4, pp. 334-346. DOI: <https://doi.org/10.1080/14626268.2016.1250012>.

Guy, Williams, Wintle 2024: Guy K., Williams H., Wintle C. (eds.), *Histories of Exhibition*

- Design in the Museum. Makers, Process, and Practice*, New York, Routledge, 2024. DOI: <https://doi.org/10.4324/9781003245377>.
- Haverkamp 2009: Haverkamp M., *Application of Synesthetic Design as Multisensory Approach on Sound Quality*, in “Proceedings of NAG/DAGA 2009 Rotterdam”, 2009. https://pub.dega-akustik.de/NAG_DAGA_2009/data/articles/000007.pdf.
- Haverkamp 2010: Haverkamp M., *Synesthetic approach for evaluation of the cross-sensory quality of multi-media applications*, in “Proceedings of QoMEX 2010, 2nd International Workshop on Quality of Multimedia Experience”, pp. 136–141. DOI: <https://doi.org/10.1109/QoMEX.2010.5516107>.
- Hooper-Greenhill 1992: Hooper-Greenhill E., *Museums and the Shaping of Knowledge*, London, Routledge, 1992. DOI: <https://doi.org/10.4324/9780203415825>.
- Iacoboni 2008: Iacoboni M., *I neuroni specchio. Come capiamo ciò che fanno gli altri*, Torino, Bollati Boringhieri, 2008.
- Kannenberg 2019: Kannenberg J., *Soundmarks as Objects of Curatorial Care*, in “Curator: The Museum Journal”, 2019, 62, 3, pp. 291–299. DOI: <https://doi.org/10.1111/cura.12328>.
- Kimbell 2012: Kimbell L., *Rethinking design thinking: Part II*, in “Design and Culture”, 2012, 4, 2, pp. 129–148. DOI: <https://doi.org/10.2752/175470812X13281948975413>.
- Lakoff, Johnson 1980: Lakoff G., Johnson M., *Metaphors we live by*, Chicago, University of Chicago Press, 1980.
- Lakoff, Narayanan 2025: Lakoff G., Narayanan S., *La mente neurale. Come pensa il nostro cervello*, Milano, ROI Edizioni, 2025.
- Leonard 2014: Leonard M., *Staging the Beatles: Ephemerality, materiality and the production of authenticity in the museum*, in “International Journal of Heritage Studies”, 2014, 20, 4, pp. 357–375. DOI: <https://doi.org/10.1080/13527258.2012.754367>.
- Levent, Pascual-Leone 2014: Levent N., Pascual-Leone A. (eds.), *The Multisensory Museum. Cross-Disciplinary Perspectives on Touch, Sound, Smell, Memory, and Space*, Lanham, Maryland, Rowman & Littlefield, 2014.
- Luca, Misdariis, Calleo 2022: Luca S., Misdariis N., Calleo A. *Designing Sounds Means Designing Relationships*, in “DIID”, 2022, 78, pp. 24–37, DOI: <https://doi.org/10.30682/diid7822m>.
- Lupo 2013: Lupo E., *Paths and scenarios of the intangible. Design production chains and the innovation potential of intangible heritage as an “open-ended knowledge system”*, in Irace F. (ed.), *Design & Cultural Heritage*, Milano, Electa, 2013, pp. 92–104.
- Macleod, Hourston Hanks, Hale 2012: Macleod S., Hourston Hanks L., Hale J. (eds.), *Museum making. Narratives, architectures, exhibitions*, New York, Routledge, 2012. DOI: <https://doi.org/10.4324/9780203124574>.
- Manchia 2022: Manchia V., *Beyond immediacy and transparency. A semiotic approach to discursive and rhetorical strategies in media visualization and data visualization*, in “Punctum International Journal of Semiotics”, 2022, 8, 1, pp. 85–113. DOI: <http://dx.doi.org/10.18680/hss.2022.0006>.
- Marks 2011: Marks L.E., *Synesthesia, Then and Now*, in “Intellectica. Revue de l’Association Pour La Recherche Cognitive”, 2011, 55, pp. 47–80. DOI: <https://doi.org/10.3406/intel.2011.1161>.
- Marks, Mulvenna 2013: Marks L.E., Mulvenna C.M., *Synesthesia on Our Mind*, in “Theoria et Historia Scientiarum”, 2013, 10, pp. 13–35.
- Mason, Vavoula 2021: Mason M., Vavoula G., *Digital Cultural Heritage Design Practice: A Conceptual Framework*, “Design Journal”, 2021, 24, 3, pp. 405–424. DOI: <https://doi.org/10.1080/14606925.2021.1889738>.

Parry 2013: Parry R., *The End of the Beginning: Normativity in the Postdigital Museum*, in “Museum Worlds”, 2013, 1, pp. 24–39. <https://hdl.handle.net/2381/40997>.

Parry, Dziekan, de Wild 2025: Parry R., Dziekan V., de Wild K., *Museums and Digital Confidence. Organisation, Collection, Interface*, New York, Routledge, 2025. DOI: <https://doi.org/10.4324/9781003269601>.

Pauletto 2012: Pauletto S., *The sound design of cinematic voices*, in “The New Soundtrack”, 2012, 2, 2, pp. 127–142. DOI: <https://doi.org/10.3366/sound.2012.0034>.

Pauletto 2017: Pauletto S., *The Voice Delivers the Threats, Foley Deliver the Punch. Embodied Knowledge in Foley Artistry*, in Mera M., Sadoff R., Winters B. (eds.), *The Routledge Companion to Screen Music and Sound*, New York, Routledge, pp. 338–348. DOI: <https://doi.org/10.4324/9781315681047-28>.

Resmini 2015: Resmini A., *Luoghi e sistemi. Vivere il post-digitale*, in Arcagni S. (ed.), *I media digitali e l'interazione uomo-macchina*, Ariccia, Aracne Edizioni, 2015, pp. 111–137.

Riccò 1999: Riccò D., *Sinestesie per il design. L'interazione sensoriale nell'epoca multimediale*, Milano, Etas, 1999.

Riva, Trocchianesi 2025: Riva M., Trocchianesi R., *Designing Sounds For Exhibitions: Tools To Enhance Sound-Driven Design Strategies*, in “Proceedings of the 11th Convention of the European Acoustics Association Forum Acusticum / EuroNoise 2025”, 2025, pp. 6059–6066.

Rocchesso, Polotti, Delle Monache 2009: Rocchesso D., Polotti P., Delle Monache S., *Designing continuous sonic interaction*, in “International Journal of Design”, 2009, 3, 3, pp. 13–25.

Seth 2023: Seth A., *Come il cervello crea la nostra coscienza*, Milano, Raffaello Cortina Editore, 2023.

Sloma et al. 2024: Sloma U., Thron T., Merten N., Brandenburg K., *Multichannel Immersive Audio Demo with reduced number of RIR Measurements*, in “Proceedings of DAGA 2024 Hannover”, 2024, pp. 1612–1615.

Stocker 1995: Stocker M., *Exhibit sound design*, in “Museum International (UNESCO, Paris)”, 1995, 47, 1, pp. 25–28. DOI: <https://doi.org/10.1111/j.1468-0033.1995.tb01219.x>.

Studio Azzurro 2002: Studio Azzurro, *Meditazioni Mediterraneo*, Milano, Silvana Editoriale, 2022.

Studio Azzurro 2011: Studio Azzurro, *Musei di Narrazione. Percorsi interattivi e affreschi multimediali*, Milano, Silvana Editoriale, 2011.

Susini, Houix, Misdariis 2014: Susini P., Houix O., Misdariis N., *Sound design: an applied, experimental framework to study the perception of everyday sounds*, in “The New Soundtrack”, 2014, 4, 2, pp. 103–121. DOI: <https://doi.org/10.3366/sound.2014.0057>.

Truax 1984: Truax B., *Acoustic communication*, New Jersey, Ablex Publishing, 1984.

Tuuri, Eerola 2012: Tuuri K., Eerola T., *Formulating a Revised Taxonomy for Modes of Listening*, in “Journal of New Music Research”, 2012, 41, 2, pp. 137–152. DOI: <https://doi.org/10.1080/09298215.2011.614951>.

Udsen, Halskov 2022: Udsen A.S., Halskov K., *Soundscape design for historical buildings as a sonic place-making process*, in “Proceedings of DRS2022: Bilbao”, 2022. DOI: <https://doi.org/10.21606/drs.2022.178>.

Werner et al. 2021: Werner S., Klein F., Neidhardt A., Sloma U., Schneiderwind C., Brandenburg K., *Creation of auditory augmented reality using a position-dynamic binaural synthesis system—technical components, psychoacoustic needs, and perceptual evaluation*, in “Applied Sciences (Switzerland)”, 11, 3, pp. 1–20. DOI: <https://doi.org/10.3390/app11031150>.

Wiens, de Visscher 2019: Wiens K., de Visscher E. (2019). *How Do We Listen To Museums?*, in “Curator: The Museum Journal”, 2019, 62, 3, pp. 277–281. DOI: <https://doi.org/10.1111/cura.12318>.

Zattra et al. 2022: Zattra L., Donin N., Misdariis N., Pequet F., Fierro D., *Sound Design as Viewed by Sound Designers. A Questionnaire About People, Practice and Definitions*, in Filmowicz M. (ed.), *Doing research in sound design*, New York, Routledge, 2022, ch.17, pp. 297-323. DOI: <https://doi.org/10.4324/9780429356360>.



The new sound tour of the Musée du Quai Branly - Jacques Chirac, Paris. Interview with Eric de Visscher

Louis Petitjean, Eric de Visscher

Keywords:

Ethnographic Museums, Sound Curation, Multisensoriality, Intangible Heritage.

ABSTRACT:

This article presents an in-depth interview with Eric de Visscher, artistic director of the new sound tour at the *Musée du Quai Branly – Jacques Chirac* in Paris. This new museum tour opened to the public in September 2024 and has been entitled “*Les collections ont leur bande-son*” (“the collections have their soundtrack”). Drawing on his experience gained at leading European museums, Eric de Visscher reflects on the challenges, possibilities and benefits of integrating sound into museum spaces.. The discussion traces the project’s development, from preliminary acoustic studies and audience research to curatorial choices, sound design strategies, and ethical issues surrounding the sourcing and dissemination of intangible heritage. Emphasis is placed on sound as a collective, spatial, and scenographic element rather than a traditional audio guide, highlighting its role in mediating objects and reshaping visitor experience. The interview contributes to broader debates on sound, museography, and contemporary exhibition practices.

Questo articolo presenta un’intervista approfondita con Eric de Visscher, direttore artistico del nuovo percorso sonoro del *Musée du Quai Branly – Jacques Chirac* di Parigi. Questo nuovo percorso museale è stato aperto al pubblico nel settembre 2024 e ha ricevuto il titolo “*Les collections ont leur bande-son*” (“Le collezioni hanno la loro colonna sonora”). Attingendo all’esperienza maturata presso le principali istituzioni museali europee, Eric de Visscher riflette sulle sfide, le possibilità e i vantaggi dell’integrazione del suono negli spazi museali.. La discussione ripercorre lo sviluppo del progetto, dagli studi acustici preliminari e dalle ricerche sul pubblico alle scelte curatoriali, alle strategie di sound design e alle questioni etiche relative alla provenienza e alla diffusione del patrimonio immateriale. L’accento è posto sul suono come elemento collettivo, spaziale e scenografico piuttosto che come tradizionale audioguida, sottolineandone il ruolo di mediazione degli oggetti e di ridefinizione dell’esperienza dei visitatori. L’intervista contribuisce al più ampio dibattito sul suono, la museografia e le pratiche espositive contemporanee.

Louis Petitjean

Louis Petitjean is a doctoral student at Paris 1 Panthéon-Sorbonne University, in joint supervision with Alma Mater Studiorum - Università di Bologna, and a member of the UnaHerDoc doctoral programme of the UnaEuropa alliance, under the supervision of Dominique Poulot and Sandra Costa. His work focuses on the circulation of organological knowledge in musical instrument museums in late 19th-century Europe, with particular reference to Asian instruments from China, Indochina and Japan.

Eric de Visscher

Eric de Visscher is a researcher, curator, artistic director, composer, and former director of Musée de la musique within the Cité de la musique – Philharmonie de Paris. Over the course of his career, he has occupied a range of positions across the fields of music, contemporary art, and has collaborated with major cultural organisations in France and abroad, contributing to the development of exhibitions, artistic programmes, and research initiatives at the intersection of heritage and creation. He is currently Inspecteur de la Création Artistique at the French Ministry of Culture, where he oversees policies related to artistic production and cultural development at a national level.

Opening Picture:

Fig. 1. Eric de Visscher © Palta Studio.

CC BY 4.0 License

<https://creativecommons.org/licenses/by/4.0/>

©Louis Petitjean, Eric de Visscher, 2026

<https://doi.org/10.60923/issn.3034-9699/26210>

This interview contributes to broader discussions on the role of sound in museums and the growing importance of sonic experience within contemporary exhibition practices¹. Historically shaped around visual display, ethnographic museums have been said to “colonize by the gaze”² and encounter, more generally, a crisis of identity in the postcolonial world. Alongside a growing recognition of the primacy of indigenous knowledge³ and the reconceptualization of museums as “contact zones”⁴, ethnographic museums have increasingly sought to engage visitors through multisensory approaches, recognizing sound not merely as a supplementary interpretive device, but as a medium capable of reshaping spatial perception, mediating cultural contexts, and transforming relationships between visitors and collections. The integration of sound into museums, especially ethnographic museums, raises a wide range of questions, from curatorial practice to scenography, technological mediation and acoustic design, as well as the ethics of representing cultural and intangible heritage. A preliminary inquiry into the *Musée du Quai Branly*’s attempt to remediate the musical instruments collection was conducted by the author and revealed a complex interplay between artistic practice and the museum⁵.

Through a career spanning institutions such as the *Ircam*⁶, the *Musée de la musique*, the *Victoria & Albert Museum* in London, and more recently the *Musée du Quai Branly – Jacques Chirac*, Eric de Visscher has played a significant role in the development of sound-based approaches to museum display. His work bridges musicology, artistic

direction, exhibition-making, and institutional research, offering a unique perspective on how sound can enrich museum visitor experiences, develop new narratives, while also facing new practical challenges⁷. In this conversation, de Visscher reflects on the evolution of his thinking *with* sound and exhibitions, tracing the development of major institutional projects and collaborations that informed his approach. Particular attention is given to his conception and implementation of the *Musée du Quai Branly*’s “sound tour”, a project designed not as a conventional audio guide but as a form of sonic scenography directly integrated into the museum’s architecture and collections. The interview addresses broader issues surrounding sound in museums, including acoustic constraints, audience reception, the role of sound designers, questions of authorship and artistic intervention, and the ethical challenges of sourcing and presenting sound materials in ethnographic contexts. More broadly, it offers insight into the emergence of new forms of expertise dedicated to the sonic dimension of museums and to rethinking the museum as a space not only to be seen, but also to be heard, creating a bridge between practitioners and academics.

Louis Petitjean (LP): *Let us start by going back a little to your institutional background. How did you end up interested in the issue of sound in museums?*

Eric de Visscher (EdV): In 1997, I was called by Ircam to take over as artistic director. There, of course, was the whole aspect of musical creation, as well as research, which has always interested me too, considering my academic background of musicology. That was also the period when we relaunched more collaborations with the *Centre Pompidou*. There was a landmark exhibition called “Le Temps Vite” that took place in 2000, at the *Centre Pompidou*, which was put together by the late Daniel Soutif, who headed then the Pompidou’s cultural development department. There, we did more than just programming music: we really included a musical and sound component in the exhibition, which was still unusual. I left in 2003. Change of management, and I also felt like I wanted to move on a bit. I worked in vocal and choral music, notably with the *Accentus* choir. Then, in 2005, I joined the *Cité de la Musique* in Paris and six months later was appointed director of the museum. And let us say that was obviously the moment when I really started to explore these issues of sound and museums.

LP: *How did your experience at the Cité de la musique expand your reflections on sound and exhibitions?*

EdV: There were three projects on my list when I arrived. One was the implementation of the reorganization of the collections, which we completed between 2006 and 2009. Then there was the temporary exhibition policy. And then the third aspect was also about seeing how the musical instrument, in all its dimensions, including its sound, could be better highlighted.

The exhibition policy always raised the question of how the sound dimension is present, how it can be highlighted, what is appropriate depending on the type of exhibition, the content, the musical genre, the type of audience... When the museum opened in 1997, the display of its permanent collection included a system that was quite innovative and revolutionary at the time, which worked with infrared technology. When you entered a room, there was a sound triggered! But there was also sonic interference, when you moved from one space to another. It generated a kind of sound, a bit like on old radios, where you would switch from one frequency to another and you would get a “shrrrr” ... In the end, this system had to be abandoned, and we opted for a classic audio guide, with people composing numbers to select and listen to sound excerpts.

But I would say that the way visitors experience the museum has not changed that much in the 2009 redesign. There have been changes in the contents of the display cases, there have been models that we have continued to develop, there

have also been architectural changes. But let us say that on the question of sound, we were enriching the experience with many more musical excerpts but not radically changing the mode of diffusion. There was also this idea of live musicians playing instruments directly in the museum, which we were firmly attached to. That is what prompted me to dig a little deeper into these questions and see how they could be developed outside of a dedicated museum.

LP: *You left for London in 2016 to work with the Victoria & Albert Museum (V&A). Did you notice a change in the way sound in museums was considered on the other side of the Channel?*

EdV: The V&A was in a period of questioning several aspects of their collection, including their sound and musical instrument collections. They were also trying to revisit certain aspects of their collection through the question of sound. Shortly before I arrived, there was a huge surge of interest around the David Bowie exhibition, which was a remarkable success for the V&A: it opened in London in 2013 and was later shown in ten other cities around the world, including Paris' which I organized and adapted. This led to other exhibitions on more sound- and music-related topics. And that created a dynamic, a reflection on music and sound. How can sound be developed in museums? How can it attract new audiences? How can it revisit the question of the link to objects? How, in relation to other objects, can we think about modes of mediation that involve

sound? It was in this spirit that they asked me to come, as part of their research department, the "V&A Research Institute", which had specific funding to host researchers.

There were of course various changes between the *Musée de la musique* and the V&A. First, the V&A is a large and "global" museum. It is a museum where music is obviously not the focus. But at the same time, it is a museum that had a history with sound, nonetheless. It was even quite pioneering in the way it presented the musical instruments, as early as the 1960s and 70s, when they had imagined a dispositive that they called a "jukebox"! They also hosted some of the first "early music" concerts on period instruments in London, in relation to their own collection.

LP: *What did your work at the V&A involve?*

EdV: There were two strands to this project. One was the collection of musical instruments, which were a bit neglected and of which few objects were on display, and there was the question of sound mediation. And there was a specific objective, yet delayed by Covid, which was the new storage facility project, eventually opened in 2025.

We did a few test projects in the museum. In 2017, a new entrance to the V&A was opened with new exhibition rooms that remained empty for three months. I suggested designing a sound installation that would allow visitors to discover this space, to perhaps encourage them to stay longer in that space, to change the timing of their visit a little, rather

than just going in and out. It was a project I did with a composer and performer who plays the viola da gamba, called Liam Byrne, who had done some work that was really connected to architecture. And then we did another project that was a little more “traditional”, but it was linked to a display case of Indian instruments, with an artist named Caroline Devine. There, it was created using sounds from the museum’s archives linked to the instruments on display. We also wanted to experiment with transducers, where the display case itself becomes the loudspeaker. This works quite well for museums, and we used it quite a lot afterwards at the *Quai Branly* museum.

Yet, these experiments were not entirely successful. At least, we did not do everything we wanted to achieve. There were obviously constraints and surprises with the Covid crisis, which delayed or abandoned many projects.

LP: *How did the project at the Quai Branly museum take place? Did it directly follow your work at the V&A?*

EdV: In fact, a large part of all this work involved research that I carried out in London, which was then done at the *Quai Branly* rather than at the V&A. The *Quai Branly* museum contacted me when I was still in London. It came from the director of collections at the time, Yves Le Fur, and Christine Drouin, who is the head of the cultural department. The project also coincided with the arrival of the new president, Emmanuel Kasarhérou, who also very quickly endorsed the idea and made it his own. The idea was

that it should be a project supported by the whole museum, a kind of collective project. That is why it took so long, because the idea was really to involve all the teams. So, there were a lot of meetings, not only with the curators, but also the public relations team, the technical teams, the building teams, the audiovisual team—in short, everyone from the museum.

LP: *What were the preliminary steps of the project, before even working on the museography itself?*

EdV: The process started with a kind of audit that I did for them, where I analysed what already existed. Which sound sources were there in the museum? What worked, what did not? And more generally, the building, the musical instrument tower, the garden, how all of that responded acoustically. That led to a series of fifteen proposals. Overall, the museum was quite receptive to my recommendations. And I felt that they wanted to move forward.

There were some things that they launched quite quickly, like the sound artists’ residency program, which started in 2022. This was the first step. The museum had a model of sorts which was the photographers’ residencies, so they took inspiration from it. The partnership with the *Le Fresnoy – Studio national des arts contemporains*, based in Tourcoing, came together quickly as well. And I think they wanted to make their mark quickly, to launch the idea of a “Resonating Museum”. With “La réserve des non-dits” (The Storage of the Unsaid), the first laureate of this residence, the Lebanese artist Youmna Saba,

did a brilliant interpretation of the museum's open storage of musical instruments: this imposing "silo" of instruments, which can be seen at various points within the museum, remains enigmatic for visitors and Saba truly tackled the questions of its invisibility and inaudibility (Fig. 2).

LP: *You mention that the audit included an acoustic inquiry to better understand how sound was diffused and perceived in the museum. How to organise such inquiry and what were the results?*

EdV: One of the recommendations I made in the report was to carry out this acoustic study to find out a little about how the building behaved and reacted. This went beyond just the collections area, because they took acoustic measurements in the exhibition hall, the large exhibition hall downstairs, the reception hall, and various other spaces throughout the museum. Let us say that it confirmed the hypotheses we already had, but it also provided some more precise information on certain points and certain spaces, and it undoubtedly influenced, or at least facilitated, decisions on the placement of loudspeakers and other aspects of the final project.

There was also an audience study with a target group that they had invited to wander around the museum without telling them exactly what the purpose of the walk was. Then the museum staff conducted qualitative interviews at the end of the walk, specifically on issues of sound, acoustics, music, what they had heard, not heard, what had interested them, caught their atten-

tion, etc. What came of it is that it is a museum with uneven sound levels, so we really noticed that there were areas of silence, and that these areas of silence were perceived a bit like holes, like voids. There was more of a demand for sound, not necessarily all the time, everywhere, but in any case, sound seemed important to the target group. They did the same study with a similar group, sometime after the opening of the new exhibition. And we find more or less the same kind of observations, where again, they note that there are still differences in the presence of sound, even if there are fewer than before. Their overall assessment is positive.

LP: *Once you started working on the new sound tour, what did you take care of in the first place?*

EdV: I took the role of artistic director, or curator, of the new "Sound tour" of the collections. The preliminary work was about defining the audio content. I worked on two levels of listening: a fairly localized listening, linked to specific objects or display cases, and a more diffuse listening experience, with more ambient and environmental sounds. We started working on this first level in terms of content with the curators of each "heritage unit", as they are called: Africa, Middle East, Asia, Oceania, Americas. We had several meetings with them, where we defined, step by step, where it would be relevant to introduce sound, always in connection with the objects. What was important in this part was that there was both scientific relevance and the technical possibilities that we knew of at the time. Then



Fig. 2:
The introductory
panel of the
installation “La
réserve des non-
dits” by Yumna
Saba © Louis
Petitjean, all
rights reserved.

there was the issue of the availability of sources, of course, to see if we could find content that was relevant. At that stage, the primary intention of the project, the philosophy behind it, was fairly well decided, as well as some of the sound sources of this first level. Before moving to the

second level, we had to select the sound designers who would realize the project, since they needed to be involved as early as possible in the project.

LP: *How did you choose the sound design team and how have you been working with them?*

EdV: We had to go through a public tender process to select the sound design team. We had to draw up specifications and then all the procedures required for public procurement. Then we put out a call for applications. If I remember correctly, we had five or six applications sent to us. We received four teams, to whom we explained the project in detail and gave a tour of the premises. Following that, they were able to submit their applications, and the company *Narrative* won the bid, for two reasons, in my opinion. We felt that they had very well understood the project in their approach and the team they proposed was quite appealing. There were three sound designers coming from three generations of designers. Luc Martinez, who has been working for quite some time, has done a lot of work in science museums, history museums, and heritage sites. He also comes from the world of electroacoustic music, and I knew him already (Fig. 3). The others are a little younger. Simon Cacheux is both an artist and someone who has worked in the field of industrial sound design. Eventually, Julia Griner had just graduated from the sound design school in Le Mans. So, there were three generations, three perspectives, three points of view. If the team worked well together, there would be real interaction between them. And that is what happened. There was also a good producer, Cécile Cros, the director of *Narrative*, who led the team and made sure that everything went according to schedule. So, from that

point of view, it worked out pretty well.

LP: *How did the collaboration with Thomas Tilly come up?*

EdV: It came at a time when I knew I would have a little less time to work on the project. So, I suggested and asked the museum to bring in an assistant to the curator, and that was Thomas Tilly, who I was interested in and knew a little. I knew his music and some of the things he had done. I found his profile as a composer very interesting, because he works with acoustic and existing sources, field recordings. He is someone who also reflects about recording, microphones, and broadcasting. And then, perhaps a little opportunistically, he is also someone who has a network of sound artists, sound engineers, field recordists, all over the world, which we were able to draw on to enhance this second layer of sound, those environmental and ambient sounds. These sounds really come from that network. People with different profiles, sound artists, people who are like reporters, who work more on the “journalistic” side of sound. But also, people who work within communities and who aim to preserve traces, people who work on the intangible heritage side of things, ethnologists, ethnomusicologists... So, with these different profiles, I thought it was good to be able to call on them. And Thomas helped us a lot with that.



Fig. 3:
Luc Martinez
at work in the
permanent
exhibition
rooms, Oceanic-
Australian
section © Eric
de Visscher, all
rights reserved.

LP: *All these “field recordists” are meticulously mentioned on the labels. Why was it important to you to source precisely all the sounds broadcasted in the museum? How did you manage to get the legal rights for each diffusion?*

EdV: Well, first of all, this is obviously part of the critical thinking that all ethnographic museums must engage in, and are engaging in. It would certainly have been completely illogical not to adopt the same ethics with regard to intangible heritage. It comes with the idea

of ensuring scientific accuracy regarding the provenance of sounds, in line with the objects on display. But also, the unavoidable agreement of the communities concerned and the designation of the people who can be identified as sound recordists (Fig. 4).

There were quite a few aspects that *Narrative* was asked to deal with, including, precisely, this issue of rights management. The museum said that it would not diffuse anything unless it had the paperwork authorising it to do so and needed the proof that the rights had been obtained and paid for. The museum would reimburse the cost of the rights, but *Narrative* would have to negotiate the prices. But it is still a significant investment and may still require work afterwards because rights are negotiated for five years, so they will have to be renegotiated. And then there is also the whole question of content renewal, which may also happen.

LP: *Speaking of which, is the sound tour going to evolve, to include more content, broadcast up-to-date sounds, with other field recordings?*

EdV: There is a centralised control system that then distributes content to the various sources, so it is obviously quite easy to change the content. For the moment, the museum has no intention of doing so in the short term, but the question will certainly arise. And that is one of the things that is easier to manage with sound than with images. Because with images, you have to produce films and documentaries. It is more complicated and more expensive to set up. Screens also age more quickly. After about ten years, the screens are no longer really up to date with what people know, what they have on their smartphones and all that. The equipment to diffuse sound will not change much: speakers are things that last a long time.

LP: *According to you, are these sound pieces diffused in the museum proper works of art?*

EdV: The question of the status of these recordings is still somewhat ambiguous. In any case, as far as the public is concerned, I think they should be shown as works of art. A large part of the sound designers' work has also been to adapt the sources for broadcast. In fact, these sources are almost never raw, and the processing can vary depending on the source. There are cases where it is just a little bit of tidying up, filtering, or things like that. There are cases where they intervened more to really enhance certain frequencies or suppress them. Or there are



Fig. 4: An exhibition label of a field recording from Mali © Louis Petitjean, all rights reserved.

even cases where we mixed diverse sources together! For example, at the beginning, you have these songs by the Solomon Islands paddlers. The initial recording, made in a studio in the 1960s, comes from an ethnomusicologist, Hugo Zemp. First, we cleaned up the recording a bit. Luc Martinez added the sounds of water, paddles and so on. He was as rigorous as possible with the rhythm and had it validated by curators and local people. And then the third phase was really the final mix, which was done on site according to the acoustics of the place. As you see here in the work of sound designers, there are moments when we approach creation.

LP: *How do we think about mediation for this specific kind of art objects? Was there a collective reflection on the labels, or did you write them yourself and had them validated by the museum?*

EdV: Actually, the museum curators wrote the labels. We have them all read, reread, and corrected, with the sound designers, and there are trivial things that we reviewed, we asked for a few corrections. I wrote the texts that are in the entrance to the areas, but they were also rewritten by the museum afterwards. It was an important collaboration on that. We had agreed on a basic outline, what kind of information to include, how to communicate it, and so on. Then, the sound designers provided all the technical elements. And then it was put together by the museum.

The idea was always to make the sound source as clear and perceptible as possible. But it is true that the

sources are vastly different, notably concerning their recording quality... Well, we had to deal with that too, obviously. And that is an aspect that is often overlooked due to a lack of resources and time. Often, in museums, you are told, "Here, I have found a recording of this or that. Let us broadcast it!". But that is not enough. There is work to be done. Sound in museums is part of the scenography, so there is really the question of how the visitor perceives it. And in fact, what we have always tried to do in the case of the *Quai Branly* was not to obscure or obliterate the works, but on the contrary to highlight them.

LP: *I had a quick question about the famous art installation by Charles Sandison, The River, set up in 2010. For the first time in 15 years, there is something that echoes it. Was it crucial for you to do something with that river?*

EdV: We felt that it was important to create a continuity with this visual work and, at the same time, make the visitor aware of the sonic dimension that he or she will encounter later in the actual spaces. Sandison's piece projects words from many different languages on the floor; we projected into space, with highly directional speakers, spoken words also in various idioms. Honestly, for me, it is not finished yet and we plan to rework it a little. It works in some circumstances, but less so in others: when a school group is climbing the ramp, I do not think they hear much.

From a more general perspective, the issue of volume and noise levels is always complex in this type

of space. We just have to accept the idea that the effectiveness of the system is variable. There are areas that may not work well when there are a lot of people, but they will work well at other times. Just as it is harder to see works of art when there are lots of people at an exhibition than when you are alone, the same applies to sound. But we are less accepting of this, or at least we are less used to it. So, what is also important to mention is that one of the project's prerequisites was to avoid overly frequent repetitions of the same sound sources, opting instead for trigger systems and multiple excerpts from the same source which can be triggered on the same spot. When a visitor comes back to a certain place, he will not hear the same excerpt. Because we know that these repetitions can also be very tiring, when the sound presence becomes irritating... For visitors *and* museum staff!

LP: *Therefore, a reflection on sound is always also a reflection on space. And for this, it is the kind of thing you can only really assess in situ. Did you wander around and do your own tests?*

EdV: I would say that we are always a bit empirical. We also need to accept the idea that adjustments can be made along the way, that the project is not completely finalized at the opening. We have already spent quite a few nights finalizing all the settings before the opening. We also did visits with the public, because obviously, it is different.

In the museum, you are in a large space and yet it is full of little nooks and crannies, spaces, and different

ceiling heights. There are all these smaller spaces on the side, called "boxes", each of which is different, and we have not used them all yet, so we can still use others if we want to. So there too, it was a challenge for the sound designers, because there are many spaces that converge and blend together, so sound interference can be a significant problem. At the same time, it also offered many acoustic possibilities with differentiated spaces, more than a traditional museum, where you would have a succession of rooms that are more or less identical or at least with fairly similar characteristics. Here, they were able to play around a bit.

Hence the importance of having studied this particular architecture in detail and designing sound systems that are appropriate for these spaces. Because from the onset, I had thought that this soundscape should be heard through speakers and not headphones, so as to create a collective experience. This involves using diverse types of loudspeakers, adapted to space and content. Sometimes we used those transducers that I mentioned earlier, and which cause materials or walls to vibrate. The question of the height of the loudspeakers also arises, depending on the type of source. For instance, we have tried to place speakers in the air for airborne sounds. For sounds from the ground or water, we will have them placed on the ground. Anthropogenic sounds are normally at human height. But then there are the constraints of the venue and the installations and so on, which meant that sometimes we had to place them a little higher. But we still tried to play around with that too.

LP: *Why was the project named like this? How is it different from a traditional renewal of audio guide contents?*

EdV: I would say that our project is a bit difficult to name. When conceiving the project, I called it the “Resonant Museum” (*Le musée résonnant*). In the end, the communications department produced a poster campaign, with the slogan “The collections have their own soundtrack” (*Les collections ont leur bande-son*) (Fig. 5). The term “soundtrack” is somewhat misleading and refers too much to cinema, but I would say that even the term “sound tour” is not really appropriate for me. Because “sound tour” suggests the idea of a guided journey with stations, or points where you stop. Whereas for me, initially, it was really more about soundscapes, or sound scenography... The idea was really also to blend in with the scenography, to be as unobtrusive as possible visually; Jean Nouvel, the architect of the building and the museum design thought of it as a “territory to be discovered”, and I really wanted to accompany this concept, whatever it means. To me, it was important to conceive a space in which we are guided by sound, but also a little bit by our own wanderings, rather than by a treasure hunt.

But often, the public has specific expectations when we talk about audio guides, for example. And I remember we often had these discussions at the *Musée de la musique*. Visitors, at least the average or regular visitor, expect to be guided by the audio. I remember that for certain exhibitions, we had imagined audio guides that were a little more,

perhaps poetic, or a little more creative, let us say. And I had strong reservations from the public services department, who said: “no, people will be lost. They expect to be given a clear explanation of what is going on”. And I think that is also a bit of the case with the sound tour. There are expectations in that regard, and they may be disappointed, because even though there are labels, not everything is obvious; there are things you discover little by little as you wander around. These surprise effects interested me very much.

LP: *Michail Zisiou advocates for the creation of the position of “soundscape designer–museumologist”⁸ who would be integrated in museums to develop an acoustic approach to the collections. Would you agree with him?*

EdV: Well, what we are already seeing is that there is a whole body of expertise that is starting to develop, specialised in sound design suited to museums. It is something quite recent; it started maybe ten or fifteen years ago. The *Centre Pompidou* was quite a pioneer in this respect. A sound designer named Gérard Chiron, who unfortunately passed away, really started doing interesting things with sound around 2000, for certain exhibitions, but not only: he introduced sound in the access ramp, for example. It is a skill that is both technical, obviously, but also, it needs adaptation to the content. So new skills are developing, that is for sure, and they are allowing us to move away a little from the exclusively visual focus, especially in art museums. Perhaps less so in history museums and science museums,



© Musée du Quai Branly - Jacques Chirac, Paris. Tous droits réservés. Copyright © 2010.

5

which have in fact often been pioneers, or at least precursors, in the use of sound.

I do not know exactly what the right term would be. Is it a “sound scenographer”? Is it a “sound museogra-

pher”? It is the link between content and the tools that allow to highlight it in an exhibition or museum space. We can see that museums that are developing this sound presence are becoming more and more common,

Fig. 5: “Les collections ont leur bande-son”, promotional poster © Musée du Quai Branly – Jacques Chirac.

Louis Petitjean, Eric de Visscher

The new sound tour of the Musée du Quai Branly - Jacques Chirac, Paris. Interview with Eric de Visscher

<https://doi.org/10.60923/issn.3034-9699/26210>

and we can say that yes, there is a need for skills. There is a need for these technical skills, which is for sure, and we can see that they are starting to appear. It is more difficult to have them in-house, like at the *Musée de la musique*, because museums do not always have the means to employ them. At the *Quai Branly* museum, we were lucky to have an audiovisual department that was already used to working with sound in exhibitions.

The problem is that often, the question of sound comes *afterwards*. In many exhibitions, we think that it would be nice to have sound, but the spaces were not designed for it... Whereas I really think that for any museum project, if we believe that sound should be included, we need to think about it from the outset. For me, that is an absolute rule, because it has a major impact on the scenography and, of course, on the connection with the other works.

LP: *What advice would you give to an ethnographic institution developing an audio tour, especially regarding how to avoid sensationalism or the exoticisation of spaces and people?*

EdV: This is an issue that some of the museum's curators were quite concerned about. Indeed, there was a risk of "essentialization". We tried to avoid it by being as rigorous as possible in terms of the origin of the sounds and sources, so we can say that it really fits with how these environments, these populations, these communities, are like today. All these recordings, apart from a few older ethnographic recordings, are also what is happening today, in

terms of the natural environment, which means that we can also have, from time to time, urban environments, machines, voices... I thought it was important to have the presence of the voice, acknowledging human presence and language. That is also how we tried to avoid clichés a little bit.

I have always avoided the word "immersion", because for me, it has a very artificial meaning today. In fact, yes, we are always immersed in some way, but we are never surrounded by ten loudspeakers. I mean, when we are outside, there are distant sounds, nearby sounds, sounds that we hear. We have to play on all these subtleties of sound, and sometimes also the absence of sound, and I think that's part of the system too. It is not at all a question of putting sound everywhere all the time. It is essential to treat the sound in such a way as to create, sometimes even unconsciously, a kind of distancing from that sound. The sound is never broadcasted raw but there is always a little bit of intervention on it. This is precisely designed to create distance. There are moments, for example, in the section about Borneo, where there are sounds of forests and birds, but if you listen carefully, they are always slightly processed with sound granularization. These are quite subtle things, but they help to avoid these pitfalls, because there are obviously some.

Endnotes:

- 1 See Bubaris 2014; Rich 2017; Wynne 2021.
- 2 Classen, Howes 2020, p. 200.
- 3 Krmpotich 2019.
- 4 Clifford 1997.
- 5 Petitjean 2025.
- 6 The Ircam (Institut de recherche et coordination acoustique/musique) was founded by Pierre Boulez in 1977 and is affiliated to the Centre Pompidou.
- 7 Candela, de Visscher 2023.
- 8 Zisiou 2011.

References:

Bubaris 2014: Bubaris, N., *Sound in museums—museums in sound*, in “Museum Management and Curatorship”, 2014, 29, 4, pp. 391-402.

Candela, de Visscher 2023: Candela E., de Visscher E., *Learning from ‘The Sounding Object’: Sound Design in the Critical Reimagining of Museum Object Narratives*, in “Design Issues”, 2023, 39, 2, pp. 57-71.

Classen, Howes 2020: Classen C., Howes D., *The Museum as Sensescape: Western Sensibilities and Indigenous Artifacts*, in Edwards E., Gosden C. and Phillips R. B., (eds.), *Sensible Objects: Colonialism, Museums and Material Culture*, London, Bloomsbury Academic, 2020, pp. 199-222.

Clifford 1997: Clifford J., *Museums as Contact Zones*, in Clifford J., *Routes: travel and translation in the late twentieth century*, Cambridge, Cambridge University Press, 1997, pp. 188-220.

Krmpotich 2019: Krmpotich C., *The senses in museums: Knowledge production, democratization and indigenization*, in *The Routledge Handbook of Sensory Archaeology*, London, Routledge, 2019.

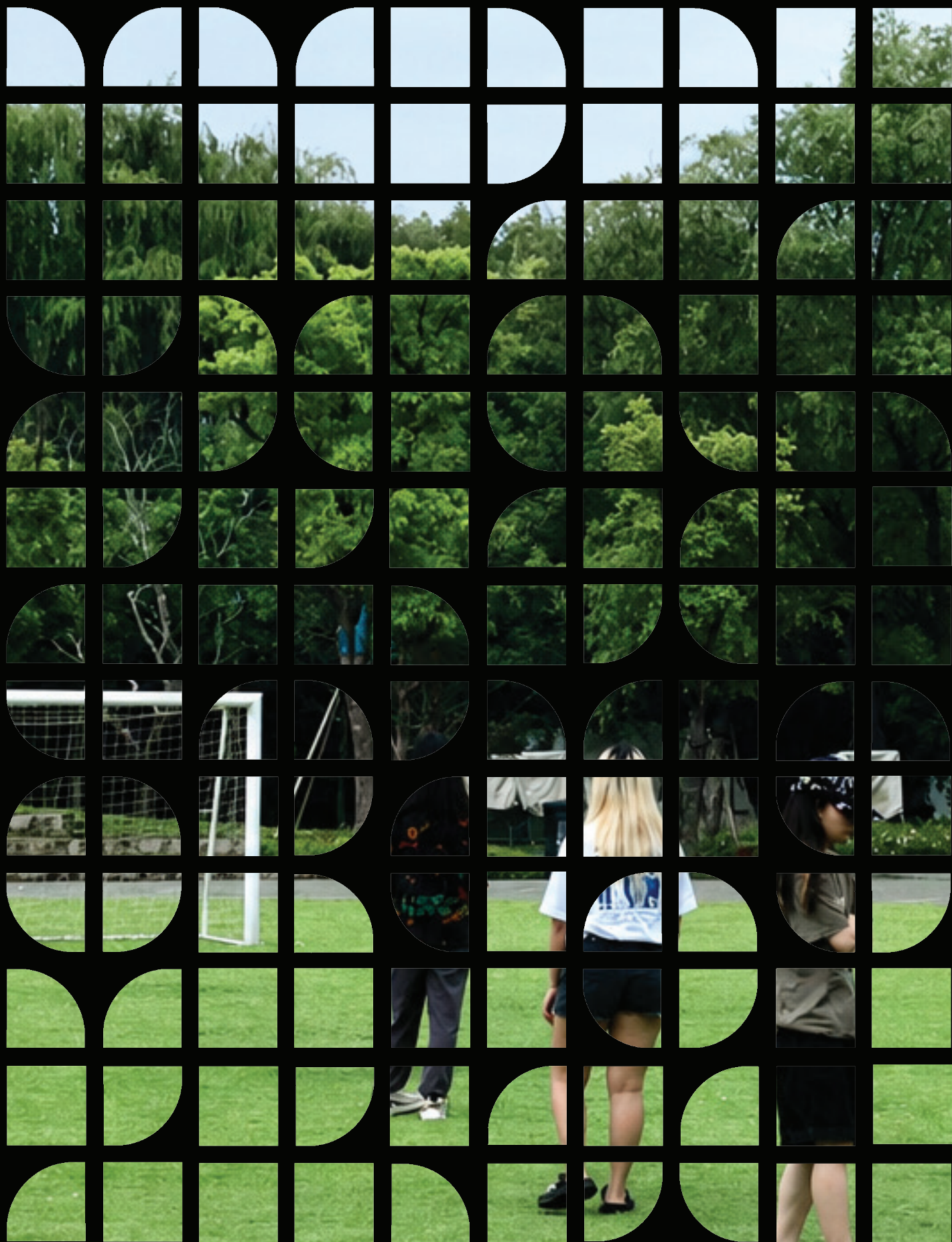
Petitjean 2025: Petitjean L., *Towards a sound remediation? Unmuting musical instruments held in ethnographic collections*, in “Museum Material and Discussions. Journal of museum studies”, 2025, 2, 1, pp. 267-287.

Rich 2017: Rich J., *Acoustics on display: collecting and curating sound at the Science Museum*, in “Science Museum Group Journal”, 2017, Special issue: Sound and Vision, DOI: <https://dx.doi.org/10.15180/170706>.

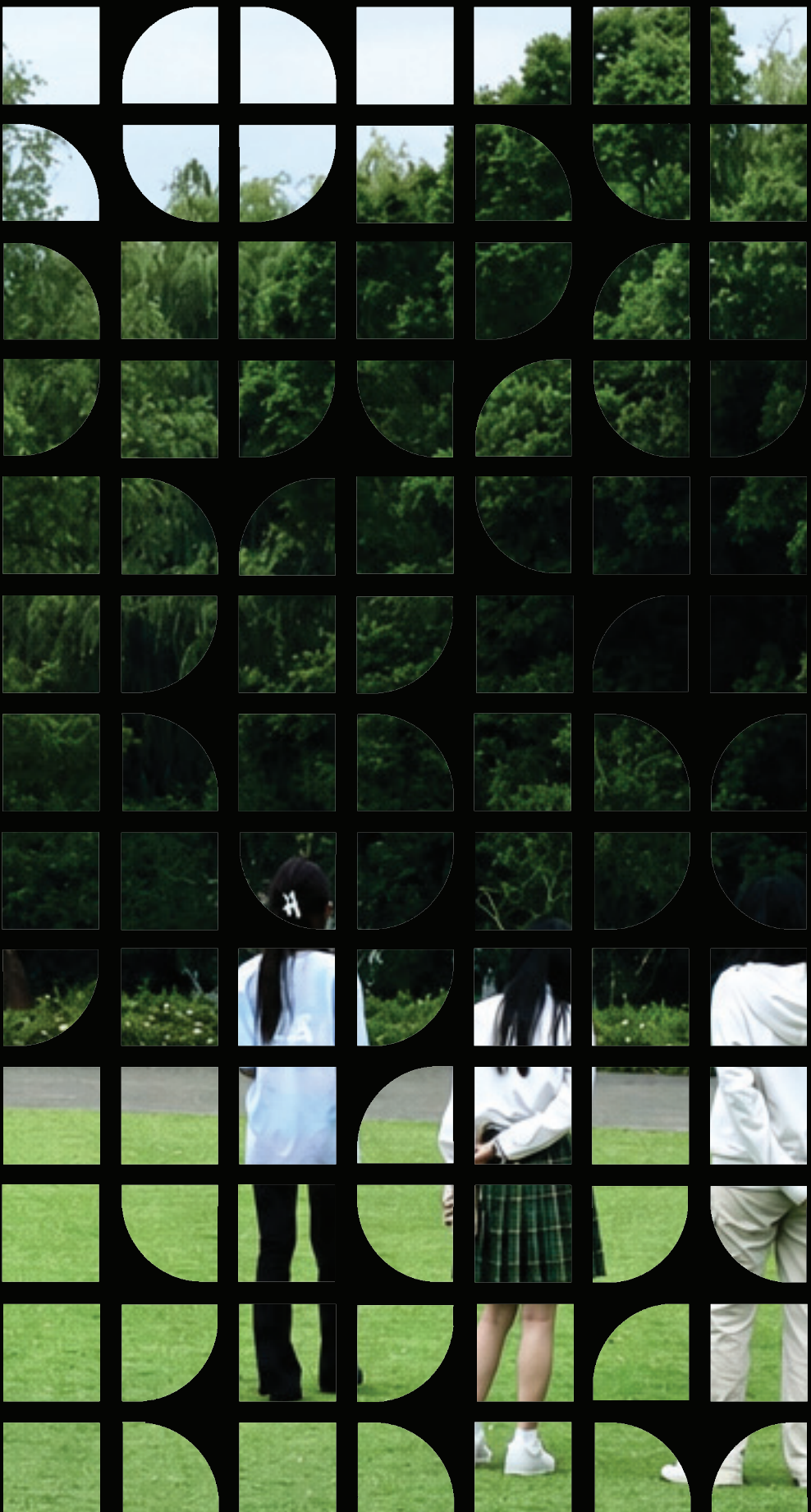
Wynne 2021: Wynne J., *Hearing faces, seeing voices: Sound art, experimentalism and the ethnographic gaze*, in Schneider A., Wright C. (eds.), *Between Art and Anthropology: contemporary ethnographic practice*, London, Routledge, 2021, pp. 49-66.

Zisiou 2011: Zisiou M., *Towards a Theory of Museological Soundscape Design: Museology as a Listening Path* in “Soundscape”, 2011, 11, 1, pp. 36-38.





materials.





enter



Developing a typological matrix of Museum Sound Sources to Enhance Design and Management

Yi Zhang

Keywords:

Sound Design, Soundwalking, Sound sketches, Museum, Exhibition design.

ABSTRACT:

Sound offers a promising direction for enhancing the visitor's experience in the context of digital transformation and multisensory engagement. However, what visitors perceive on site is a composite soundscape woven from multiple sound sources. If curators and designers attend only to the sound inside the exhibit while overlooking these other sources, the intended effect of sound design may be diluted or disrupted. This study introduces two sound methods, Soundwalking and Sound Sketch, and engages 24 participants in guided listening activities at two museums in Hangzhou, China. These activities generated a rich body of empirical materials, they provide the basis for developing a typological framework of museum sound sources and for formulating the concept of *Sound Field Thinking*. This framework contributes to a more precise description of the museum's soundscape and provides a more comprehensive perspective for museum professionals to understand sound in museums.

Il suono offre una prospettiva promettente per migliorare l'esperienza del visitatore nel contesto della trasformazione digitale e del coinvolgimento multisensoriale. Tuttavia, ciò che i visitatori percepiscono sul posto è un paesaggio sonoro composito, un intreccio di molteplici sorgenti sonore. Se curatori e progettisti si concentrano soltanto sui suoni interni alla mostra, trascurando queste altre sorgenti, l'effetto previsto del sound design rischia di essere attenuato o compromesso. Questo studio introduce due metodi sonori, il *Soundwalking* e il *Sound Sketch*, coinvolgendo 24 partecipanti in attività di ascolto guidato in due musei di Hangzhou, Cina. Tali attività hanno generato un corpus ricco di materiali empirici, che costituisce la base per sviluppare un quadro tipologico delle sorgenti sonore museali e formulare il concetto di *Sound Field Thinking*, contribuendo a descrivere con maggiore precisione il paesaggio sonoro del museo.

Opening Picture:

Examples of sound sketches, created by CAA students.

CC BY 4.0 License

<https://creativecommons.org/licenses/by/4.0/>

©Yi Zhang, 2026

<https://doi.org/10.60923/issn.3034-9699/26211>

Yi Zhang*

Yi Zhang holds a PhD from the Design Department at Politecnico di Milano. She is also a researcher in the project 'Sound Design and Cultural Heritage'. Her research focuses on sound design and narrative in museums and temporary exhibitions, with an emphasis on sound elements and sensory experiences in museum production. In 2024, she joined the EPFL Laboratory for Experimental Museology (eM+) and EPFL Pavilions as a visiting PhD student.

Orcid 0000-0002-4028-1033, yi.zhang@polimi.it

* corresponding author



Foot 2



每个电视机的



1. Introduction

In recent decades, a new generation of museums has adopted diverse strategies to expand their audiences and challenge the traditional image of silence, sanctity, and rigidity.¹ In the meantime, the soundscape and sonic texture have undergone profound transformations.² Modern society has become accustomed to the constant roar and noise generated by industrial products, sounds that have inevitably permeated museums and evolved into various forms and functions. Sound serves multiple purposes in the cultural production of various types of museums.³ It functions as a curatorial theme, a medium of communication, an artifact, and a component of multi-sensory experiences.⁴ Through the strategic use of sound, museums can enhance storytelling, facilitate knowledge interpretation, and enrich visitor engagement.⁵

A growing body of literature highlights a shared observation: the positive aspects of sound and its sensory qualities are often largely overlooked in museum environments.⁶ In the digital age, while many museums have come to recognize the role of sound in shaping exhibition experiences, a noteworthy gap remains in understanding the interplay of museum acoustics ecology and the potential of diverse sound sources. Sound is often regarded as a challenging and intrusive element that is often selectively skipped in many museum settings.⁷ Sound has been consistently marginalised by the dominance of visual hierarchies, struggling to achieve equal recognition. Although multilayered, multichannel, and multi-perspective exhibition practices

are increasingly accepted,⁸ the uneven power dynamics between sensory modalities in museums remain difficult to address fully.

Museum soundscapes have become increasingly complex. Digital exhibits, interactive installations, immersive media, and audio guide systems add layers of sound, while ambient noise – from air conditioning, elevators, external traffic, and conversations – continually permeates the exhibition hall. These sounds, often beyond the control of curators or designers, shape how visitors perceive space, exhibits, and narrative. Museum sound design, therefore, requires understanding how multiple sound sources coexist, overlap, and interact, rather than focusing on any single sound in isolation.

Thus, this study addresses two primary research questions:

- What types of sound sources exist in museums, and how do these sound sources affect visitors' experience?
- Given the increasing demand for sound content in the current era of digital transformation, what attitudes should museum professionals adopt toward designing and managing sound?

This study proposes a typological matrix of museum sound sources and intervention strategies, developed through sonic exercises with 24 participants across two distinct museums. The contributions of this study include: (i) introducing *soundwalking* and *sound sketches* into museum design education and on-site observation as a repeatable process for guided listening; (ii) de-

veloping a typological matrix of museum sound sources to describe the relationships among ambient background sound, operating sound, sound from the audience and designed sound; (iii) proposing *Sound Field Thinking* as an initial concept for understanding museum sound environment as a continuous, dynamic, and interrelated environment.

2. The roles of sound in exhibition interpretations

Currently, academic discussions on the classification of sound in museums are shaped by varying definitions and taxonomies. These frameworks are shaped by the role, function and narration of sound within exhibitions.

According to Stocker,⁹ sound was categorized into useful and useless types. Useful sounds were defined as music, narrative, and ambient sounds – mirroring classifications used in film production. Useless sounds were identified as noise. It was noted that both types of sound could be intentionally created and applied for specific purposes.

Bubaris¹⁰ introduced an initial framework for understanding sound in museum narratives inspired by the film sound design theory, transposing concepts previously explored by Chion¹¹ in his description of the cinematic space to the museum field. It includes two categories: diegetic sounds and non-diegetic sounds, layered either in the foreground or background of the exhibition experience to facilitate the communication of sonic information. Diegetic sounds are intentionally designed to align close-

ly with the audience's experience, while non-diegetic sounds, though less directly related to the thematic content, can meaningfully contribute to the narrative. de Jong¹² also explored these concepts and applied them in Polish museums.

Salmouka and Gazi¹³ proposed a framework for classifying sound in exhibitions that identifies three key roles: informative, interpretive, and immersive. The *informative* role means sound as information, similar to text in exhibitions, offering supplementary context. The *interpretive* sound is crucial in shaping the exhibition narrative, fostering audience engagement and connecting different exhibit elements, promoting meaning-making processes. The *immersive* sound focuses on creating a deeply engaging sensory experience to evoke emotions and enhance audience immersion.

Cortez¹⁴ developed a typological framework for sound in museums based on literature and field observations from 59 on-site exhibitions and 10 online exhibitions. It includes five "genres": sound as lecturing, sound as ambience/soundtrack, sound as artifact, sound as art, sound as crowd curation. She later expanded the framework by adding two further categories: sound as a mental phenomenon, and sound as live performance.¹⁵ This categorization illustrates the diversity of sound practices in museums and highlights its significance in shaping sensory experiences and contributing to audience's meaning-making.

These sound typologies underscore the complexity of sound in exhibitions and its diverse applications through the lenses of curation, design, visitors' experience, and infor-

mation exchange. Yet they mainly address curated or designed sounds, or the role of sound in meaning-making and sensory experience. In actual museum settings, other sources, such as mechanical operations, visitor activity, and external environmental sounds, are often left outside these frameworks. Sometimes, unpredictable sound sources may even interact unexpectedly with those well-crafted by curators or designers, leading to shifts in their intended use and the visitor's experience. This study, therefore, does not seek to replace existing frameworks but to offer a more integrative perspective for identifying overlooked sound sources that may significantly affect everyday museum experience.

3. The Listening Activities for Observing Museums

3.1 Soundwalking

Soundwalking is an active listening activity designed to explore environments, soundscapes and acoustic characteristics. It shifts the emphasis from a visually dominant spatial experience to auditory perception, encouraging awareness of subtle sounds in the surroundings. Soundwalking is widely employed as a research method across disciplines and contexts, including its theoretical reviews,¹⁶ studies of measuring urban and outdoor soundscapes,¹⁷ and research on soundscapes in interior spaces.¹⁸ Soundwalking remains rarely applied in museum spaces, though it has been explored in educational and observational contexts. Soundwalking remains rarely applied in museum spaces, although existing studies have begun to demonstrate

its potential for exhibition practice and curatorial education.¹⁹

In recent years, Soundwalking has been adopted as an official method in empirical soundscape research, with efforts to establish a standardised framework for its implementation. The international standard ISO 12913-2²⁰ outlined detailed procedures and guidelines for using Soundwalking to collect perceptual data and evaluate soundscapes in specific sites or spaces.²¹ Under this framework, the author combine Soundwalking with surveys and interviews to gather insights into the soundscape of a location, informing its planning and design related to sound.

3.2 Sound sketch

The *Sound sketch* can be regarded as the sonic counterpart to traditional sketch by visual representation of the perception and characteristics of sound.²² This method captures the cognitive processes and design thinking involved, thereby reducing the load on working memory.²³ This approach of *auralization* helps designers and creators to document inspiration, articulate thought processes, and preserve fleeting sound experiences. Previous studies have explored sound sketches from various perspectives, including the associations and semantic-auditory channels of sound sketches,²⁴ the iterative refinement of sound sketches in design processes,²⁵ and the use of vocal sketching, gestures, and other multimodal means of representing sounds as a research and design creative tool.²⁶ In the museum context, Kannenberg²⁷ proposed a framework for creating sound sketches by integrating

listening, recording, and drawing to interpret museum soundscapes. This approach incorporates drawing, a fundamental artistic skill, into sound art practice, metaphorically representing specific listening experiences.

Sound sketches, when understood as metaphorical interpretations and representations, serve not only as a means of creating new meanings but also as a way of perceiving ourselves and structuring our language.²⁸ Analyzed primarily through a generative semiotic and narrative lens,²⁹ metaphors and analogies reflect a ‘corporeal reverberation’ that can consciously connect individuals, their cultures, languages, and backgrounds through embodied representations such as diagrams or linear narratives. This is particularly relevant in the fields of design and architecture.³⁰ Similar to how revisiting sketches in visual art can yield fresh discoveries, sound sketches can help participants or designers revisit and refine compelling concepts about sound.³¹ Here, participants did not seek to reproduce the sounds themselves with precision. Instead, they used lines, shapes, colours, and written annotations to record the sound sources, movement, intensity, emotional qualities, and spatial relationships they perceived during the soundwalking. In this study, sound sketches are therefore treated as a supporting tool for soundwalking, helping participants recall and reflect on their listening experience.

4. Methodological phases and implementation

4.1 Research sites

Soundwalking and Sound Sketch practices were conducted as part of the extracurricular activities for the course *Research-based Artistic Practices: Narrating the Post-human in the Multi-Sensory Exhibition*. This course was offered during the PLAY-SHOP summer school³² at the China Academy of Art from June to July 2023, with the author serving as the main tutor.

The Soundwalking and Sound Sketch sessions were conducted at two renowned museums in Hangzhou, China: *The China Museum of Design Bauhaus Collection*³³ (hereinafter referred to as CDM), designed by Álvaro Siza and Carlos Castanheira, and *the China Comic & Animation Museum*³⁴ (hereinafter referred to as CCAM), designed by MVRDV. CDM was selected for its typical characteristics as a white-cube design dedicated to art and design themes. In comparison, CCAM was chosen for its extensive use of audiovisual content and interactive experiences that enhance visitors’ understanding of animation, with sound playing an important role in its narrative.

4.2 Participants and Research Activity Process

The experiment involved 24 second-year students from the major of art, science, and design at the CAA School of Innovation Design. The experimental procedures were explained to all participants, and written informed consent was obtained from each participant prior to the start of the study. All interviews

were audio-recorded with consent.

Before the Soundwalking and Sound Sketch sessions began, a deep listening exercise was organized on campus. As Figure 1 shows, the author embarked on a three-part exercise designed to enhance our auditory perception and attune us to the intricate and textural nuances of the sounds that envelop us.

The first step underscored how routinely we categorize, and name sounds based on their sources. The second step brought students' attention to aspects such as tempo, pitch, and timbre. The third step served as an immersive exploration of the acoustic ecosystem that constantly surrounds us, often unnoticed. The exercise proved transformative, providing us with an enhanced appreciation for the richness of sound and the many ways in which it influences our perception of space

and environment.

Then, students were divided into two groups and asked to explore the soundscapes of each museum from two perspectives: as visitors with traditional soundwalking questionnaires and as artists or designers with sound sketches. Their roles were switched between the museums to provide a balanced exploration. The study drew on a set of listening questions suggested by Voegelin.³⁵ These questions can inspire students to reflect on their sound exploration in museums. Within two days of the activities, the author conducted semi-structured interviews with all students, each lasting approximately thirty minutes. Students were invited to reflect on their soundwalking experiences and discuss their insights into the intersections of sound, art, and design, referencing their questionnaires and sound sketches.

Fig. 1:
A deep listening exercise at CAA campus, photographed by the author.



Key questions included:

- How would you describe your listening experience in the museum? Please refer to your questionnaire and sound sketch.
- How would you evaluate the soundscapes of the two museums?
- What role do you think sound plays in the overall museum experience?
- Which sounds left the most significant impression on you?
- As an artist and designer, what insights did you gain from this experience?

The research used a multisensory dataset to document the characteristics, functions, and potential impacts of sound on visitors. The dataset includes: observational field notes written by the author; photographs and videos documenting museum spaces, exhibits, visitor activity, and the surrounding environment; on-site audio recordings capturing designed sounds, ambient noise, music, and mechanical operations; sound sketches created by participants; soundwalking questionnaires completed by participants; and semi-structured interviews conducted by the author, along with their transcriptions.

This study frames the listening activities as an exploratory investigation based on observation, documentation, discussion, and reflection. Through open coding, it identifies recurring sound sources and perceptual experiences from questionnaires, interviews, and field notes, and cross-references them with sound sketches, photographs, videos, and audio recordings to con-

firm their spatial and contextual relations. These findings are then synthesized into four categories of sound. Drawing on workshop materials, participant feedback, and existing literature, the study clarifies the value of this matrix for museum sound design and management.

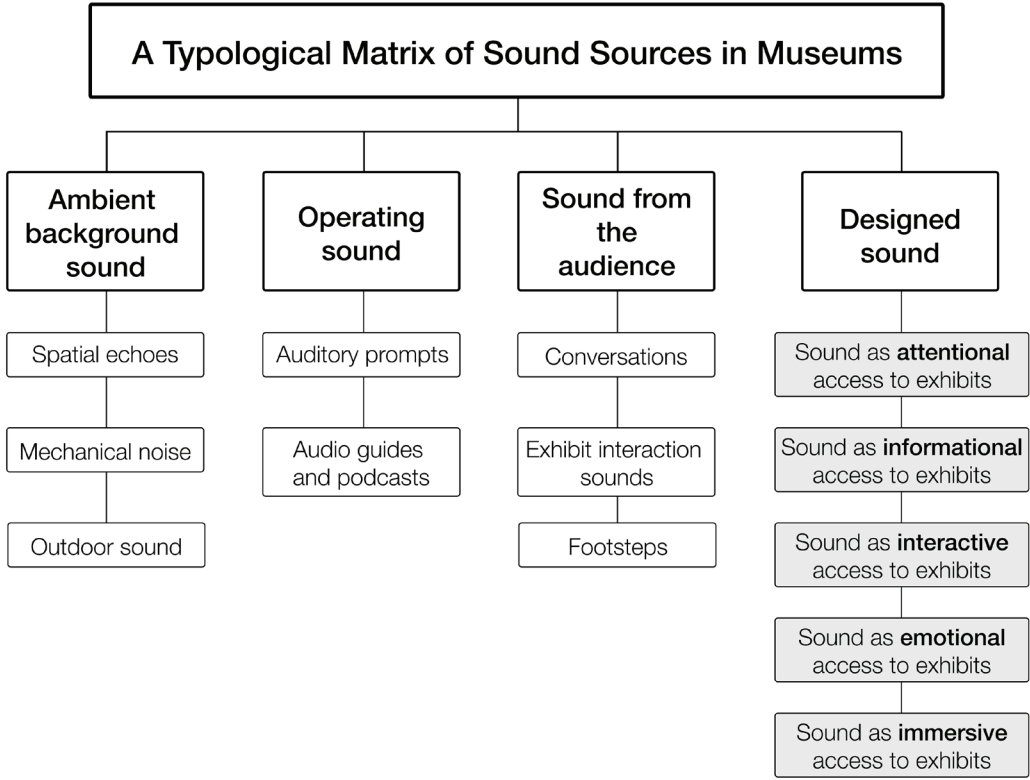
5. A typological matrix for listening to museum

Building on the previous activities, the author proposes a typological matrix that serves as a conceptual framework to address the potential of sound in terms of its source, function, and designability within the exhibition design field (see Figure 2). The aim is to encourage a more holistic and listening-oriented design approach to sound, understood as a critical element in exhibition narratives and spatial design.

Ambient background sound

In this study, ambient background sound refers to the collection of non-specific, continuously present sounds within a museum space under normal operating conditions and without visitors. These sounds typically include spatial echoes, mechanical noise, and environmental sounds from the outdoor surroundings.

Spatial echoes are influenced by the architecture and materials of the space, which influence how sound diffuses and decays. A quarter of students noted that the echoes in CDM created a pronounced sense of openness, to the extent of evoking disorientation. These reverberations enhanced the impression of spaciousness, even though CDM is an enclosed, windowless building.



2

When effectively applied, reverberation can create an optimal listening environment and foster a sense of immersion. Among notable examples, Fiebig, Piereth and Karnatz in *Soundscape as Methodology in psychoacoustics and noise management*,³⁶ demonstrated how the integration of staircase design and reverberation at *Cadolzburg Castle Museum* in Germany enhanced historical perception, and Susan Philipsz’s sound art in museums³⁷ used reverberation to blur spatial boundaries. Mechanical noise, on the other hand, originates from facilities such as air conditioning, elevators, and exhibit equipment. About one-third of participants highlighted that air conditioning noise in the corridor connecting two exhibition halls at CCAM detracted from their experience. The intrusive sound discouraged visitors from lingering in the corridor, causing them to overlook the exhibits displayed there.

Ambient sounds are also influenced by the museum location and are often random and dynamic. Whether located in the countryside or the urban landscape, these sounds may include natural elements, such as birdsong, wind, or water, as well as external traffic noise. One student recalled arriving at CCAM on a quiet morning, noting the profound stillness of its suburban setting, which atmosphere was accentuated by the presence of a lake just behind the building.

Operating sound

The daily operation of a museum is a complex and meticulous process requiring the coordination of numerous individuals, systems, and resources. For example, systems for ventilation, temperature control, surveillance, and lighting maintain a safe and comfortable environment for museums to ensure basic

Fig. 2:
A Typological Matrix of Sound Sources in Museums, created by the author.

infrastructure and accessibility.

From this perspective, two subcategories of sound are identified: auditory prompts, audio guides and podcasts.

Auditory prompts

In museums, auditory prompts are categorized into two types: broadcast systems covering the entire venue and localized audio cues for specific areas. Museum-wide broadcasts are used in particular contexts to convey information, such as reminding visitors to follow the rules, assisting in locating individuals, or announcing closing times. Localized audio cues guide navigation, help visitors orient themselves through sound, and provide directional support, especially in dark environments, multi-sensory exhibitions, or customized space where sound enhances the experience. While the design of auditory prompts has been extensively studied in fields like automotive and healthcare,³⁸ design research in museum contexts remains limited and often leads to the generation of unintentionally intrusive and annoying soundscapes.

Audio guides and podcasts

Audio guides are widely used and well-accepted tools for auditory interpretation in museums.³⁹ These guides use storytelling to explain exhibits, helping visitors to learn about their background and details. Audio guides can be either automatically activated via Bluetooth, RF, RFID or IR triggering systems at specific locations or they can be manually selected on devices. In recent years, many museums have made audio guides accessible online so

that visitors can use their smartphones to scan QR codes and access the content. Audio guides function as a compass that helps visitors navigate the overwhelming array of displayed artefacts and offers each individual a personalised guide.⁴⁰

Museum podcasts represent a newer category of sonic media gaining traction. The museum podcasts cover a range of topics, including the history of the museum, detailed knowledge about collections, and behind-the-scenes stories of exhibition production. It contributes to museums extending their cultural influence beyond physical boundaries, offering audiences a flexible way of engagement.

Operating sounds refer to sounds generated by museums to maintain order, convey information, manage circulation, and support visitor services. Here, the following types of sound are grouped together because they all serve the museum's operational and guidance functions at different scales. Museum-wide broadcasts address the entire facility and are typically used for closing reminders, rules, or emergency notifications. Localized audio cues target specific areas, offering directional guidance, interactive reminders, or safety alerts. While audio guides and podcasts primarily support the interpretation of exhibition content. While often considered beyond the conventional responsibilities of exhibition designers, these sounds remain integral to the holistic construction of the visitor's experience.

Sound from the audience

Nearly all students emphasised the

impact of sounds from the audience on their museum experience, including conversations, exhibit interactions, and footsteps.

Visitors' conversations typically involve sharing impressions, exchanging ideas, or seeking information. At CCAM, where children are a primary audience group, their unpredictable behaviour creates particular challenges. In the interactive game areas, children's excitement often leads to loud screams, creating an excessively noisy environment that diminishes the effectiveness of the exhibition content and coerces the audience to escape.

Footsteps are generally considered part of the ambient background noise, yet they may also be understood as sounds produced by visitors' bodily movement. While their influence is subtle, they can become prominent in quieter galleries. Over half of the students mentioned the creaking wooden floors in CDM's Bauhaus design exhibition room. Opinions of students on this sound varied. Some students found it distracting and preferred the quieter terrazzo flooring. One student observed that the creaking sound was tolerable when walking alone but became pretty jarring as large groups were present. Others felt the sound encouraged more careful movements to keep a serene atmosphere. One student associated the sound with the solemn tranquillity of wooden ancestral halls in her hometown, describing it as calming and comforting. As noted by Orhan and Yilmazer⁴¹ some visitors reported that certain sounds in museums can foster a sense of ease, helping them avoid the overly restrained and cautious behaviour often asso-

ciated with library environments.

It shows that visitors are not passive recipients of the sound, but active contributors to the museum soundscape. Their behaviour may reinforce, mask, or interrupt the designed sounds for the exhibition. Thus, exhibition designers and museum managers should consider the sonic effects of visitors' density and interaction.

Designed sound

The integration of this type of sound in exhibitions is often driven by curators' and designers' efforts to enhance interpretative and interactive experiences. Designed sounds can be categorised into five functional subtypes.

Sound as Attentional Access to Exhibits

Sound holds the inherent power to capture, guide, and focus attention, and it is a fundamental perceptual property of auditory stimuli in daily life.⁴² In exhibitions, this type of sound is used to direct visitor focus to specific exhibits or areas in an information-rich context. Examples include brief alert tones, tonal variations, or rhythmically distinct sound compositions.

Sound as Informational Access to Exhibits

Sound serves as a dynamic medium for conveying complex information, encouraging active listening and observation beyond passive reliance on visual elements. Common examples include *ad hoc* and/or archival recordings of scripted narratives, theatrical presentations, readings, interactive dialogues, oral

stories, and interviews. Especially within highly complex sensory contexts, these narrative sounds can enhance or restrict the visitors' interpretation and meaning-making while opening or closing interpretative perspectives on content. For instance, historical recordings or dialogue segments can vividly illustrate past events and stories. For instance, historical recordings or dialogue segments can vividly illustrate past events and stories.

Sound as Interactive Access to Exhibits

Sound can stimulate curiosity and enhance visitor engagement through immediate and dynamic feedback. In museums, interactive and reactive sound takes various forms, such as in hands-on systems, body-on systems, motion-based systems and complex multimedia installations. These sound interactions can occur through changing sound effects, increasing volume, or shifting sound positioning in space to help visitors locate specific exhibits, select, manipulate or uncover hidden content. This use of sound fosters active visitors' participation and transforms the exhibition experience into a more engaging, embodied and enjoyable process.

Sound as Emotional Access to Exhibits

As noted by Kang,⁴³ "Compared to vision, sound perception is usually information-poor but emotion-rich". This emotional depth makes the sound a powerful narrative tool in exhibitions, capable of evoking specific emotional states such as suspense, nostalgia, joy, sorrow, solemnity, or relaxation. Often

presented as music, sound effects, or soundscapes, these sounds have low informational density but are highly emotionally impactful. Yet, these sounds transcend cultural and linguistic barriers to convey emotions that visual elements alone cannot comprehensively express. For instance, a familiar melody or a specific sound effect can evoke emotional resonance without requiring verbal explanation.

Sound as Immersive Access to Exhibits

Spatial sound goes beyond emotional engagement to create a sensory-enhanced environment that draws and immerse visitors deeply into a narrative. Unlike emotional sound, immersive sound is designed to construct a mentally contained environment that captures and sustains attention. This type of sound design is frequently integrated with lighting, visuals, and spatial elements to create comprehensive, multi-sensory experiences, often used to reconstruct or simulate narrative settings. Among sonic forms, the soundscape is particularly significant in defining the overall exhibition atmosphere and shaping immersive experiences. The term immersion frequently appears in discussions of sound experiences.⁴⁴ In museums, immersive experiences often construct self-contained narrative spaces, where spatial enclosures and multisensory stimuli concentrate visitors' awareness, guiding them into a predefined scenario. The role of sound in this process is significant, as listening can enhance the audience's perception of realism of the scene.⁴⁵

6. Inspirational insights: *Sound Field Thinking*

*Only a total appreciation of the acoustic environment can give us the resources for improving the orchestration of the world soundscape.*⁴⁶

Listening actively to an exhibition reveals the diverse array of sound sources within a museum. These include music, audio guides, background and operating sounds, sound effects, visitors' conversations, and other sounds that merge and interact from all directions. The potential of sound to create meaningful museum experiences is increasingly recognized, permeating exhibitions in various forms. The insights gathered in this study are converging into a problem consciousness that remains to be further tested and developed: *Sound Field Thinking*. This concept views the museum as a unified and continuous auditory environment where sound design must take the entire space into account rather than being confined to isolated installations or specific areas. Designers are encouraged to perceive the museum as a dynamic sound field and consider both its inherent sound sources and the unpredictable, visitor-generated sounds that occur during the experience. To create a coherent and harmonious auditory environment, designers must address the narrative of both existing and designed sounds, mediate the relationships between different sound sources, and consider how visitors' behaviour shapes the overall soundscape.

One participant remarked that sound has the power to ruin an ex-

hibition due to its significant disruptive potential. Whether it is a central element or not, sound is inherently intrusive and cannot be ignored.⁴⁷ Unlike visitors who can choose to close their eyes to turn off the visual, they cannot turn off their perception of sound.⁴⁸ Uncontrolled noise or sound design that contradicts the exhibition narrative, whether through excessive volume, disruptive noise, or irrelevant effects, can impede deeper visitor engagement. Its negative impact is more easily amplified in the minds of visitors than visual failure or visual disruptions. For example, visitors themselves are often the largest and least controllable source of noise in museums.⁴⁹ Human-generated noise significantly affects acoustic comfort.⁵⁰ Many visitors describe a museum as a noisy and disordered place, particularly one featuring interactive or multimedia exhibits. The sounds of visitors tapping on interactive displays, the hum of air conditioning, sound bleeding from exhibits, and the chatter or shouts of children combine to form a dynamic and often chaotic soundscape.⁵¹ This issue is exacerbated by two factors: insufficient consideration during the design phase of cumulative visitor sounds and the frequent use of highly reflective surfaces in museum architecture.⁵² It also underscores a broader issue: discussions about sound and acoustic design often focus solely on noise control and mitigating negative impacts.⁵³ This negative image overlooks the potential of sound as a powerful tool for enhancing visitors' experiences.

A student described an exhibition hall at CCAM where two interactive touch walls allowed visitors to trigger thematic content by tapping

the screens. Children screamed and fought intensely for control of the display, their noise blending with the loud scolding from parents and the constantly shifting sound effects from the installation. The cacophony reverberated through the smooth surfaces of the hall, creating what the student described as ‘sounds battling each other’. At this point, the sound volume of the space exceeded its reasonable limit, prompting visitors to hurry past the hall to escape the overwhelming noise. Background noise is an unavoidable aspect of human environments,⁵⁴ and noise cannot be entirely eliminated.⁵⁵

Another student shared her experience at an exhibition room on rural education at CDM. She noted that as the temperature and the number of visitors increase, the museum usually adjust the indoor temperature, but sound levels remain unchanged. In this exhibition, she initially heard the faint sound of running water, which fit the ambience of the space well. However, as more visitors entered, the delicate sound was quickly overpowered by crowd noise. Despite the wealth of research on how visual elements and temperature affect museum experiences, sound, as an essential parameter for improving spatial comfort and visitor engagement, has received comparatively little attention.⁵⁶

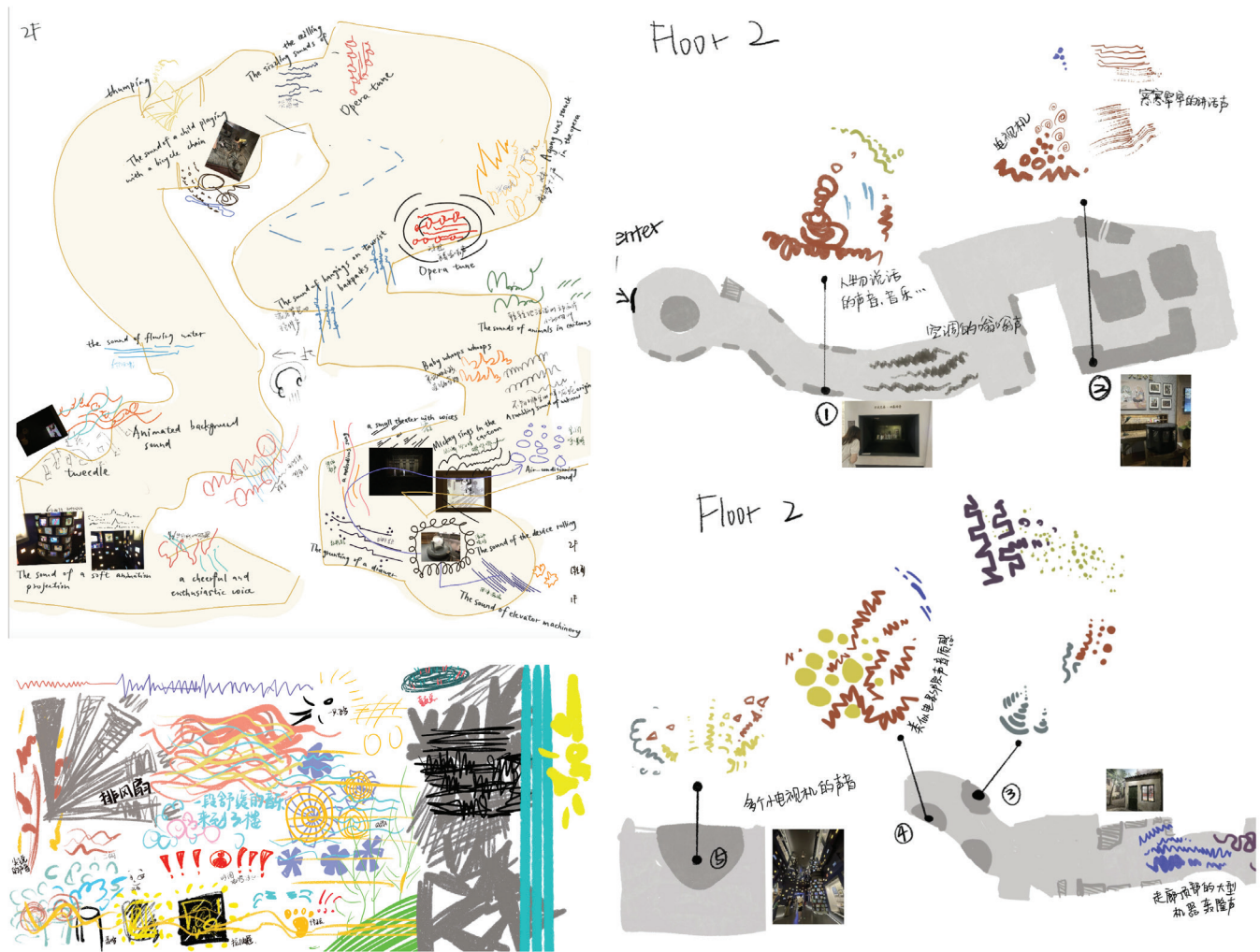
These examples illustrate a critical insight: the spatial sound volume is not static but fluctuates with the number of visitors. Moreover, when one set of sounds interacts with another, they may amplify, cancel out, interfere, or resonate in unpredictable ways. Designers often test designed sounds in empty or minimal-

ly occupied rooms without other sound sources, overlooking how visitor presence dynamically alters sound volume and interactions between different sounds.

From a practical perspective, *Sound Field Thinking* offers a form of practical awareness for curators, designers, and museum managers. It begins with identifying sound sources early in the exhibition production process, especially ambient background sounds and their influence on the exhibition. Audio guides, museum-wide podcasts, and localized prompts should be planned as part of a unified sound design strategy, while designers should test designed sound under real visitor conditions rather than only in empty spaces. It is important to recognize that sound is not simply an added layer of content, but a medium that shapes spatial perception, narrative rhythm, and embodied experience. After opening, designers or museum technicians should adjust volume, duration, playback frequency, and spatial placement based on visitor feedback to refine the sound experience during daily operations.

7. Application of sound research methods in museum interior environment

The development of sound design relies on effective methods and tools. In our exploration of listening in museums, the author guided students to adopt the perspectives of audiences, artists or designers. As Figure 3 manifests, they learned to document and articulate their thoughts and impressions during the listening process. Our bodies serve as sensitive and practical instruments for detecting sound.



These methods are valuable not for measuring sound but for guiding participants to re-enter the museum environment through attentive listening and to render otherwise inexpressible sound experiences into visual materials.

Thus, the author encouraged participants to engage with the soundscape by adjusting their movements, like clapping, to explore reverberation and perceive how sound disperses or concentrates within the space, such as continuity, rhythm, cadence, polyphony, and dissonance. Subsequently, *Soundwalking* questionnaires and sound sketches were introduced to help participants document their auditory perceptions

systematically, laying a foundation for subsequent sound analysis and design translation. Here, *soundwalking* helps designers identify previously overlooked sound sources within the museum and incorporate them into design considerations. Compared with conventional text-based questionnaires, sound sketches provide an immediate and tangible representation of participants' understanding of spatial relationships among sound sources. For instance, some sketches depict echoes as outward-flowing lines, represent mechanical sounds through dense textures, and record children's voices as irregular, high-intensity symbols. While these representations are not standardized,

Fig.3: Examples of sound sketches, created by CAA students.

they offer designers a visual tool for reflecting on how sounds move, interact, and flow within the space.

Variations in sensory sensitivity, commonly referred to as *aural diversity*⁵⁷, mean that participants may have different auditory and perceptual abilities due to varying degrees of hearing loss or listening habits. Besides, the lack of a standardized visualization system means that sound sketches depend on individual expression. As a result, these records remain subjective and situated, and cannot be treated as comparable representations of sound experience. However, these explorations can offer some insights for teaching and practicing sound design in museums. Perhaps, future research could focus on integrating *soundwalking*, sound sketch, and other complementary tools into a comprehensive sound design toolkit. It would provide exhibition designers with a structured process for transitioning from sound perception to expression, advancing the application of sound-driven design in museums and broader design contexts.

8. Conclusions: towards a listening-driven design approach

This paper presented an in-depth investigation into the important role that sound plays in modern museums, addressing two main topics. On the one hand, the author considered the different types of sound existing in museums and how they affect the visitors' experience. On the other, we explored possible ways and methodological tools that museum professionals can adopt to design and manage sound in museums in the era of digital transformation.

Fieldwork conducted in two renowned museums with a group of students demonstrates how *Soundwalking* and *Sound Sketches* methods can be useful for learning to open one's ears and analyse different sound environments, thus enhancing creative conceptual exploration and sensory documentation. In addition, findings on the multifaceted role of sound from literature review and fieldwork have led to the definition of a typological matrix of museum sound sources that reveals the potential of sound for construction, design and narrative transformation within the museum context.

Although it is not possible to analyse every sound source that contributes to the generation of the overall museum soundscape, this research tries to provide a useful analytical framework for building a more systematic and comprehensive understanding of sound. This typological matrix then informed the concept of *Sound Field Thinking*, understood as a method to view the museum as a unified and continuous auditory environment that should be taken into consideration

as whole within the design process. Finally, these methods can support further exploration of sound applications in museum contexts, offering museum professionals a tool to integrate sound within the design process thus supporting the further exploration of sound-driven design and management approaches in the future.

Acknowledgments

This work was supported by the research project “Sound Design and Cultural Heritage” (PI Prof. Raffaella Trocchianesi), which received an Athenaeum Funding for Basic Research (FARB) 2023-2025 from Politecnico di Milano.

Endnotes:

- 1 Bruce 2006; Greenberg 2005, p. 226.
- 2 Schafer 1977; Sterne 2012, p. 1.
- 3 Pekarik, Doering, Karns 1999; Salmouka, Gazi 2021.
- 4 Bubaris 2014; Everrett 2019.
- 5 Candela, de Visscher 2023; Salmouka, Gazi 2021.
- 6 Binter 2014; Classen, Howes 2006; Everrett 2019.
- 7 Bubaris 2014; Stocker 1994; 1995.
- 8 Fiebig, Piereth, Karnatz 2017.
- 9 Stocker 1994; 1995.
- 10 Bubaris 2014.
- 11 Chion 1994.
- 12 de Jong 2018.
- 13 Salmouka, Gazi 2021.
- 14 Cortez 2022.
- 15 Cortez 2024.
- 16 Adams, Bruce, Davies et al. 2008; Biserna 2020; Radicchi 2017.
- 17 Aletta, Guattari, Evangelisti et al. 2019; Sun, Qi, Da et al. 2023; Zhang, Kang 2007.
- 18 Xiao, Aletta 2016.
- 19 Voegelin 2014.
- 20 ISO 12913-2 2018.
- 21 Fiebig, Schulte-Fortkamp 2020.
- 22 Engeln, Keck 2022.
- 23 Bilda, Gero, Purcell 2006.
- 24 Engeln, Keck 2022.
- 25 Nykänen, Wingstedt, Sundhage et al. 2015.
- 26 Ekman, Rinott 2010; Delle Monache, Rocchesso 2019; Hug 2020; Selfridge, Delle Monache, Pauletto 2024.
- 27 Kannenberg 2016.
- 28 Lakoff, Johnson 1980, p. 196.
- 29 Greimas, Collins, Perron 1989.
- 30 Wischer 2012; Zellner 2012.
- 31 Goldschmidt, Sever 2011.
- 32 <https://sdi.caa.edu.cn/youngtoyoung/#> (last accessed on 5 July 2026)
- 33 <https://cdm.caa.edu.cn/#/home> (last accessed on 5 July 2026)
- 34 <https://ccam.hzxcw.gov.cn> (last accessed on 5 July 2026)
- 35 Voegelin 2014.
- 36 Fiebig, Piereth, Karnatz 2017.
- 37 Philipsz 2019.
- 38 Delle Monache, Misdariis, Özcan 2022; Hug, Pfaff 2019.

- 39 Abi Khalil, Daou, Mishlawi 2019.
- 40 Pavement 2014.
- 41 Orhan, Yilmazer 2021.
- 42 Hug, Pfaff 2019, pp. 102–130.
- 43 Kang 2006, p. 48.
- 44 Agrawal, Simon, Bech et al 2020; Kaghat, Le Prado, Damala et al. 2009.
- 45 Pursey, Lomas 2018.
- 46 Schafer 1977, p. 205-206.
- 47 Stocker 1994.
- 48 Bull, Back 2020.
- 49 Fry 2002.
- 50 D’Orazio, Montoschi, Garai 2020.
- 51 Fry 2002.
- 52 Fry 2002.
- 53 Bild, Coler, Pfeffer et al. 2016; Truax 1984, p. 94.
- 54 Truax 1998, pp. 8-16.
- 55 Truax, 1984, p. 94.
- 56 D’Orazio, Montoschi, Garai 2020; Stocker 1994.
- 57 Drever, Hugill 2022; Renel 2018.

References

Abi Khalil, Daou, Mishlawi 2019: Abi Khalil A., Daou A., Mishlawi N., *Sounding the Museum: A Shared Reflection on the Chou Hayda. Intervention at the National Museum of Beirut*, in “Curator: The Museum Journal”, 2019, 62, 3, pp. 367-376. DOI: <https://doi.org/10.1111/cura.12312>.

Adams, Bruce, Davies et al. 2008: Adams, M., Bruce, N., Davies W.J. et al., *Soundwalking as a methodology for understanding soundscapes*, in the Proceedings of the Institute of Acoustics, Reading, U.K., Institute of Acoustics, 2008, pp. 548-554.

Agrawal, Simon, Bech et al 2020: Agrawal S., Simon A., Bech S. et al., *Defining Immersion: Literature Review and Implications for Research on Audiovisual Experiences*, in “Journal of the Audio Engineering Society”, 2020, 68, 6, pp. 404–417.

Aletta, Guattari, Evangelisti et al. 2019: Aletta F., Guattari C., Evangelisti L. et al., *Exploring the compatibility of “Method A” and “Method B” data collection protocols reported in the ISO/TS 12913-2:2018 for urban soundscape via a soundwalk*, in “Applied Acoustics”, 2019, 155, pp. 190-203. DOI: <https://doi.org/10.1016/j.apacoust.2019.05.024>.

Bild, Coler, Pfeffer et al. 2016: Bild E., Coler M., Pfeffer K. et al., *Considering Sound in Planning and Designing Public Spaces: A Review of Theory and Applications and a Proposed Framework for Integrating Research and Practice*, in “Journal of Planning Literature”, 2016, 31, 4, pp. 419-434. DOI: <https://doi.org/10.1177/0885412216662001>.

Bilda, Gero, Purcell 2006: Bilda Z., Gero J.S., Purcell T., *To Sketch or Not to Sketch? That Is the Question*, in “Design Studies”, 2006, 27, 5, pp. 587–613. DOI: <https://doi.org/10.1016/j.destud.2006.02.002>.

Binter 2014: Binter J.T.S., *Unruly Voices in the Museum*, in “The Senses and Society”, 2014, 9, 3, pp. 342-60. DOI: <https://doi.org/10.2752/174589314X14023847039674>.

Biserna 2020: Biserna E., *Ambulatory Sound-Making: Rewriting, Reappropriating*,

- “Presencing” Auditory Spaces, in Bull M., Cobussen M. (eds.), *The Bloomsbury Handbook of Sonic Methodologies*, New York, Bloomsbury Publishing, 2020, pp. 297–314.
- Bruce 2006: Bruce C., *Spectacle and Democracy: Experience Music Project as a Post-Museum*, in Marstine J. (ed.), *New Museum Theory and Practice*, John Wiley & Sons Ltd., 2006, pp. 129-151. DOI: <https://doi.org/10.1002/9780470776230.ch5>.
- Bubaris 2014: Bubaris N., *Sound in Museums. Museums in Sound*, in “Museum Management and Curatorship”, 2014, 29, 4, pp. 391-402. DOI: <https://doi.org/10.1080/09647775.2014.934049>.
- Bull, Back 2020: Bull M., Back L., *The Auditory Culture Reader*, London – New York, Routledge, 2020.
- Candela, de Visscher 2023: Candela E., de Visscher E., *Learning from “The Sounding Object”: Sound Design in the Critical Reimagining of Museum Object Narratives*, in “Design Issues”, 2023, , 2, pp. 57-71. DOI: https://doi.org/10.1162/desi_a_00717.
- Chion 1994: Chion M., *Audio-Vision. Sound on screen*, Columbia University Press, 1994.
- Classen, Howes 2006: Classen C., Howes D., *The Museum as Sensescape: Western Sensibilities and Indigenous Artifacts*, in Edwards E., Gosden C., Phillips R. (eds.), *Sensible Objects*, London – New York, Routledge, 2006, pp. 199-222.
- Cortez 2022: Cortez A., *Museums as Sites for Displaying Sound Materials: A Five-Use Framework*, in “Sound Studies”, 2022, 8, 1, pp. 43–72. DOI: <https://doi.org/10.1080/20551940.2021.1975442>.
- Cortez 2024: Cortez A., *Communicating Through Sound in Museums: A Genre-Based Framework*, in “Curator: The Museum Journal”, 2024, pp. 513-533. DOI: <https://doi.org/10.1111/cura.12667>.
- D’Orazio, Montoschi, Garai 2020: D’Orazio D., Montoschi F., Garai M., *Acoustic Comfort in Highly Attended Museums: A Dynamical Model*, in “Building and Environment”, 2020, 183:107176, pp. 1-10. DOI: <https://doi.org/10.1016/j.buildenv.2020.107176>
- de Jong 2018: de Jong S., *Sentimental Education. Sound and Silence at History Museums*, in “Museum and Society”, 2018, 16,1, pp. 88-106. DOI: <https://doi.org/10.29311/mas.v16i1.2537>.
- Delle Monache, Misdariis, Özcan 2022: Delle Monache S., Misdariis N., Özcan E., *Editorial: Sound and Design*, in Lockton, D., Lenzi, S., Hekkert, P., Oak, A., Sádaba, J., Lloyd, P. (eds.), DRS2022: Bilbao, 25 June - 3 July, Bilbao, Spain, 2022. DOI: <https://doi.org/10.21606/drs.2022.1055>.
- Delle Monache, Rocchesso 2019: Delle Monache S., Rocchesso D., *Sketching Sonic Interactions, in Foundations in Sound Design for Embedded Media*, London – New York, Routledge, 2019, pp. 79-101. DOI: <https://doi.org/10.4324/9781315106359-4>.
- Drever, Hugill 2022: Drever J.L., Hugill A., *Aural Diversity*, London – New York, Routledge, 2022.
- Ekman, Rinott 2010: Ekman I., Rinott M., *Using Vocal Sketching for Designing Sonic Interactions*, in Bertelsen O.W., Krogh P., Halsov K., Graves Petersen M. (eds.), *DIS’10: Proceedings of the 8th ACM Conference on Designing Interactive Systems*, New York, Association for Computing Machinery, 2010, pp. 123–131. DOI: <https://doi.org/10.1145/1858171.1858195>.
- Engeln, Keck 2022: Engeln L., Keck M., *Exploring Sketch-Based Sound Associations for Sonification*, AVI 2022 Workshop on Audio-Visual Analytics: Workshop on the International Conference on Advanced Visual Interface 2022, Frascati, Rome, Italy, 2022. DOI: <https://doi.org/10.5281/zenodo.6576696>.
- Everrett 2019: Everett T., *A Curatorial Guide to Museum Sound Design*, in “Curator: The Museum Journal”, 2019, 62, 3, pp.313–325. DOI: <https://doi.org/10.1111/cura.12305>.
- Fiebig, Schulte-Fortkamp 2020: Fiebig A., Schulte-Fortkamp B., *Soundscape as Methodology in psychoacoustics and noise management*, in Bull M., Cobussen M. (eds.), *The Bloomsbury*

Handbook of Sonic Methodologies, Bloomsbury Handbooks, London – New York, Bloomsbury Publishing, 2020, pp. 252–268.

Fiebig, Piereth, Karnatz 2017: Fiebig A., Piereth U., Karnatz S., *The Cadolzburg Experience: On the Use of Sound in a Historical Museum*, in “Leonardo Music Journal”, 2017, 27, pp. 67–70. DOI: https://doi.org/10.1162/LMJ_a_01021.

Fry 2002: Fry R., *Delightful Sound and Distracting Noise*, in “Journal of Museum Education”, 2002, 27, 1, pp. 14–17.

Goldschmidt, Sever 2011: Goldschmidt G., Sever A.L., *Inspiring Design Ideas with Texts*, in “Design Studies”, 2011, 32, 2, pp. 139–55. DOI: <https://doi.org/10.1016/j.destud.2010.09.006>.

Greenberg 2005: Greenberg S., *The Vital Museum*, in *Reshaping Museum Space*, London – New York, Routledge, 2005.

Greimas, Collins, Perron 1989: Greimas A.J., Collins F., Perron P., *Figurative Semiotics and the Semiotics of the Plastic Arts*, in “New Literary History”, 1989, 20, pp. 627–649.

Hug 2020: Hug D., *How Do You Sound Design? An Exploratory Investigation of Sound Design Process Visualizations*, in Groß-Vogt K., Höldrich R. (eds.), *AM '20: Proceedings of the 15th International Audio Mostly Conference*, New York, Association for Computing Machinery, 2020, pp. 114–121. DOI: <https://doi.org/10.1145/3411109.3411144>.

Hug, Pfaff 2019: Hug D., Pfaff S., *Bringing Sound to Interaction Design: Challenges, Opportunities, Inspirations*, New York, Routledge, 2019.

ISO 12913-2 2018: *International Organization for Standardization. Acoustics – Soundscape – Part 2: Data collection and reporting requirements (ISO/TS 12913-2:2018)* ISO, 2018.

Kaghat, Le Prado, Damala et al. 2009: Kaghat F.Z., Le Prado C., Damala A. et al., *Experimenting with Sound Immersion in an Arts and Crafts Museum*, in Natkin S., Dupire J. (eds.), *Entertainment Computing – ICEC 2009*, Berlin, Springer, 2009, pp. 173–178. DOI: https://doi.org/10.1007/978-3-642-04052-8_16.

Kang 2006: Kang J., *Urban Sound Environment*, London, CRC Press, 2006.

Kannenberg 2016: Kannenberg J., *Listening to Museums: Sound Mapping towards a Sonically Inclusive Museology*, in “Museological Review”, 2016, 20, pp. 6–17.

Lakoff, Johnson 1980: Lakoff G., Johnson M., *Metaphors we live by*, Chicago, University of Chicago Press, 1980.

Nykänen, Wingstedt, Sundhage et al. 2015: Nykänen A., Wingstedt J., Sundhage J. et al., *Sketching Sounds – Kinds of Listening and Their Functions* in “Design Studies”, 2015, 39 (July), pp. 19–47. DOI: <https://doi.org/10.1016/j.destud.2015.04.002>.

Orhan, Yilmazer 2021: Orhan C., Yilmazer S., *Harmony of Context and the Built Environment: Soundscapes in Museum Environments via GT*, in “Applied Acoustics” 2021, 173 (February), pp.1-12. DOI: <https://doi.org/10.1016/j.apacoust.2020.107709>

Pavement 2014: Pavement P., *Gramophones in the Gallery: A Chronology of Museums and Media Technology*, in “Journal of Museum Ethnography”, 2014, 27, pp. 12–26.

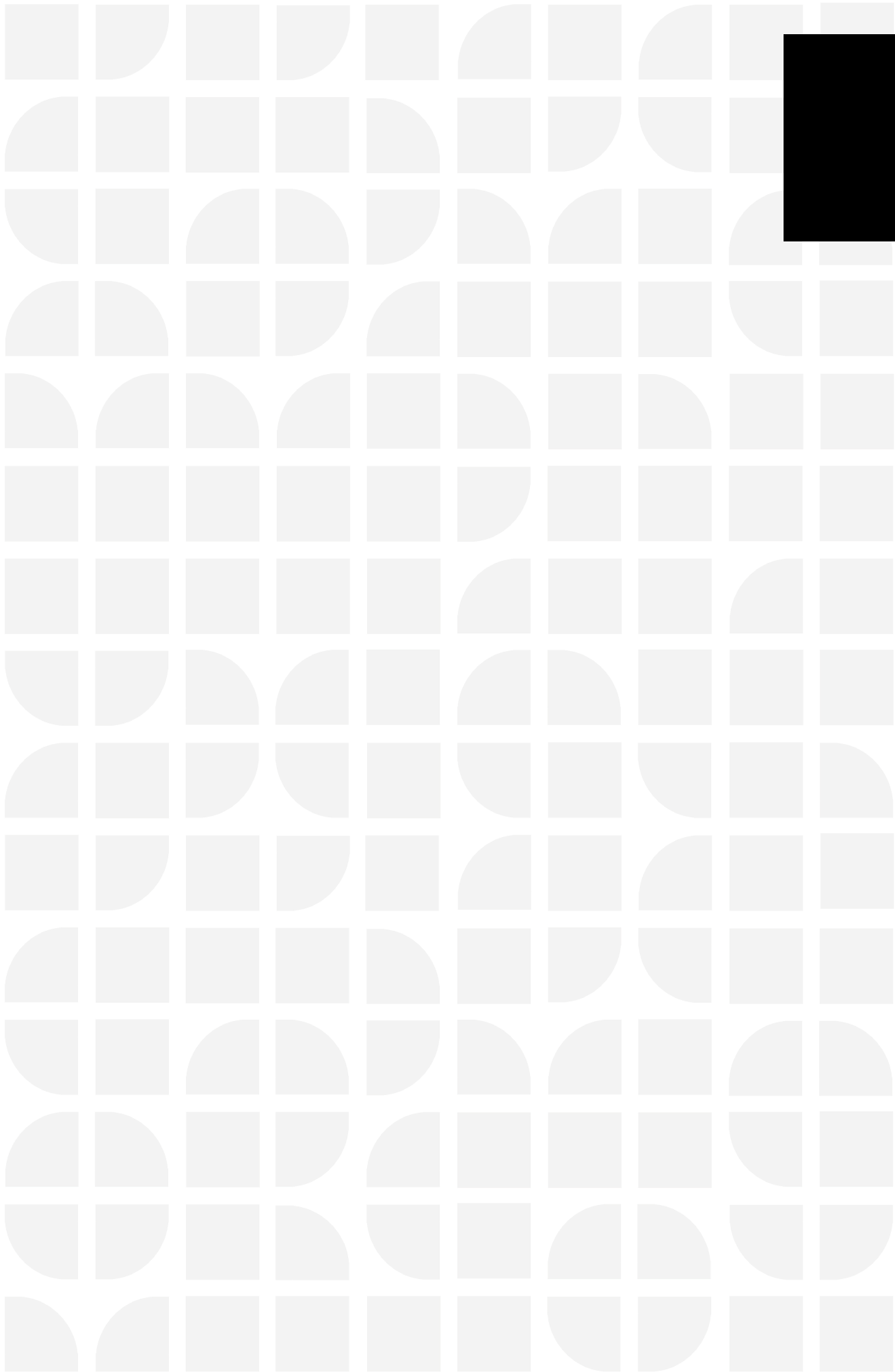
Pekarik, Doering, Karns 1999: Pekarik A.J., Doering Z.D., Karns D.A., *Exploring Satisfying Experiences in Museums*, in “Curator: The Museum Journal”, 1999, 42, 2, pp. 152–173. DOI: <https://doi.org/10.1111/j.21516952.1999.tb01137.x>.

Philipsz 2019: Philipsz S., *Beyond Borders*, in “Curator: The Museum Journal”, 2019, 62, 3, pp. 283–290. DOI: <https://doi.org/10.1111/cura.12299>.

Pursey, Lomas 2018: Pursey T., Lomas D., *Tate Sensorium: An Experiment in Multisensory Immersive Design*, in “The Senses and Society”, 2018, 13, 3, pp. 354–366. DOI: <https://doi.org/10.1080/17458927.2018.1516026>.

Radicchi 2017: Radicchi A., *A Pocket Guide to Soundwalking: Some Introductory Notes on Its Origin, Established Methods and Four Experimental Variations*, in Besecke A., Meier J., Pätzold R., Thomaier S. (eds.), *Stadtökonomie – Blickwinkel und Perspektiven: ein*

- Gemischtwarenladen / Perspectives on urban economics: a general merchandise Store*, Berlin, Sonderpublikation des Instituts für Stadt und Regionalplanung der Technischen Universität Berlin, 2017, pp.70-73.
- Renel 2018: Renel W., “Auraldiversity”: *Defining a Hearing-Centred Perspective to Socially Equitable Design of the Built Environment*, in “Built Environment”, 2018, 44, 1, pp. 36–51.
- Salmouka, Gazi 2021: Salmouka F., Gazi, A., *Mapping Sonic Practices in Museum Exhibitions – An Overview*, in Shehade M., Stylianou-Lambert T. (eds), *Emerging Technologies and the Digital Transformation of Museums and Heritage Sites*, Cham, Springer International Publishing, pp. 61–75, 2021. DOI: https://doi.org/10.1007/978-3-030-83647-4_5.
- Schafer 1977: Schafer R.M., *The Soundscape: Our Sonic Environment and the Tuning of the World*, Rochester, Destiny Books, 1977.
- Selfridge, Delle Monache, Pauletto 2024: Selfridge R., Delle Monache S., Pauletto S., *Sound Design Ideation: A Structured and Systematic Analysis*, in Ludovico L.A., Mauro D.A., *AM '24: Proceedings of the 19th International Audio Mostly Conference: Explorations in Sonic Cultures*, New York, Association for Computing Machinery, 2024, pp. 492–501. DOI: <https://doi.org/10.1145/3678299.3678350>.
- Sterne 2012: Sterne J. (ed.), *The Sound Studies Reader. Sport in the Global Society*, New York, Routledge, 2012.
- Stocker 1994: Stocker M., *Exhibit Sound Design for Public Presentation Spaces*, in “Museum Management and Curatorship”, 1994, 13, 2, pp. 177–183. DOI: [https://doi.org/10.1016/0964-7775\(94\)90075-2](https://doi.org/10.1016/0964-7775(94)90075-2).
- Stocker 1995: Stocker M., *Exhibit Sound Design*, in “Museum International”, 1995, 47, 1, pp. 25–28. DOI: <https://doi.org/10.1111/j.1468-0033.1995.tb01219.x>.
- Sun, Qi, Da et al. 2023: Sun C., Qi M., Da Y., Yue Wu, *Soundwalk Path Affecting Soundscape Assessment in Urban Parks*, in “Frontiers in Psychology”, 2023, 13, pp. 1-16. DOI: <https://doi.org/10.3389/fpsyg.2022.1096952>.
- Truax 1984: Truax B., *Acoustic Communication*, Norwood, New Jersey, Ablex Publishing Corporation, 1984.
- Truax 1998: Truax B., *Models and Strategies for Acoustic Design*, 1998. https://www.sfu.ca/sonic-studio-webdav/WSP_Doc/Articles/Truax_Models&Strategies.pdf.
- Voegelin 2014: Voegelin S., *Soundwalking the Museum: A Sonic Journey through the Visual Display*, in Levent N., Pascual-Leone A. (eds.), *The Multisensory Museum: Cross-Disciplinary Perspectives on Touch, Sound, Smell, Memory, and Space*, Lanham, Maryland, Rowman & Littlefield, 2014, pp. 119–130.
- Wischer 2012: Wischer S.A., *Narrative Transformations And The Architectural Artefact*, in Macleod S., Hanks L.H., Hale J. (eds.), *Museum Making. Narratives, Architectures, Exhibitions*, London, Routledge, 2012, pp. 132–143.
- Xiao, Aletta 2016: Xiao J., Aletta F., *A Soundscape Approach to Exploring Design Strategies for Acoustic Comfort in Modern Public Libraries: A Case Study of the Library of Birmingham*, in “Noise Mapping”, 2016, 3, 1, pp. 264-273. DOI: <https://doi.org/10.1515/noise-2016-0018>.
- Zellner 2012: Zellner P., *Narrative Space: The Book of Lies*, in Macleod S., Hanks L.H., Hale J. (eds.), *Museum Making. Narratives, Architectures, Exhibitions*, London, Routledge, 2012, pp. 203-212.
- Zhang, Kang 2007: Zhang M., Kang J., *Towards the Evaluation, Description, and Creation of Soundscapes in Urban Open Spaces*, in “Environment and Planning B: Planning and Design”, 2007, 34, 1, pp. 68–86. DOI: <https://doi.org/10.1068/b31162>.



Oltre l'accesso. Vocalità, ascolto e corpoliteracy come critica istituzionale

Cecilia Bima

Keywords:

Vocalità, Ascolto, Crip time, Multisensorialità, Critica istituzionale.

ABSTRACT:

This article investigates how contemporary artistic practices and museum *dispositifs* are reshaping regimes of listening, perception, and participation within cultural institutions, drawing on Jonathan Sterne's *Phenomenology of Impairment*, Brandon LaBelle's reflections on sonic agency, and the notion of crip time. Through a comparative analysis of three case studies – *Infinite Ear* (2018), *Delinking–Relinking* (2021–2026), and *aneducation* (2017) – the article examines how sound, vocality, and divergent temporalities operate as critical tools for rethinking the sensory and political hierarchies that structure museum experience. The aim is to show how these practices not only deconstruct the assumption of a universal, able, and readily available perceptual subject, but also open up multisensory, relational, and situated forms of knowledge capable of transforming the museum from a site of transmission into a space of co-production of knowledge. This is not merely a matter of including new voices, but of transforming the very conditions of institutional listening: the capacity to welcome uncertain, non-standardized voices that diverge from normative codes of clarity or authority.

Il presente articolo indaga le modalità attraverso cui pratiche artistiche e dispositivi museali contemporanei stanno riformulando i regimi d'ascolto, di percezione e di partecipazione all'interno delle istituzioni culturali, prendendo come cornice teorica la *Phenomenology of Impairment* di Jonathan Sterne, le riflessioni di Brandon LaBelle sull'agentività sonora e la nozione di *crip time*. Attraverso l'analisi comparata di tre casi studio – *Infinite Ear* (2018), *Delinking–Relinking* (2021–2026) e *aneducation* (2017) – il contributo esamina come il suono e la vocalità operino come strumenti critici per ripensare le gerarchie sensoriali e politiche che governano la fruizione museale. L'obiettivo è mostrare come queste pratiche mettano in discussione l'idea di un soggetto percettivo universale, pienamente abile e immediatamente disponibile all'ascolto. Allo stesso tempo, esse aprono a forme di conoscenza multisensoriali, relazionali e situate, capaci di trasformare il museo da luogo di trasmissione del sapere a spazio di co-produzione. Non si tratta soltanto di includere nuove voci, ma di trasformare le condizioni stesse dell'ascolto istituzionale: la capacità di accogliere voci incerte, non standardizzate, disallineate rispetto ai codici normativi della chiarezza o dell'autorità.

Cecilia Bima

Cecilia Bima (1996) is a curator and researcher trained at Iuav University of Venice and Université Paris 1 Panthéon-Sorbonne. She is Coordinator of Public Program at Fondazione Elpis, Milan, and teaches Set Design at NABA. Her work explores sound, vocality, pedagogy, and institutional critique. She contributed to *Millesuoni* (2025) curated by Lisa Andreani. cecibima@gmail.com

CC BY 4.0 License

<https://creativecommons.org/licenses/by/4.0/>

©Cecilia Bima, 2026

<https://doi.org/10.60923/issn.3034-9699/26212>

Introduzione

Questo articolo prende avvio dalla domanda su come le vocalità, nelle loro forme situate di udibilità, possano costituire una lente critica per ripensare l'istituzione museale e le sue logiche progettuali. Muovendo dalla *Phenomenology of Impairment* di Jonathan Sterne, in dialogo con gli studi sulla disabilità di Joel Michael Reynolds e Christine Wieseler, e dalle riflessioni di Brandon LaBelle sulla giustizia acustica, il testo esplora il museo come regime percettivo: una struttura che seleziona e gerarchizza ciò che può essere riconosciuto come legittimo. Guardare al museo da questa prospettiva significa non limitarsi al tema dell'inclusione formale delle differenze, ma interrogare il modo in cui l'istituzione organizza ascolto, partecipazione e riconoscimento. Tale prospettiva si intreccia con il concetto di *corpoliteracy* elaborato da Bonaventure Soh Bejeng Ndikung e con le riflessioni contemporanee sulla multisensorialità. Attraverso i casi studio di *Infinite Ear* (2018), *Delinking-Relinking* (2021–2026) e *aneducation* (*documenta 14*, 2017), il testo analizza le trasformazioni che emergono quando il museo viene concepito come spazio polivocale, multisensoriale e attraversato da temporalità divergenti.

Cornice Teorica

1. Fenomenologia della disabilità

Jonathan Sterne, docente e studioso di *sound studies* alla McGill University di Montréal, apre *Diminished Faculties. A Political Phenomenology of Impairment*¹ ricostruendo il percorso che, dalla diagnosi di un tumore alle corde vocali, lo conduce all'intervento di tracheotomia e alla conseguente perdita parziale della voce. Il saggio si apre dunque con la delineaazione di un "regime di impossibilità": Sterne non può più utilizzare la voce come in precedenza e, nel descrivere la paralisi dell'apparato fonatorio, mette in evidenza la singolarità di dover compiere intenzionalmente un'azione che in passato si realizzava senza alcuna consapevolezza. "È strano perdere il controllo su qualcosa su cui non ho mai avuto un controllo cosciente. [...] la mia voce fuori posto: un corpo consapevole delle proprie facoltà, ma consapevole di esse nel modo sbagliato." ² L'acquisizione di una disabilità si configura così come un processo graduale di ridefinizione della propria corporeità: non un evento puntuale, ma un percorso di negoziazione continua della condizione di disabilità e delle sue implicazioni. A partire da questa esperienza si sviluppa il metodo d'indagine che Sterne definisce *Phenomenology of Impairment*. Per chiarirne la portata, con la sua prosa ironica e narrativa, ricorre a una metafora: se di norma la fenomenologia si occupa di un tavolo, con i suoi esponenti che lo osservano e vi siedono attorno, anche la sua indagine si situa al tavolo ma, al contempo, anche *sul* tavolo, poiché egli stesso diventa l'oggetto di osservazione. In questo

slittamento di postura si produce una torsione di senso. In altre parole, la fenomenologia tradizionale parrebbe procedere da una posizione di agio e privilegio, di “soddisfazione dei desideri e dei bisogni primari”: là dove Merleau-Ponty fonda la fenomenologia del corpo sulla formula “io posso”,³ Sterne propone di muovere dall’assunto opposto: “io non posso”, cioè dal limite e dalla mancanza intrinseci alla sua condizione di disabilità. “Una fenomenologia politica della disabilità è dunque una fenomenologia meno l’uno, meno l’unità, meno l’interesse, meno la quiete, meno un inizio stabile”.⁴ Ciò che contraddistingue tale impostazione è l’attenzione sistematica alle dinamiche di potere che attraversano l’esperienza del sé, rivelando come le condizioni di possibilità dell’agire e del percepire siano sempre posizionate. Cosa succederebbe se il soggetto si definisse per una condizione di “impedimento”, piuttosto che immaginarsi come integro e agentivo?⁵ Le argomentazioni di Sterne si inseriscono all’interno di una più ampia cornice di studi sulla disabilità che forniscono alcuni strumenti utili per considerare il soggetto alla luce dei suoi limiti. Figure centrali nell’ambito dei *crip studies*, come Joel Michael Reynolds (2018)⁶ e Christine Wieseler (2023)⁷, criticano le assunzioni abiliste della fenomenologia classica, proponendo una “fenomenologia *crip*” o “del non-normativo” che parta dall’esperienza vissuta della disabilità come prospettiva creativa e generatrice di mondi, piuttosto che come ostacolo. Reynolds identifica un errore sistematico nella storia della filosofia: l’equiparazione automatica della disabilità al dolore, alla sofferenza o allo svantaggio intrinseco. Que-

sta “conflazione abilista” – ovvero l’errore di equiparare automaticamente la disabilità a una vita di sofferenza o privazione – impedisce di vedere la disabilità come un modo d’essere produttivo.⁸ Contrariamente alla visione medica che vede la cecità o la sedia a rotelle come una mancanza, Reynolds sostiene che queste condizioni siano generatrici di mondi. Ad esempio, il bastone del cieco non è solo un’estensione dell’arto, ma uno strumento che riconfigura interamente lo spazio e il tempo del soggetto.

Wieseler porta il discorso sul piano della fenomenologia critica, che integra l’analisi dell’esperienza vissuta con quella delle norme sociali e delle relazioni di potere.⁹ Il punto di vista di Reynolds viene ampliato, dimostrando come il pregiudizio della conflazione abilista abbia portato a una sistematica esclusione dei resoconti in prima persona dalla letteratura filosofica. La fenomenologia non può limitarsi a descrivere l’esperienza vissuta, ma deve interrogare le condizioni politiche e sociali che la rendono possibile. Il corpo non normativo, infatti, è un corpo che si muove in uno spazio progettato secondo criteri che spesso lo marginalizzano o lo escludono. Con le parole di Kim Q. Hall, accademica e teorica di *crip theory*, se un corpo zoppica, l’esperienza fenomenologica non riguarda solo il muscolo, ma il modo in cui il mondo – con i marciapiedi, gli sguardi, le leggi – risponde a quel movimento.¹⁰

2. Agentività sonora e progettazione istituzionale

È questa prospettiva fenomenologica che intendo assumere come cornice teorica, non da una condizione personale analoga a quella di Sterne, ma per interrogare le modalità normative di fruizione degli spazi istituzionali e museali. L'esperienza professionale personale in istituzioni museali ha reso evidente una criticità strutturale nella relazione tra museo e pubblico: l'esclusione delle dimensioni corporee dalla progettazione genera una separazione poco produttiva tra curatela, mediazione e accessibilità. Tale dicotomia si manifesta, ad esempio, nello scarto temporale tra le diverse fasi, con la mediazione e accessibilità ridotte a funzioni accessorie e posteriori. È a partire da una critica dell'abilismo che propongo una revisione delle pratiche di progettazione culturale, gli spazi istituzionali e il rapporto tra progetti curatoriali e dispositivi educativi e di mediazione. La disabilità di Sterne, in particolare, riguarda la vocalizzazione e invita, dunque, a riflettere sulla capacità di essere ascoltati. Abituato a possedere una voce dotata di autorevolezza, egli sperimenta improvvisamente la perdita di tale facoltà. Mi domando quindi come le vocalità, con i loro limiti e le loro possibilità di essere ascoltate, possano costituire una lente critica per ripensare l'istituzione museale e attivare strategie di progettazione culturale capaci di mettere in discussione i modelli normativi di fruizione prodotti dalle istituzioni stesse: modelli che presuppongono un visitatore standardizzato, pienamente abile sul piano sensoriale, cognitivo e comunicativo. Gli studi sul suono interrogano da tempo le logiche

istituzionali in relazione alle vocalità e all'ascolto; Brandon LaBelle in *Sonic Agency*,¹¹ per esempio, parte dall'assunto che le esperienze di produzione sonora siano esperienze sociali e, come tali, informino delle pratiche di emancipazione per determinati soggetti e non per altri. Con il suo testo si pone, infatti, l'obiettivo di considerare come alcune soggettività, individuali e collettive, mettano in atto delle soluzioni creative di negoziazione di sistemi di dominazione e acquisiscano forza e agentività tramite l'ascolto e l'essere ascoltati. Nel configurare e modulare le condizioni sonore di uno spazio collettivo, si generano modalità differenti di partecipazione e di espressione politica. La nozione di agentività diventa particolarmente significativa quando viene messa in relazione alla disabilità e al modo in cui i soggetti possono essere riconosciuti all'interno degli spazi istituzionali. È infatti nella definizione dell'agency come "capacità di agire e influire sul mondo circostante"¹² che emerge la sua dimensione strutturalmente politica. Molto utile a questo discorso è il contributo di Nora Sternfeld, mediatrice, educatrice e curatrice, la quale, nel saggio *That Certain Savoir/Pouvoir. Gallery Education as a Field of Possibility*, richiama la rilettura che Gayatri Chakravorty Spivak compie del rapporto foucaultiano tra sapere e potere. Come mostrato dal testo, il potere non va inteso esclusivamente come struttura coercitiva, ma come *possibilità di azione*, come capacità di sapere e saper vivere entro certe condizioni. In sintesi, la conoscenza e il potere non solo esprimono due diverse modalità di *agentività*, ma, al tempo stesso, generano uno spazio specifico proprio attraverso la

relazione che instaurano fra loro.¹³ È in questo spazio tra *sapere* e *potere* in senso *spivakiano*, che è possibile esaminare le dinamiche strutturali e i dispositivi che informano la progettazione curatoriale ed educativa in ambito museale, con particolare attenzione ai paradigmi d'azione che riproducono, spesso in modo inconsapevole, un'impostazione abilista. Nonostante la crescente enfasi sull'inclusione e sull'accessibilità, molti progetti istituzionali si limitano a promuovere tali valori come dichiarazioni di principio o come elementi di legittimazione pubblica, senza incidere realmente sulle pratiche di produzione e fruizione culturale. Molte iniziative legate all'inclusione rimangono confinate ai programmi educativi e di mediazione, senza incidere sui modelli curatoriali che producono le stesse disparità che intendono correggere. In questo modo, le strategie inclusive assumono la forma di interventi accessori o compensativi, piuttosto che costituire un principio strutturale della progettazione museale. Ciò rivela come la partecipazione resti spesso un obiettivo enunciato ma non effettivamente praticato, e come l'idea stessa di accessibilità necessiti di essere ripensata in termini politici e estetici, oltre che tecnici o funzionali. Ritengo infatti che una delle criticità strutturali nella relazione tra museo e pubblico risieda proprio nell'esclusione delle dimensioni corporee dalla progettazione.

3. *Corpoliteracy* e conoscenza multisensoriale

Particolarmente significativa è la riflessione curatoriale di Bonaventure Soh Bejeng Ndikung¹⁴ sulla nozione di *corpoliteracy*,¹⁵ ovvero la capacità di leggere, comprendere e produrre conoscenza attraverso il corpo. Il corpo non è un mero involucro biologico, ma un sito primario di apprendimento e "disapprendimento" (*unlearning*), capace di generare conoscenza in domini che precedono o superano il linguaggio verbale.¹⁶ Ndikung propone di considerare il corpo come una piattaforma capace di apprendere e trasmettere saperi attraverso il gesto, il ritmo, la voce e la memoria. Tale visione trova un'eco fondamentale nella fenomenologia critica di Reynolds, il quale descrive i corpi non-normativi come entità *world-creating* (generatrici di mondi):¹⁷ lungi dal rappresentare una mancanza, la disabilità sviluppa una *corpoliteracy* specifica che riconfigura la percezione dello spazio e del tempo.

Come emerge dai contributi raccolti in *I Think My Body Feels, I Feel My Body Thinks: On Corpoliteracy*,¹⁸ volume collettivo a cura di Nick Aikens e Yolande Zola van der Heide, la conoscenza prende forma in una relazione dinamica tra percezione sensoriale, affettività, temporalità e contesto sociale. Il volume riunisce contributi di artisti, curatori, teorici e ricercatori che, a partire da pratiche situate, quali la performance, la danza, la musica, la vocalità, il rituale e la trasmissione orale, mettono in discussione i modelli epistemologici occidentali fondati sulla separazione tra mente e corpo e sulla centralità del linguaggio scritto come forma privilegiata di

conoscenza. Nella sua pratica curatoriale, ad esempio in progetti come *An Age of Our Own Making* (Holbæk, 2016) o nelle mostre realizzate a Savvy Contemporary di Berlino, Ndikung traduce questa idea in un approccio che concepisce la danza e la performance come un rituale di conoscenza e di memorie sociali e individuali. *Corpoliteracy* o corpo-epistemologia¹⁹ si occupa di domande come “cos’è una conoscenza del corpo?”, “come si acquisisce una conoscenza corporea?”, “come può un osservatore di una performance decifrare e mettersi in relazione con queste conoscenze del corpo?”. Nella prospettiva di Ndikung, la *corpoliteracy* identifica anche una pratica multisensoriale attraverso cui il corpo conserva e trasmette saperi non conformi.²⁰

Questa “disobbedienza dei corpi” si manifesta con particolare forza nella dimensione acustica. La *corpoliteracy* diventa così la capacità di abitare e interpretare il mondo attraverso ritmi e frequenze divergenti: l’azione di zoppicare, evocata da Kim Q. Hall, ad esempio, non è solo un movimento, ma la produzione di un’acustica differente che interrompe il silenzio normativo degli spazi pubblici²¹. Come suggerito da Christine Wieseler, rivendicare il valore epistemico di queste esperienze significa operare un atto di giustizia contro l’oppressione che tende a silenziare i corpi non-normativi.²² Seguendo questa traiettoria, la conoscenza corporea si sposta dal piano puramente sensorio a quello di una vera e propria agentività sonora: il corpo che “legge” il mondo attraverso la vibrazione e il suono è un attore politico capace di negoziare la propria presenza all’interno di architetture istituzionali progetta-

te per corpi standardizzati e abili. Questo intreccio tra percezione incarnata e produzione di senso acustico prepara il terreno per l’analisi di come il binomio sapere/potere si strutturi proprio attraverso la progettazione sonora delle istituzioni, definendo chi ha il diritto di essere ascoltato e chi, invece, viene ridotto a rumore di fondo.

Casi Studio

La presente analisi si articola attraverso l’esame di tre casi paradigmatici di programmi di mostre – *Infinite Ear* (Garage Museum, 2018), *Delinking–Relinking* (Van Abbemuseum, 2021–2026) e *Aneeducation*, (*documenta 14*, 2017) – selezionati per la loro capacità di operare come modelli esemplari delle tensioni tra strutture istituzionali e vissuto corporeo. Essi forniscono un terreno d’indagine in cui la fenomenologia critica e la *corpoliteracy* emergono come strumenti privilegiati che integrano la dimensione del suono, dell’ascolto e della vocalità. La selezione è stata condotta a partire da tre parametri principali. In primo luogo, sono stati privilegiati progetti che assumono il suono, la vocalità o l’ascolto non come semplici strumenti di mediazione, ma come dispositivi di senso in grado di riconfigurare la relazione tra pubblico, spazio e istituzione. In secondo luogo, i casi sono stati scelti per la loro capacità di interrogare criticamente il paradigma normativo della percezione – in particolare la centralità della visione e dell’ascolto cocleare – aprendo a forme multisensoriali e non standardizzate di esperienza. Infine, la comparazione si fonda sulla diversa scala temporale e infrastrutturale

degli interventi analizzati: dalla dimensione espositiva e performativa di *Infinite Ear*, alla trasformazione istituzionale di lungo periodo attivata da *Delinking–Relinking*, fino alla natura processuale, dialogica ed effimera di *Aneeducation*. Attraverso questa articolazione metodologica, i tre casi consentono di osservare il passaggio da pratiche di accessibilità intese come adattamento tecnico a modelli più radicali di co-produzione sensoriale e politica dello spazio culturale. La comparazione mira quindi a mettere in relazione differenti strategie attraverso cui il museo contemporaneo può essere ripensato come spazio di ascolto, vulnerabilità e negoziazione incarnata.

1. *Infinite Ear* (2018): ascolto non cocleare

Prendiamo in analisi la mostra *Infinite Ear*, curata dal collettivo Council al Garage Museum di Mosca nel 2018. Gli artisti Tarek Atoui, Lendl Barcelos, Goda Budvytytė, Valentina Desideri, Myriam Lefkowitz e Alison O'Daniel sono stati invitati a riflettere sulle differenti e possibili “abilità” nel percepire un’opera d’arte, immaginando un futuro delle istituzioni che affronti autenticamente l’ampio spettro della sordità come un’opportunità per accedere a nuovi modi di ascoltare. Le domande da cui gli artisti e i curatori sono partiti sono: “che cosa sentiva davvero Beethoven mentre componeva la sua Nona Sinfonia, dato che era quasi completamente sordo? Le persone udenti percepiscono tutto lo stesso suono quando questa sinfonia viene eseguita? È possibile per chiunque accede-

re alla totalità di un’opera d’arte e abbiamo davvero bisogno di tale accesso per esserne commossi?”.²³ In particolare, sono state esposte le installazioni del gruppo *WITHIN* di Tarek Atoui: strumenti elettronici costruiti su misura, mostrati sia come oggetti museali, sia attivati in concerti e workshop che coinvolgevano membri della comunità sorda e ipoudente. La mostra di Mosca è il punto di arrivo di un processo iniziato nel 2013 a Sharjah (Emirati Arabi Uniti), sviluppato nel 2016 per la Bergen Assembly e nel 2017 a Parigi per raggiungere la versione più recente nel 2018. L’intero progetto indaga come la sordità e le forme non convenzionali di percezione sonora possano ridefinire la performance, lo spazio espositivo e persino la costruzione degli strumenti musicali. Tra questi strumenti si distinguono *Organ Within 1*, un ibrido tra organo tradizionale e sintetizzatore modulare, progettato per essere percepito tanto acusticamente quanto attraverso la vibrazione e la spazialità; *SubBass Prototone*, una grande cavità risonante che produce frequenze prossime o inferiori alla soglia dell’udibile, percepibili soprattutto come vibrazioni corporee; *0.9*, una struttura composta da subwoofer e piattaforme, attivabile tramite un’interfaccia gestuale ispirata alla lingua dei segni, che consente di “scuotere” lo spazio con onde a bassissima frequenza; *4 Iterations on Drums*, una serie di tavoli-percussioni in metallo e legno che trasmettono le vibrazioni direttamente nelle mani dell’esecutore prima ancora che il suono sia percepito coclearmente. Un’operazione per certi versi affine è condotta dalla stessa Eva Fotiadi che, con il collettivo *OtherAbilities* e in collabora-

zione con il centro *VibraFusionLab*, ha sviluppato il progetto di ricerca artistica *What Do I Hear?*: una serie di prototipi di superfici architettoniche aptiche pensate per tradurre il suono in vibrazione, testate sia da persone udenti sia da persone sorde e ipoudenti coinvolte anche nella loro stessa progettazione.²⁴ Come in *WITHIN*, anche qui il corpo — e non il solo orecchio — diventa superficie ricevente del suono, a conferma di come questa strategia curatoriale attraversi contesti e collettivi differenti. La traduzione espositiva di queste ricerche dà forma a uno spazio para-istituzionale che accoglie situazioni di ascolto eterogenee, da sessioni performative ad ambienti di studio, a installazioni audiovisive e dispositivi tattili e momenti di conversazione. *WITHIN* di Atoui afferma che l'orecchio non è il solo organo dell'ascolto, ma il corpo, come superficie più estesa, partecipa in modo determinante alla percezione del suono.²⁵ La multisensorialità del suono incrina l'assunto dominante di un ascolto cocleare e ne ridistribuisce le facoltà ad altri sensi corporei. *Infinite Ear* apre degli spiragli di sperimentazione sonora alternativi in contesti istituzionali, scardinando almeno temporaneamente il suono dalla "supremazia acustica"²⁶ e contesta apertamente l'episteme "auraltypical" — quel modello di udito idealizzato e simmetrico che la progettazione acustica tradizionale assume come standard universale.²⁷ Integrando le riflessioni fenomenologiche di Salomé Voegelin²⁸, l'esperienza di *Infinite Ear* trasforma l'ascolto in una pratica partecipativa. In questa prospettiva, l'ascolto non è una ricezione passiva di dati, ma un atto che contribuisce alla produzione

dell'identità del soggetto e del senso dell'opera. L'esposizione abilita così l'esplorazione di "mondi sonori possibili" (sonic possible worlds)²⁹, creando un continuum tra corpi umani e non umani e materia vibrante, rendendo udibili dimensioni della realtà che solitamente rimangono escluse dalla percezione normativa.

Il dispositivo della mostra, tuttavia, proprio in nome della sua temporaneità, ha un raggio d'azione circoscritto nel tempo. La sua capacità trasformativa, per quanto significativa, si esercita dunque entro un arco temporale limitato, senza necessariamente sedimentarsi nelle infrastrutture istituzionali. È proprio questa discrepanza tra l'evento e l'istituzione che costringe a interrogare le modalità di intervento che non si esauriscano nella temporalità della mostra, ma che operino nel lungo periodo, incidendo sui sistemi di produzione culturale e sulle politiche museali. In questo senso, l'approccio fenomenologico suggerito da Sterne, che prende le mosse dall'"io non posso" e assume la disabilità non come eccezione, ma come condizione produttiva e politica, invita a identificare pratiche istituzionali capaci di trasformare fin dalla radice le condizioni di possibilità della fruizione. Allo stesso modo, gli studi di Brandon LaBelle sull'agentività sonora portano a interrogare non soltanto chi parla e chi ascolta, ma anche la durata e la forma delle pratiche istituzionali che organizzano la fruizione. Se la pluralità sensoriale mette in crisi l'assunto di un soggetto percettivo universale — implicito modello di visitatore autonomo, normoudente, normovedente e immediatamente disponibile alla fruizione — allora le istituzioni culturali

devono essere valutate non soltanto sulla base di singole azioni inclusive, ma anche sulla loro capacità di ripensare l'esperienza museale nel tempo: quanto dura, come si prolunga oltre la visita e in che modo continua a trasformarsi attraverso pratiche di ascolto, partecipazione e memoria condivisa.

2. *Delinking–Relinking* (2021–2026): un'accessibilità permanente

È seguendo questa traiettoria, intenzionata a superare la natura effimera di molte sperimentazioni museali, che il progetto *Delinking and Relinking* del Van Abbemuseum di Eindhoven rappresenta un caso particolarmente significativo: non una mostra, ma un processo pluriennale, che interviene sulle logiche stesse dell'istituzione. Il progetto integra fin da principio misure strutturali: una moltitudine di dispositivi multisensoriali (etichette in braille, repliche tattili e olfattive, “token” progettati per l'interazione), percorsi polivocali online e visite tematiche che trasformano la relazione fra opera e corpo e pubblico. Queste scelte traducono l'accessibilità in un principio progettuale sistemico piuttosto che in un'aggiunta a posteriori: il museo offre modalità diverse e permanenti per abitare lo spazio espositivo – toccare, annusare, sentire vibrazioni, partecipare a visite performative – e lo fa in modo che tali modalità possano essere riviste e ampliate nel tempo. Tra i diversi elementi che compongono *Delinking and Relinking*, il progetto “Love Letters Hotline & Audio Tour”,³⁰ sviluppato insieme a Office of Queer Affairs,³¹ rappresenta un passaggio cruciale per comprendere come l'istituzione possa farsi spa-

zio di ascolto e co-produzione di vocalità plurime. Il dispositivo invita i visitatori a interagire attivamente con le opere attraverso la registrazione di messaggi vocali, riflessioni personali e affettive, che vengono raccolti su una piattaforma online e reintegrati nel percorso museale come parte dell'audio tour. La hotline funziona come un'espansione temporale dell'esperienza, perché le registrazioni rimangono disponibili, si accumulano, si stratificano, creando un archivio vivo di ascolti e di presenze che superano la durata della visita fisica. Si tratta inoltre di un atto profondamente politico, poiché ridistribuisce l'autorialità e rompe la gerarchia tra voce istituzionale e voci dei visitatori.

Piuttosto che partire dall'assunto moderno secondo cui i visitatori portano con sé un determinato contesto in termini di classe, istruzione, etnia, ecc., desideriamo ascoltare una pluralità di potenziali utenti del museo e condividere le loro risposte alle opere con tutto il pubblico. Consentire al museo di parlare attraverso una molteplicità di voci è fondamentale per aprire nuovi dialoghi e connessioni, capaci di far fiorire un pensiero decoloniale. Nell'allestimento attuale, abbiamo strutturato questo processo principalmente attraverso diversi percorsi audio.³²

Il programma preso in analisi procede in una direzione particolarmente feconda rispetto ai temi affrontati: il suono, ovvero l'insieme di voci e narrazioni prodotte da chi attraversa lo spazio istituzionale e dalle comunità cittadine coinvolte, diviene elemento strutturale del museo. Uno dei maggiori meriti del progetto è quello di riportare l'attenzione su una nozione che di norma rimane sorprendentemente marginale nel dibattito sull'accessibilità culturale: quella di "giustizia acustica".³³ Tale prospettiva consente di riconfigurare l'idea di accessibilità da mera rimozione di barriere fisiche o sensoriali a una comprensione più ampia e politica dell'ascolto, inteso come pratica di relazione extra-sonora, riconoscimento e coesistenza. Parlare di giustizia acustica significa interrogare le condizioni in cui determinate voci vengono ascoltate o, al contrario, messe a tacere; significa riflettere su come il suono, la voce e il silenzio partecipino alla costruzione delle gerarchie sociali e culturali che definiscono chi può occupare lo spazio dell'udibilità.

Il progetto "Love Letters Hotline & Audio Tour" può essere interpretato come un dispositivo che redistribuisce attivamente le condizioni della presa di parola all'interno dell'istituzione museale. In tal senso, esso si inserisce in un dibattito cruciale nell'ambito dell'educazione e della mediazione artistica contemporanea, che negli ultimi decenni ha attinto in modo significativo dalle pratiche dell'educazione radicale e dai contributi teorici degli studi decoloniali e postcoloniali. In questo orizzonte si collocano di nuovo le riflessioni di Spivak, la quale, nel celebre saggio *Can the Subaltern Speak?*,³⁴ interroga la possibilità stessa

che i soggetti subalterni, ovvero coloro che sono strutturalmente esclusi dai circuiti della rappresentazione e dell'enunciazione, possano effettivamente parlare e, soprattutto, essere ascoltati. La domanda di Spivak, pur rivolta a un contesto storico e politico specifico, risuona con particolare intensità quando applicata allo spazio museale, che continua a operare come dispositivo di selezione delle voci legittimate e dei soggetti autorizzati a produrre discorso. All'interno di questa cornice, *Love Letters* non si limita a invitare il pubblico a lasciare una testimonianza audio, ma costruisce una piattaforma in cui la vocalità diviene pratica di soggettivazione e di rivendicazione. La presa di parola, di conseguenza, assume una valenza performativa e politica: come osserva José Esteban Muñoz, parlare in uno spazio pubblico non significa soltanto esprimersi, ma affermare una presenza, reclamare un diritto a esistere nella sfera dell'udibilità e dell'immaginazione collettiva.³⁵

3. Aneduction, documenta 14: coralità e co-produzione del sapere

Se *Love Letters* mostra come l'istituzione possa farsi permeabile alle voci dei visitatori, altre pratiche di mediazione hanno esplorato la dimensione vocale come strumento di relazione e co-costruzione dello spazio istituzionale: *Walks and Chorus*, dispositivo artistico e di mediazione iniziato in occasione di *documenta 14* nel 2017. In questo progetto, il *chorus walker* sostituisce la guida tradizionale, conducendo i visitatori in camminate collettive e dialogiche. L'impiego del termine *chorus* richiama allo stesso

tempo la pluralità delle voci attivate e la funzione originaria del coro nella tragedia greca, forma arcaica di mediazione tra scena e pubblico. In questa prospettiva, la vocalità si configura come espressione irriducibile dell'unicità vocale di ciascun *walker*, che è anche visitatore. Nella pubblicazione collettiva *Aneduction*, *documenta 14* vengono riportate le esperienze concrete delle persone componenti del gruppo di mediazione e i testi istituzionali sullo stesso piano, senza gerarchia, ma ordinati in ordine alfabetico. In "Introduzione" vengono espressi gli obiettivi del dispositivo:

Pensare attraverso il corpo ha reso possibile indagare le modalità con cui ci riuniamo e riconosciamo la conoscenza non come una trasmissione unidirezionale, ma come una forma di scambio capace di circolare. L'obiettivo era inoltre quello di ascoltare e apprendere come istituzione, coltivando una postura ricettiva e riconoscendo la complessità dell'atto dell'ascolto: dalla pratica del carpire conversazioni fino all'ascolto della propria voce interiore. La modalità del "being with" ha orientato sia il nostro programma sia la nostra pubblicazione, che mirano a rendere trasparenti le relazioni spesso opache tra educazione, produzione espositiva e i loro pubblici.³⁶

Il riferimento esplicito di *aneduction* alla necessità di "riconoscere la complessità dell'atto dell'ascolto" colloca questa azione entro una costellazione di possibilità divergenti, che si costituisce come un campo di negoziazione costante tra soggetti, contesti, corpi e tecnologie. Diviene allora possibile interrogare più radicalmente il ruolo di un'istituzione come *documenta*, nei suoi regimi d'ascolto. Non si tratta soltanto di includere nuove voci, ma di trasformare le condizioni stesse dell'ascolto istituzionale: la capacità di accogliere voci incerte, non standardizzate, disallineate rispetto ai codici normativi della chiarezza o dell'autorità. In parallelo al rapporto con i pubblici, il dispositivo corale viene utilizzato anche per il processo di formazione reciproca tra i *walker*. Insieme ad un gruppo di artisti e educatori nominato *Faculty*, i mediatori di *documenta 14* hanno sperimentato esercizi e metodi dal carattere polifonico che potevano essere a loro volta sottoposti in sede di visita con i visitatori.

Il carattere completamente discorsivo di questo dispositivo di mediazione ne rivela l'intrinseca effimerità e l'impossibilità di essere fissato, archiviato o riprodotto secondo modalità stabilite. Il suo valore risiede infatti nella relazione contingente tra le singole soggettività che compongono il coro, e la sua temporalità è irriducibilmente ancorata al presente dell'azione. Esso, cioè, non può essere rappresentato retrospettivamente, ma soltanto esperito nel momento stesso in cui accade. Questa natura transitoria e performativa trova un importante punto di risonanza nella teoria

della performance di Peggy Phelan, in particolare nel suo testo fondamentale *Unmarked. The Politics of Performance*.³⁷ Phelan sostiene che la performance, proprio perché non lascia una traccia materiale duratura, sfugga alle logiche della rappresentazione e della riproducibilità che governano l'economia culturale e visuale occidentale. La sua forza politica risiede precisamente in questa "non-rappresentabilità": la performance non può essere tradotta in un oggetto stabile o trasferibile senza perdere la propria carica trasformativa. La sua esistenza è interamente affidata al presente della relazione, alla co-presenza di corpi che si affettano reciprocamente. Applicata al dispositivo corale di *aneducation*, questa prospettiva permette di riconoscere come l'effimero costituisca una forma di resistenza alle modalità normative di enunciazione istituzionale. L'ascolto diviene così un processo vivo e dialogico, attraverso cui si producono relazioni e si ridefiniscono le condizioni stesse della partecipazione istituzionale.

Conclusioni

Le tre traiettorie analizzate – ascolto non cocleare, temporalità espansa e coralità – mostrano come le pratiche artistiche e curatoriali contemporanee possano mettere in crisi le forme normative attraverso cui il museo organizza percezione, partecipazione e produzione del sapere. Nei tre casi studio, il suono e la vocalità non funzionano come semplici strumenti di mediazione, ma intervengono direttamente sulle infrastrutture istituzionali dell'esperienza.

Infinite Ear ridefinisce l'ascolto come esperienza corporea e multisensoriale, incrinando l'idea di un visitatore ideale dotato di facoltà percettive standardizzate. La mostra rende evidente come l'istituzione museale continui spesso a costruire i propri spazi attorno a un modello implicito di soggetto abile, fondato sulla centralità della visione e dell'ascolto cocleare. In questo senso, il progetto di Atoui non amplia semplicemente le modalità di fruizione, ma apre una domanda più radicale: quali corpi vengono immaginati quando si progettano dispositivi espositivi, architetture acustiche e forme di partecipazione?

Delinking–Relinking sposta invece il problema sul piano infrastrutturale e temporale. L'aspetto più significativo del progetto non risiede soltanto nell'introduzione di strumenti accessibili, ma nel tentativo di integrare l'accessibilità nei processi permanenti dell'istituzione. La costruzione di archivi vocali partecipativi e percorsi polivocali mette in discussione la distinzione tra pubblico e istituzione, tra produzione culturale e ricezione. Da questa prospettiva emerge una questione cruciale: fino a che punto il museo è disposto a redistribuire davvero l'autorità della narrazione e ad accettare forme di sapere non pienamente controllabili?

Con *aneducation*, infine, l'ascolto assume una dimensione apertamente relazionale e performativa. La coralità proposta da *documenta 14* evidenzia come il sapere possa emergere da pratiche dialogiche, contingenti ed effimere, difficili da archiviare secondo le logiche tradizionali dell'istituzione culturale. Il valore del dispositivo non

risiede nella stabilità dei contenuti prodotti, ma nella trasformazione temporanea delle relazioni tra corpi, voci e spazio istituzionale. In questo caso, la domanda che si apre riguarda la possibilità stessa di un'istituzione capace di accogliere pratiche non completamente traducibili in documentazione, patrimonio o valore espositivo. Considerati insieme, i tre casi mostrano come il problema dell'accessibilità non riguardi soltanto l'eliminazione di ostacoli, ma investa il modo in cui il museo definisce le condizioni dell'udibilità, della presenza e della legittimità percettiva. L'attenzione alla dimensione sonora amplia quindi la nozione stessa di accessibilità, spostandola da un paradigma compensativo a una comprensione relazionale e politica dell'esperienza culturale.

In questo quadro diventa utile richiamare il concetto di *creative access*,³⁸ sviluppato nell'ambito delle pratiche artistiche e performative legate alla *disability culture* e ai *crip studies*. Il concetto raccoglie e mette a sistema tanto l'“io non posso” da cui muove la fenomenologia politica di Sterne, quanto la nozione di corpi *world-creating* elaborata da Reynolds, così come la *corpoliteracy* teorizzata da Ndikung. Con questa espressione non si intende l'aggiunta tecnica di strumenti compensativi a un'opera già conclusa, ma un approccio progettuale in cui l'accessibilità partecipa fin dall'inizio alla costruzione della forma artistica, dei linguaggi e delle modalità di relazione con il pubblico.

Nel contesto museale, la nozione di *creative access* permette di leggere dispositivi come la multisensorialità di *Infinite Ear*, le infrastrutture par-

tecipative di *Delinking-Relinking* e la coralità di *aneducation* non come adattamenti successivi, ma come pratiche che ridefiniscono l'esperienza estetica e istituzionale a partire dalla pluralità dei corpi e delle percezioni. L'accessibilità smette così di essere una funzione separata e diventa un elemento generativo del progetto curatoriale e artistico. Le pratiche analizzate suggeriscono inoltre che la trasformazione dell'istituzione passi attraverso una ridefinizione dei suoi regimi d'ascolto. Non si tratta semplicemente di includere più voci, ma di modificare le condizioni che stabiliscono chi può parlare, chi viene ascoltato e quali forme di presenza risultano legittime nello spazio pubblico. In questo senso, le riflessioni di Jacques Rancière sulla “distribuzione del sensibile” risultano particolarmente pertinenti: trasformare le modalità dell'ascolto significa intervenire sulle forme di appartenenza e sulle possibilità di immaginazione collettiva che il museo rende praticabili.³⁹

Alla luce di queste considerazioni, emerge anche una tensione irrisolta: molte istituzioni culturali adottano lessici dell'inclusione e della partecipazione senza mettere realmente in discussione le proprie gerarchie organizzative e percettive. I casi analizzati mostrano invece che assumere vulnerabilità, lentezza, dipendenza e pluralità sensoriale come condizioni progettuali implica una trasformazione molto più profonda, che coinvolge tempi istituzionali, pratiche curatoriali e forme di autorità. Attraverso la lente della *crip phenomenology*, la pratica curatoriale può allora essere intesa come una vera e propria “curatela dell'ascolto”: non una gestione tecnica dell'accessibilità, ma un processo

politico e relazionale capace di ridefinire chi produce sapere, quali corpi vengono resi percepibili e quali modalità di esperienza il museo considera legittime. In questa prospettiva, la pluralità delle percezioni e delle vocalità non rappresenta un'eccezione da amministrare, ma la condizione stessa di una possibile funzione pubblica dell'istituzione culturale contemporanea.

Endnotes:

- 1 Sterne 2021.
- 2 Sterne 2021, p. 25: "It is strange to lose control over something over which I never had conscious control in the first place [...] a body aware of its own faculties but aware of them in a wrong way" (traduzione dell'autrice).
- 3 Merleau-Ponty 2012, pp. 93, 204, 220-221, 247, 330, 390.
- 4 Sterne 2021, p. 18: "A political phenomenology of impairment is therefore phenomenology minus one, minus unity, minus wholeness, minus quietude, minus a stable beginning" (traduzione dell'autrice).
- 5 LaBelle 2018, p. 8: "Agency, as the capacity to affect the world around us".
- 6 Reynolds 2018.
- 7 Wieseler 2023.
- 8 Reynolds 2018, pp. 421-422.
- 9 Wieseler 2023.
- 10 Hall 2021.
- 11 LaBelle 2018.
- 12 La Belle 2018, p. 8: "Agency, as the capacity to affect the world around us" (traduzione dell'autrice).
- 13 Sternfeld 2013, pp. 1-5.
- 14 Curatore e fondatore di Savvy Contemporary (Berlino), attuale direttore di Haus Der Kulturen Der Welt (Berlino).
- 15 *Aneeducation Documenta 14* 2017, p. 107.
- 16 Neugebauer 2024.
- 17 Reynolds 2018, p. 424
- 18 Aikens, van der Heide 2022.
- 19 Aikens, van der Heide 2022, p. 114.
- 20 Neugebauer 2024.
- 21 Hall 2021.
- 22 Wieseler 2023, pp. 130-131.
- 23 <https://garagemca.org/> (traduzione dell'autrice) (ultima consultazione 06/07/2026).
- 24 Fotiadi 2025, pp. 14-15.
- 25 <https://garagemca.org/> (ultima consultazione 06/07/2026).
- 26 Concetto coniato da Raymond Antrobus, poeta, scrittore e autore radiofonico. <https://raymondantrobus.com/> (ultima consultazione 19/06/2026).
- 27 Drever 2019; 2021.
- 28 Voegelin 2014.
- 29 Voegelin 2014, pp. 3-4.
- 30 È possibile ascoltare le registrazioni vocali di *Love Letters* sulla piattaforma Smartify: <https://app.smartify.org/it-IT/tours/love-letters-tour> (ultima consultazione 1/11/2025).
- 31 Collettivo queer informale costituitosi nella città di Eindhoven. Nato come un gruppo di lettura queer, si è trasformato in un gruppo dedicato alla discussione dei media da una prospettiva queer.

- 32 Esche 2024, p. 98: "Rather than the modern assumption of visitors as bringing with them a certain context in terms of class, education, ethnicity etc, we want to listen to a diversity of potential users of the museum and share their responses to the works with everyone else. Facilitating the museum to speak with a plurality of voices is crucial to opening up to new dialogues and connections that can allow decolonial thinking to flourish. In the current presentation, we have structured this mainly through different audio tours" (traduzione dell'autrice).
- 33 LaBelle 2021.
- 34 Spivak 1988.
- 35 Muñoz 2025.
- 36 *Aneeducation Documenta 14* 2017, p. 181: "In thinking through the body it was possible to examine how we come together and recognize knowledge not as a one-way transmission but as a form of exchange that can be circulated. Further, the aim was to listen and learn as an institution, be receptive, and acknowledge the complexities of hearing, from eavesdropping to listening to one's inner voice. The mode of "being with" guided our program and publication, both of which seek to lay bare the opaque relationships between education, exhibition making, and their publics." (traduzione dell'autrice).
- 37 Phelan 1993.
- 38 Cachia 2018.
- 39 Rancière 2016, p. 140: "The museum is a crucial framing device for shifting who is included as part of a recognized social 'we'".

References:

- Aikens, van der Heide 2022: Aikens N., van der Heide Y.Z. (eds.), *I Think My Body Feels, I Feel My Body Thinks: On Corpoliteracy*, Eindhoven, Van Abbemuseum Eindhoven, 2022.
- Aneeducation Documenta 14* 2017: *Aneeducation, documenta 14*, Berlin, Archive Books, 2017.
- Cachia 2018: Cachia, A., *The Politics of "Creative Access": Guidelines for a Critical Dis/ability Curatorial Practice*, in Semedo A., Frayão Camacho C. (eds.), *Representing Disability in Museums. Imaginary and Identities*, Porto, Citcem, 2018, pp. 139-148.
- Drever 2019: Drever J.L., 'Primacy of the Ear' – But Whose Ear?: *The case for auraldiversity in sonic arts practice and discourse*, in "Organised Sound", 2019, 24, n. 3, pp. 317-326.
- Drever 2021: Drever J.L. (2021). Sound art: Hearing in particular. In J. Grant, J. Matthias, & D. Prior (Eds.), *The Oxford handbook of sound art*. Oxford University Press. <https://doi.org/10.1093/oxfordhb/9780190274054.013.38> (ultima consultazione 06/07/2026)
- Esche 2024: Esche C., *Practising Ideas or, How Decolonial Thinking Slowly Gave Form to the Collection Presentation of the Van Abbemuseum*, in Esche C., *The Critical Visitor*, Amsterdam–Eindhoven, Van Abbemuseum / Reinwardt Academy, 2024, pp. 94-105.
- Fotiadi 2025: Fotiadi E. (ed.), *Exhibiting for Multiple Senses: Strategies of Mediation in Contemporary Art Exhibitions*, Amsterdam, Valiz, 2025.
- Hall 2021: Hall, K. Q., *Limping Along: Toward a Crip Phenomenology*, in "Journal of Philosophy of Disability", 2021, pp. 35-58.
- LaBelle 2018: LaBelle B., *Sonic Agency: Sound and Emergent Forms of Resistance*, London, Goldsmiths Press, 2018.
- LaBelle 2021: LaBelle B., *Acoustic Justice: Listening, Performativity, and the Work of Sound*, New York, Bloomsbury Academic, 2021.

- Merleau-Ponty 2012: Merleau-Ponty M., *Phenomenology of Perception*, Oxon, Routledge, 2012.
- Muñoz 2025: Muñoz J.E., *Insegnamento, saperi minoritari e amore*, in *Performance + pedagogia*, Roma, Luca Rossella Editore, 2025.
- Neugebauer 2024: Neugebauer D., *Cruising Corpoliterate Art Mediation. Reflections on the Mediation Program of Adina Pintilie's "You are Another me. A Cathedral of the Body"*, in "CONCEPT", 2023, 27, 2, pp. 96-106.
- Phelan 1993: Phelan P., *Unmarked: The Politics of Performance*, London – New York, Routledge, 1993.
- Rancière 2016: Rancière J., *Dissensus: On Politics and Aesthetics*, London, Bloomsbury Academic, 2016.
- Reynolds 2018: Reynolds J.M. Merleau-Ponty, *World-Creating Blindness, and the Phenomenology of Non-Normate Bodies*, in "Chiasmi International", 2018, 19, pp. 419-434.
- Spivak 1988: Spivak G.C., *Can the Subaltern Speak?*, in Nelson C., Grossberg L. (eds.), *Marxism and the Interpretation of Culture*, Urbana, University of Illinois Press, 1988, pp. 271-313.
- Sterne 2021: Sterne J., *Diminished Faculties: A Political Phenomenology of Impairment*, Durham (NC), Duke University Press, 2021.
- Sternfeld 2013: Sternfeld N., *That Certain Savoir/Pouvoir: Gallery Education as a Field of Possibility*, in "e-flux journal", 2013, 42, pp. 1-5.
- Voegelin 2014: Voegelin S., *Sonic Possible Worlds: Hearing the Continuum of Sound*, Bloomsbury Academic, New York/Londra, 2014.
- Wieseler 2023: Wieseler C., *The Import of Critical Phenomenology for Theorizing Disability* in "Techné: Research in Philosophy and Technology", 2023, 27, pp. 116-137.

Previous volumes:



Vol. 3 No. 1 (2026)

The exhibitions in Japan: Historical perspectives and contemporary relevance

Edited by Naoki Sato



Vol. 2 No. 2 (2025)

Objects on the Move. Unpacking the Narratives of Circulating Exhibitions 1900-1953

Edited by Paola Cordera

MMD - Museum, Materials and Discussions. Journal of Museum Studies is an open-access academic journal in English, French, and Italian, devoted to museology, museography, Cultural Heritage as well as research on audiences and fruition with an international outlook, addressing both the life of museum institutions and collections, and the latest challenges they face in their broad cultural and social dimension.

MMD aims at promoting and enhancing the collaboration among researchers from the field of humanities, social sciences, architecture, and Digital Humanities through their complementary perspectives. It is addressed to scholars, students and professionals working in these specific disciplinary fields, but also readers interested in the current evolution of the debate on issues, methods and tools related to the material and immaterial aspects of museology in its relation to history and contemporaneity, and in connection with the progress of public welfare.

