Giuseppe Silvi

il sogno radicale

autobiografia di un eretico. appunti revb.

botteghe di suono

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1. Introduction: The Workshop as Living Laboratory

> It was really like being an apprentice in a 16th-century workshop. (Nottoli 2019)

The preservation of technology-mediated operatic works presents a fundamental tension between two temporalities: the *opera* as discrete sign inscribed in the past, and the *operazione* as continuous process oriented toward the future[1]. This tension becomes particularly acute in the case of Mario Bertoncini's aeolian sculptures, where the technological mediation is not merely an amplification system but constitutes the very condition of possibility for musical experience.

Bertoncini's works exist today as *botteghe di suono* (sound workshops): audible elements of an absolute, material traces of an unrealized utopia. The term *bottega* deliberately evokes the Renaissance workshop model, where knowledge transmission occurred through direct practice, where the boundary between master craftsman and artist remained porous, and where tools themselves embodied accumulated wisdom. This paper examines how the concept of *bottega* can inform contemporary approaches to preserving and re-activating technology-mediated operatic repertoire, using LAZZARO's 2025 performance project as a methodological case study.

The central thesis articulates as follows: preservation of Bertoncini's works cannot proceed through museum-like crystallization but requires active *maintenance* as interpretative practice. The workshop becomes not merely a site of conservation but a *Laboratorium* in the alchemical sense—a space where continuous material transformation embodies poetic decision-making.

[1] See: `https://github.com/grammaton/il-sogno-radicale/blob/bf51bade8fa8ea7be60f7df9d57efe19a7c4a1d9/src/v03/opera-operazione/2025-10-26-opera-operazione-impaginato.pdf`

2. The Electroacoustic Chain as Unfinished Text

> **Menippo:** As far as I know, however, the crystal microphone offers a limited frequency response, even deficient in the low regions.
>
> **Bremonte:** Exactly. This is precisely the reason for my friend's repeated attempts, for his long sonic research not yet concluded. (Bertoncini 2007)

2.1. Historical Context: The Piezoelectric Problem

Bertoncini's technical writings reveal a persistent preoccupation with the transduction problem: how to render perceptible sounds that exist "richly complex but fundamentally at the threshold of audibility." His solution— adapting piezoelectric crystal microphones to mobile bridges of varying thickness and materials (wood, plastic, cardboard, metal)—represented both an elegant acoustical solution and an admission of technical limitation.

The piezoelectric pickup system functioned according to a dual principle:

1. The strings perform acoustic *production* of sound through aeolian excitation
2. The same strings simultaneously function as *amplification* resonance chamber
3. Electronic amplification occurs from the bridge, where the piezoelectric crystals transduce mechanical vibration into electrical signal

However, Menippo's objection identifies the critical weakness: piezoelectric transducers exhibit severe frequency response limitations, particularly in low frequency regions. This technical constraint determined not merely timbral characteristics but fundamental compositional possibilities. The "unfinished research" that Bertoncini acknowledged becomes, in this light, a hermeneutic opening: the work explicitly contains its own incompleteness as aesthetic principle.

2.2. Contemporary Interventions: New Pickup Strategies

LAZZARO's 2025 reconstruction confronted this incompleteness as both technical and philosophical challenge. The preparation for *Ripresa di Venti* required developing a contemporary electroacoustic chain while maintaining fidelity to Bertoncini's sonic world. Several strategic decisions emerged:

Pickup Selection and Placement The team experimented with multiple transduction technologies:

- Contact piezoelectric pickups (maintaining historical continuity)
- Electromagnetic pickups (addressing low-frequency deficiency)

- MEMS accelerometers (capturing structural vibrations)
- Condenser microphones in near-field configuration (capturing aerodynamic turbulence)

Each technology privileges different aspects of the sonic phenomenon. The piezoelectric crystals respond primarily to direct mechanical stress at the bridge; electromagnetic pickups sense string motion in magnetic field; MEMS devices register structural resonances of the entire frame; condenser microphones capture acoustic radiation and air turbulence around the strings.

Signal Path Documentation The complete electroacoustic chain for the 2025 performances:

```
Bridge vibration → Pickup → Preamplifier → [optional: EQ/dynamics] → Spatial diffusion system
```

Critical parameters requiring documentation:

- Pickup impedance matching and loading effects
- Preamplifier gain structure and noise floor
- Equalization curves applied (if any) and their rationale
- Compression/limiting thresholds (if used)
- Spatial diffusion strategies (point source vs. distributed)

2.3. Philological Questions: Fidelity and Evolution

The technical interventions raise profound hermeneutic questions: What constitutes "fidelity" to a work whose creator explicitly acknowledged its incompleteness? Three possible positions emerge:

1. **Archaeological fidelity**: Reconstruct the 1973-2008 electroacoustic chain as closely as possible, accepting its limitations as historically authentic
2. **Intentional fidelity**: Complete Bertoncini's "unfinished research" by solving the technical problems he identified, thereby realizing the work he intended
3. **Evolutionary fidelity**: Treat the work as living system that continues to develop, incorporating contemporary technologies while maintaining essential sonic characteristics

LAZZARO's approach navigates between these positions, recognizing that Bertoncini himself operated in this liminal space. His continuous modifications to bridge materials, pickup placements, and amplification strategies suggest that the work exists not as fixed object but as *research program*—a set of constraints and possibilities within which each realization constitutes a new experiment.

2.4. The Threshold of Audibility as Aesthetic Principle

The technical challenge of amplifying barely audible phenomena reveals itself as aesthetic necessity rather than mere limitation. The listener's perceptual attention becomes heightened precisely because the sounds exist at the edge of perception. The electroacoustic chain does not simply make sounds louder; it creates a condition of heightened listening, a phenomenological reduction that brackets quotidian acoustic experience.

This principle connects to Bertoncini's broader aesthetic project: the revelation of natural enigmas through technological mediation. The aeolian harps do not produce "new" sounds but render audible sonic worlds that always existed but remained inaccessible to unmediated perception. Technology becomes not prosthesis but *revelation*.

3. Maintenance as Interpretative Practice

> It is our duty to inhabit those places, to dialogue with his characters, to keep his instruments in order, his Workshop. (**silvi2025botteghe**)

3.1. Beyond Museum Conservation

Traditional approaches to instrument preservation emphasize stasis: climate control, minimal handling, preventive conservation. This model, appropriate for historical artifacts, proves inadequate for Bertoncini's sculptures. These instruments were designed for continuous use, for experimental modification, for ongoing dialogue between maker and performer. Their preservation paradoxically requires their activation.

The concept of *maintenance* therefore shifts from conservation to *cura*—care in the sense of both preservation and cultivation. Each intervention in the workshop becomes simultaneously:

- Technical necessity (replacing corroded strings, adjusting bridge pressure, recalibrating air nozzles)
- Interpretative decision (choice of string material affects harmonic content, bridge placement modifies resonance characteristics)
- Transmission of knowledge (documenting why certain adjustments produce specific sonic results)

3.2. Material Interventions: Case Studies

String Replacement and Tensioning The circular aeolian harp contains approximately 1,200 metal strings. Over time:

- Oxidation alters mass and flexibility
- Plastic deformation reduces tension
- Individual strings break, creating gaps in the spectral field

String replacement requires decisions about:

- Material: steel, bronze, brass? Original specifications vs. contemporary availability
- Gauge: maintaining original diameter vs. optimizing for contemporary pickups
- Tensioning: uniform tension vs. graduated to create specific spectral distributions

Each decision affects not merely timbre but the fundamental microintervallique density that Bertoncini sought. The workshop becomes site of continuous negotiation between historical information and contemporary sonic imagination.

Bridge Adjustment and Materials Bertoncini fabricated mobile bridges "of various thicknesses and different materials (wood, plastic, cardboard, metal)." The bridges perform multiple functions:

- Mechanical: transmitting string vibration to resonant body
- Acoustic: defining vibrational nodes and anti-nodes
- Electronic: serving as pickup mounting surface

LAZZARO's preparation involved systematic experimentation:

- Documenting existing bridge configurations
- Testing alternative materials for specific sonic goals
- Developing reproducible bridge fabrication protocols
- Creating notation system for bridge placement in scores

This research constitutes not deviation from Bertoncini's practice but continuation of it. His own "repeated attempts" and "unfinished research" establish precedent for ongoing experimental modification.

Compressed Air System: Pressure, Flow, Nozzle Design Mario Bertoncini stands to compressed air as Prometheus to fire. The workshop's pneumatic system requires continuous attention:

- **Pressure regulation**: 2 bar (as specified for *Istantanee II*) vs. variable pressure for dynamic control
- **Flow rate**: continuous vs. pulsed air streams
- **Nozzle design**: diameter, angle, distance from strings
- **Temperature effects**: compressed air cooling affects metal resonance

The air system embodies the work's conceptual core: the domestication of wind, the transformation of wild air into artistic instrument. Each adjustment to pressure or nozzle angle represents interpretative choice about the character of this domestication—whether the air should whisper or roar, caress or assault the strings.

3.3. Documentation as Maintenance Practice

Every intervention in the workshop generates documentation:

- **Photographic**: before/after states, detail shots of modifications
- **Schematic**: technical drawings of bridge designs, air system configurations
- **Audio**: recordings of sonic results from different setups
- **Written**: rationale for decisions, problems encountered, solutions discovered

This documentation serves multiple futures:

1. **Immediate**: Supporting current performance preparation
2. **Medium-term**: Enabling future restorations and performances
3. **Long-term**: Providing archaeological evidence for 22nd-century scholars/performers

The workshop thus becomes not static repository but *living archive*, accumulating layers of interpretative knowledge embedded in material modifications and their documentation.

4. Notating the Wind: The Problem of the Score

> The composer had constructed the perfect music stand on which air, for the first time, could read itself. (**silvi2025lazzaro**)

4.1. Three Paradigms: Istantanee I, II, III

The three *Istantanee* (Snapshots) present an evolutionary trajectory in notation strategy:

Istantanee I (1995): The Notation of Absence Trebnitz, summer 1995. A circular frame of 1,200 metal strings exposed to wind. The score consists of:

- Instrument specifications (frame dimensions, string count, material)
- Site selection (park of Trebnitz castle)
- Date and duration (unspecified—"until the wind stops")
- Recording protocol (chronicler notes: "14:27 a dog barked in the distance, 14:31 a flock of birds crossed the sky, 14:33 a beetle struck the string bed")

The work's "notation" thus consists of *conditions* rather than prescriptions. The performer is the wind itself; the score merely establishes the possibility-space within which wind can manifest its voices. This represents an extreme position: notation as pure potentiality, the instrument as "library of all possible voices of the unannotatable wind."

Istantanee II (2006): The Notation of Memory A decade later, the same circular harp awaits in a concert hall. Now a human "performer" interrogates the harp using compressed air at 2 bar, fans, and breath. The score specifies:

- Proportional temporal structures based on golden ratio calculations derived from the 1995 Trebnitz wind duration
- Reference to Ovid's Echo myth: "the voice remains; they say the bones took the form of stone"
- Performance instructions regarding air pressure, nozzle angles, approximate durations

The score functions as *mnemonic device*—it recalls what the wind has already spoken. The performer reads not prescriptive commands but traces, archaeological evidence of past sonic events. The notation mediates between the absent wind (1995) and the present performer (2006).

Istantanee III (2008): The Notation of Metamorphosis Rome, 2008. The harp, the performer, real-time electroacoustic elaboration. The score now contains:

- Performance instructions from Istantanee II
- Signal processing algorithms and parameter ranges

- Temporal coordination between acoustic and electronic layers
- Spatial diffusion strategies

The notation becomes explicitly multi-layered: acoustic score + electronic score + spatial score. Yet this complexity maintains connection to the original condition: all layers ultimately respond to the aeolian principle, the wind reading itself through technological mediation.

4.2. LAZZARO's Notation Strategies

Ripresa di Venti (2025) required developing notation adequate to:

- Five performers
- Three historical aeolian sculptures (Kathedrale, Circular Harp, large Spiral)
- Diverse air sources (compressed air, fans, breath)
- Spatial distribution of instruments and performers
- Approximately 20-minute duration

The notation system developed combines multiple representational strategies:

Temporal Structure Rather than metric notation (measures, beats), the score employs:

- **Duration blocks**: Flexible time segments with approximate durations
- **Cue points**: Synchronization moments triggered by acoustic events rather than clock time
- **Density curves**: Graphical representation of overall activity level

This approach acknowledges the fundamental non-metric character of aeolian phenomena. Wind does not organize itself in regular pulsation; the notation should not impose metric regularity alien to the material.

Action Notation For each performer/instrument combination, the score specifies:

- **Air source**: compressed air at X bar, fan at Y setting, breath, natural wind (if outdoor)
- **Point of application**: Which region of string bed, which bars of metal spiral
- **Gesture quality**: Sustained, pulsed, sweeping, localized

- **Approximate intensity**: From pppp (barely touching) to ffff (maximum pressure)

Critically, the notation represents *actions* rather than *results*. The actual sounds produced depend on countless variables: string tension, ambient humidity, previous performance history of the instrument, microscopic variations in air pressure. The score creates conditions for sonic emergence rather than determining specific outcomes.

Spatial Notation The three sculptures occupy specific positions in performance space. The score includes:

- Ground plan showing instrument and performer locations
- Movement paths for mobile performers
- Acoustic zones (where each instrument is primarily audible)
- Listening positions (where audience focus should be directed)

Spatial distribution becomes compositional parameter: the *Kathedrale* produces dense harmonic fields, the *Circular Harp* creates microintervallique continuums, the *Spiral* generates inharmonic metallic resonances. Their positioning determines possibilities for acoustic interference patterns, spatial counterpoint, timbral blending.

4.3. Notation as Hermeneutic Opening

The notational strategies developed for Bertoncini's works reveal notation's dual function:

1. **Prescriptive**: Transmitting composer's intentions to performers
2. **Descriptive**: Documenting what occurred in previous realizations

Traditional Western notation emphasizes the prescriptive function: the score as command, the performer as executor. Bertoncini's works suggest alternative model: notation as *hermeneutic opening*, as question posed to material conditions. The score asks: "What voices can emerge when air encounters these metal strings under these conditions?" Each performance constitutes a response, never definitive, always provisional.

This understanding has profound implications for preservation. The "authentic" performance cannot mean reproduction of some ur-text but rather faithful engagement with the hermeneutic question the work poses. Notation preserves not fixed sonic surface but the *condition of questioning*.

5. Documentation as Archaeology of the Future

5.1. Multi-Modal Recording Strategies

LAZZARO's 2025 performances generated comprehensive documentation:

Audio Recording Multiple simultaneous recordings:

- **Pickup feeds**: Direct recordings from each instrument's transduction system (preserving pure signal before amplification)
- **Near-field microphones**: Capturing acoustic radiation from each sculpture
- **Ambience microphones**: Room acoustics and acoustic interactions between instruments
- **Binaural recording**: Simulating listener perspective from specific audience position

This multi-track approach enables:

- Post-performance analysis of individual instrument contributions
- Alternative mixing strategies for different presentation contexts
- Comparison between transduced and acoustic sound
- Spatial reconstruction through ambisonic rendering

Video Documentation Multi-camera setup capturing:

- **Performer actions**: Gesture, body position, air source manipulation
- **Instrument response**: String vibration patterns, frame resonances (rendered visible through high-speed capture and macro cinematography)
- **Air dynamics**: Using smoke or light scattering to visualize airflow patterns
- **Audience response**: Listening behaviors, spatial positioning

The video archive serves multiple purposes:

- Pedagogical: Teaching future performers gestural techniques
- Analytical: Correlating actions with sonic results
- Artistic: Creating standalone video works
- Archaeological: Preserving evidence of 2025 performance practice

Parametric Data Logging Beyond audio/video, systematic logging of:

- Air pressure readings (logged via digital pressure sensors)
- Environmental conditions (temperature, humidity, barometric pressure—all affecting acoustic behavior)
- Performer locations (via motion capture or manual notation)
- Technical issues and solutions (troubleshooting log)

This data constitutes meta-documentation: information about the conditions of documentation itself, enabling future users to interpret the primary audio/video materials with full contextual understanding.

5.2. Open Formats and Long-Term Accessibility

The documentation adheres to open standards:

Audio Formats

- Master recordings: FLAC (lossless compression) at 96kHz/24bit
- Distribution versions: Multiple formats (FLAC, WAV, MP3) for different use cases
- Metadata: Embedded BWF (Broadcast Wave Format) chunks containing full technical and descriptive information

Video Formats

- Master: Open-source codec (FFV1 in Matroska container)
- Distribution: H.264/H.265 with open-source encoding
- Metadata: Embedded technical, descriptive, and rights information

Documentation Text and Graphics

- Text: Markdown and LaTeX sources (plain text, version-controllable)
- Graphics: SVG for vector graphics, PNG for raster images
- Data: CSV and JSON for tabular and structured data
- Code: All signal processing algorithms documented in open-source languages (Python, Faust, Csound)

Repository Structure All materials organized in Git repository with clear directory structure:

```
bertoncini-archive/
├── instruments/
│   ├── circular-harp/
│   │   ├── specifications/
│   │   ├── maintenance-logs/
│   │   └── photos/
│   ├── kathedrale/
│   └── spiral/
├── performances/
│   ├── 2025-09-22-lazzaro-rome/
│   │   ├── audio/
│   │   │   ├── masters/
│   │   │   └── distribution/
│   │   ├── video/
│   │   ├── scores/
│   │   ├── parametric-data/
│   │   └── documentation/
├── research/
│   ├── electroacoustic-chain/
│   ├── notation-systems/
│   └── interviews/
└── README.md
```

5.3. Creative Commons Licensing

The documentation employs tiered licensing:

- **Technical documentation**: CC BY-SA 4.0 (requiring attribution and share-alike)
- **Performance recordings**: CC BY-NC-SA 4.0 (non-commercial, requiring attribution and share-alike)
- **Musical scores**: CC BY-NC-ND 4.0 (preserving performance practice integrity while allowing distribution)

This licensing strategy balances multiple concerns:

- Honoring Bertoncini's estate and legacy
- Enabling scholarly and educational use

- Preventing commercial exploitation
- Ensuring future accessibility

5.4. The Archive as Score

The comprehensive documentation constitutes not merely preservation of past performances but *score for future realizations*. Future performers in 2075 or 2125 will encounter this archive as primary text. They will observe:

- How we held the air nozzles in 2025
- What sounds we privileged through our pickup choices
- Which gestural vocabularies we developed
- What compromises we made with degraded instruments

They will then make their own decisions, continuing the "unfinished research" that Bertoncini acknowledged and that we have inherited. The archive becomes not endpoint but relay point in multigenerational dialogue.

This understanding transforms documentation from bureaucratic necessity to artistic practice. Each photograph, each audio file, each technical note constitutes a message to unknown future interpreters. We curate this archive not for ourselves but for archaeologists who will excavate our sonic world long after compressed air has perhaps become obsolete, replaced by technologies we cannot yet imagine.

6. The "Toward the Concert" as Methodology

6.1. Interdisciplinary Convergence

The preparation for LAZZARO's September 2025 concert constituted research process in itself. The ensemble's name encodes this position: LAZZARO, the last student of Bertoncini, "the one from the back row," awakens the dead instruments not through resurrection but through studious interrogation.

The preparation involved multiple disciplinary perspectives:

Historical Research

- Studying Bertoncini's writings, particularly the dialogic structure of *Arpe Eolie e altre cose inutili*
- Analyzing recorded performances from 1995-2008
- Interviewing musicians who worked with Bertoncini (Giorgio Nottoli, etc.)
- Examining archival photographs of instrument construction

Technical Investigation

- Systematic acoustic analysis of the three sculptures
- Experimentation with pickup placement and types
- Development of air delivery systems
- Testing spatial configurations in performance venue

Interpretative Exploration

- Developing gestural vocabularies for air manipulation
- Discovering sonic possibilities through systematic exploration
- Negotiating performance roles among five performers
- Creating notation adequate to discoveries

Philosophical Reflection

- Interrogating concepts of authenticity and fidelity
- Considering the work's ontological status (object vs. process)
- Analyzing Bertoncini's dialectical methodology (Bremonte/Menippo)
- Situating the project within broader questions of repertoire sustainability

These perspectives did not operate sequentially but in continuous dialogue. A technical discovery (e.g., electromagnetic pickups revealing previously inaudible low frequencies) generated historical questions (Did Bertoncini want these frequencies? If technology had permitted, would he have included them?) which informed interpretative decisions (Should we feature or minimize these frequencies?) which required philosophical consideration (What does "fidelity" mean for unfinished research?).

6.2. Rehearsal as Research

The ensemble conducted rehearsals not as preparation for predetermined performance but as structured exploration. Each session followed protocol:

1. **Documentation of starting conditions**: Instrument state, environmental conditions, technical setup
2. **Focused experimentation**: Testing specific parameters (air pressure, pickup placement, performer positioning)

3. **Systematic recording**: Capturing all trials for subsequent analysis
4. **Collective reflection**: Discussion of discoveries, problems, questions
5. **Documentation of decisions and open questions**: Maintaining research journal

This methodology yields multiple outputs:

- Performance-ready interpretative strategies
- Technical documentation of instrument behavior
- Comparative recordings for analytical study
- Pedagogical materials for future performers

6.3. The Concert as Provisional Synthesis

The September 22, 2025 performance at Goethe-Institut Rome represented not conclusion but *provisional synthesis* of research process. The concert fixed—temporarily, for that evening—certain decisions:

- These pickup configurations
- These air pressures
- These gestural approaches
- This temporal structure

But the research continues. Post-concert analysis revealed:

- Acoustic phenomena recorded but not perceived during performance
- Alternative strategies that might have been more effective
- Technical problems requiring solution
- New questions for investigation

This cycle—research, synthesis (performance), analysis, renewed research—mirrors Bertoncini's own practice. His "repeated attempts" and "unfinished research" establish precedent for understanding the work as iterative process rather than fixed object.

6.4. Transmission Beyond Documentation

The "toward the concert" methodology generates knowledge that exceeds documentation's capacity. Certain understandings emerge only through embodied practice:

- The tactile sense of air pressure at different settings
- The visual reading of string vibration patterns
- The acoustic judgment of when instrument reaches resonance
- The ensemble coordination through listening rather than visual cues

This *tacit knowledge* (**polanyi1966**) cannot be fully textualized. It requires direct transmission, apprenticeship, the workshop model that Nottoli invoked. LAZZARO's practice thus becomes not merely documentation project but *living pedagogy*—the ensemble as bottega, maintaining not just instruments but practices, not just objects but ways of knowing.

Future performers will need both the archive (documentation) and the lineage (embodied transmission). The archive provides information; the lineage provides *formation*. Together they constitute preservation adequate to works whose essence lies not in fixed score but in ongoing inquiry.

7. Sustainability and the Ecology of Practice

7.1. Material Sustainability

Bertoncini's aeolian sculptures present specific sustainability challenges:

Strings

- Gradual oxidation requiring periodic replacement
- Availability of specific gauges and materials
- Environmental impact of metal production

Compressed Air System

- Energy consumption of air compressor
- Noise pollution during performance
- Carbon footprint of pneumatic infrastructure

Electronic Components

- Pickup longevity and replaceability
- Amplification system power requirements
- Electronic waste from obsolete equipment

The ensemble confronts these challenges through:

- Documenting specifications to enable future sourcing
- Exploring alternative air sources (manual fans, breath)
- Prioritizing repairable over replaceable electronics
- Developing skills in lutherie and electronics repair

7.2. Economic Sustainability

Technology-mediated opera faces economic pressures:

- Specialist technical knowledge required
- Equipment costs (instruments, amplification, documentation)
- Venue requirements (space, acoustic treatment)
- Limited audience compared to standard repertoire

LAZZARO's model addresses these through:

- **Multi-functionality**: Performers as technicians, researchers, documentarians
- **Collaborative funding**: Combining institutional support (Fondazione Isabella Scelsi, Festival ArteScienza) with grassroots fundraising
- **Open documentation**: Sharing knowledge to reduce redundant research costs for future projects
- **Pedagogical integration**: Embedding research in educational contexts (conservatory partnerships)

7.3. Epistemological Sustainability

Beyond material and economic concerns lies question of *knowledge sustainability*: How to maintain understanding of these works across generational gaps?

The challenge intensifies with time:

- 2025: Direct students of Bertoncini still active
- 2045: Students of students, oral tradition weakening
- 2075: Only documentation remains, no direct lineage
- 2125: Historical distance comparable to our relation to 1925 avant-garde

Each temporal remove requires different preservation strategies:

Near-term (2025-2045)

- Intensive documentation of tacit knowledge
- Oral history interviews with all direct collaborators
- Establishment of performance traditions and lineages

Medium-term (2045-2075)

- Maintenance of instruments and documentation archives
- Periodic revival performances to test documentation adequacy
- Development of scholarly literature and critical traditions

Long-term (2075-2125+)

- Archaeological approach: reconstructing practice from documentation
- Acceptance of historical distance and interpretative freedom
- Potential for radical re-invention as historical understanding evolves

7.4. Ecological Model: The Workshop as Ecosystem

The bottega provides model for sustainable practice. Like ecological system, the workshop maintains itself through:

Cyclic Processes

- Performance → analysis → modification → rehearsal → performance
- Knowledge → practice → discovery → documentation → knowledge

Diversity

- Multiple interpretative approaches coexisting
- Various technical solutions to similar problems
- Different performance contexts and purposes

Adaptation

- Responding to changing technological landscape
- Incorporating new performance practices
- Maintaining core identity while evolving

Resilience

- Distributed knowledge (not dependent on single master)
- Documented practices (surviving loss of tacit knowledge)
- Flexible works (accommodating multiple realizations)

This ecological understanding suggests preservation strategy fundamentally different from museum model. Rather than attempting to freeze works in "original" state, we cultivate conditions for their continued evolution. The goal becomes not crystallization but *sustained vitality*.

8. Conclusions: The Duty of the Living

> How to honor music
> to listen without acting
> without sequences of comments
> how to be silent not before
> but inside music
> how to let it undo
> the heart and scramble the thought.
> A sonic landscape
> confronts us everywhere and invites:
> to be music is flight from noise
> is symphonic ear
> toward the voice of silence
> toward the count of what remains. (**silvi2025botteghe**)

8.1. Summary of Findings

This study has examined preservation and sustainability of Mario Bertoncini's technology-mediated works through LAZZARO's 2025 performance project. Key findings include:

Technical

- The electroacoustic chain represents unfinished research requiring ongoing development
- Maintenance practices constitute interpretative decisions rather than neutral conservation
- Documentation must be comprehensive, multi-modal, and format-agnostic for long-term accessibility

Methodological

- The "toward the concert" process generates knowledge through interdisciplinary convergence
- Rehearsal as research produces multiple valuable outputs beyond performance preparation
- The workshop model enables transmission of both explicit and tacit knowledge

Philosophical

- Fidelity to unfinished works requires evolution rather than crystallization
- Notation functions as hermeneutic opening rather than prescriptive command
- Preservation means maintaining conditions for questioning, not fixing answers

8.2. Implications for Contemporary Opera

The Bertoncini case study suggests broader principles for technology-mediated opera:

Against Fetishization of Original Technologies Historical authenticity cannot mean slavish reproduction of obsolete technologies. When original equipment becomes unavailable, contemporary alternatives that preserve essential sonic characteristics prove more faithful than archaeological reconstruction that produces degraded results.

For Documentation as Creative Practice Documentation should not be afterthought but integral component of artistic process. The archive constitutes not merely preservation of past but score for future.

For Open Knowledge Commons Proprietary systems and closed documentation threaten long-term sustainability. Open formats, Creative Commons licensing, and transparent technical specifications enable broader communities of practice to sustain works beyond original creators' lifetimes.

For Workshop Pedagogy Conservatory education should integrate practical workshops where students engage directly with instruments, electronics, and maintenance practices. Technical knowledge cannot remain separated from interpretative knowledge.

8.3. Future Research Directions

This study opens multiple avenues for investigation:

- **Comparative studies**: How do preservation strategies differ across technology-mediated works (live electronics, interactive systems, networked performances)?
- **Perceptual studies**: How do audiences experience works performed with updated technologies vs. period equipment?
- **Economic modeling**: What organizational and funding structures best support sustained engagement with challenging repertoire?
- **Notation theory**: Can formal systems be developed for notating complex electroacoustic interactions?
- **Software archaeology**: How can obsolete software environments be preserved and emulated?

8.4. The Radical Dream

Mario Bertoncini's legacy resides not in fixed objects but in *radical dream*: that wind could become music, that breath could be sculpted, that the inaudible could be revealed through technological mediation. This dream remains incomplete—as Bertoncini acknowledged, the research continues.

Our duty as inheritors involves neither museum preservation nor abandonment but *active stewardship*. We must inhabit the workshop, dialogue with the instruments, keep the tools in order. We must ask the questions the works pose, knowing answers remain provisional. We must document our attempts so future ar-

chaeologists can reconstruct not just what we did but why we did it, what we hoped for, what remained beyond our reach.

The botteghe di suono await their next inhabitants. The air continues to blow. The strings still await excitation. The work—unfinished, as all authentic works must be—calls to those willing to take up its questions.

> Born too late to become a Workshop Master, deceased too soon to have LAZZARO in the Workshop. Mario, by bending words, writing interweavings of metal, concealed potential musical forms throughout his life. (**silvi2025lazzaro**)

It falls to us, now, to unfold those potentials.

Riferimenti bibliografici

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Nottoli, Giorgio (2019). *Breve riflessione su Mario Bertoncini*.