

Laika: A Bio-Integrated Ambient Interface for Ecological Agency

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Abstract— While ecological data is abundant, it is rarely integrated into everyday perception or emotional awareness. Since lichen is a proven indicator of air quality, Laika proposes a low-volume embedded system that augments a living lichen substrate to translate environmental conditions through a dual-timescale ambient data interface. Biomimetically inspired by the thallus structures of Umbilicariaceae lichen, the enclosure regulates gas exchange and hydration. A microcontroller retrieves local pollution data and modulates light and humidity on the lichen surface. The project builds on the author's experience developing a bioluminescent algae display prototype for an art installation.

I. INTRODUCTION / BACKGROUND

While there is an abundance of weather apps etc., there is a gap translating environmental data into meaningful, emotive everyday lived experiences. Laika bridges this gap by operating across two timescales: short augmented ambient data surface changes reflecting current conditions and long-term shifts in lichen health as environmental memory. The living interface positions the user as a more-than-human steward rather than merely a passive data consumer. The low volume production invites the user in as citizen science participant.

II. RELATED WORK

Ambient information systems and data physicalisation research shows that peripheral, material displays can communicate continuous environmental data more intuitively and emotionally than screens [1,2]. Biodesign research further demonstrates that living organisms can function as interactive substrates, though most examples remain in the lab or gallery [3]. As a functional experimental design artefact, Laika treats growth and decline as meaningful signals rather than failures [4]. Beyond representing ecological data, it embodies it through a living lichen interface that closens the user-lichen umwelt [5].

III. THE BIOLOGICAL BASIS FOR ACTIVE BIOMONITORING

Lichen is a well-established bioindicator of air quality, with visible changes linked to pollution exposure and some strains can even actively improve air quality [6].

Laika builds on the author's earlier co-led project, Phycologica, a bioluminescent algae interactive display installation that revealed key challenges in maintaining living organisms within electronic systems but with audience research that indicated a deeper emotional impact by centring an interactive experience around a

more-than-human being, with 95% of the audience



reporting that the experience changed them in a positive way, towards feeling more hopeful.

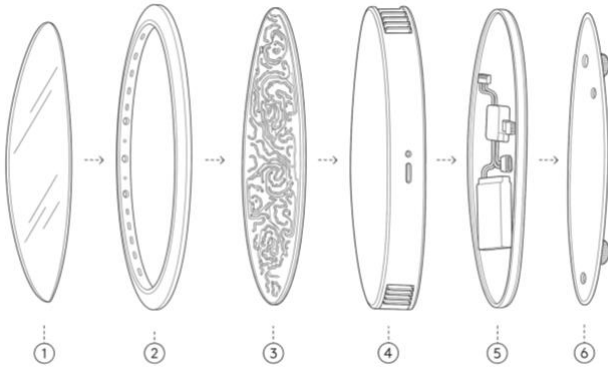
1. Previous one-off bioluminescent algae display

IV. LOW VOLUME DESIGN SYSTEM ARCHITECTURE

Laika will be a low-volume embedded device that uses edge sensing, may send and receive air quality data and modulates light and humidity on a living lichen substrate. A microcontroller controls a low-power LED array and moisture system housed within a semi-porous 3D-printed enclosure inspired by Umbilicariaceae thallus structures [7], balancing airflow and humidity while reducing mould risk- a typical problem in bioart installations. It will be powered by USB-C and/or solar.

In the short term, changes in hydration and colour reflect current environmental conditions. The lichen's growth or decline records longer-term ecological trends. Continuous logging data can later be studied for correlations.

A later software update may add a community layer, were the owners can share the current state of Laikas worldwide to feel a sense of support.



2. Exploded sketch of low volume prototype main layers

Description of layers in Figure 2	
Layer	Description
1	Protective transparent shield
2	Sensors and LED ring
3	Living lichen layer on an artificial parametrically designed rock-like substrate
4	Biomimetic atmospheric regulator case with sealed back for electronics protection
5	Electronics hardware, wiring and power connector
6	Clip-on back plate with feet and mounting options

V. RESPONSIBLE INNOVATION

Laika reframes the human-computer-nature relationship from passive consumption to active care. By exposing the needs of the lichen, the system invites ongoing care and long-term observation. Lichen survival depends on both environmental quality and user stewardship.

The design prioritises low-volume fabrication using 3D-printed housings and off-the-shelf electronics, with low-power operation and replaceable components. Laika catalyses a networked community of active ecological stewards to monitor, care and protect and moves beyond passive, screen-based dashboards [3].

VI. CONCLUSION

Laika will demonstrate that by integrating the biological, interactive systems can foster deeper connections to the environments we inhabit. By collaborating with lichen as a living, breathing partner rather than a data-transmission tool, we move toward a more-than-human future that prioritises duration, care, and embodied awareness.

VII. AUTHOR BIO

Jon Somerscales is an Interaction Designer whose practice spans experimental electronic systems and ecologically engaged interactive design. His current research investigates bio-interaction and living interfaces towards regenerative design. Laika extends this inquiry after his co-



led Phycologica project—an exhibition-scale interactive installation using bioluminescent algae.

3. Possible visualisation of Laika

VIII. ACKNOWLEDGEMENTS

Phycologica, the artwork that I co-led that helped inform, in the lineage sense only, that is discrete from this idea, was funded by CO2RE via Studio Blue Green. That project was carried out by a team, details of which can be found elsewhere.

Although not used to generate the Laika concept itself, AI tools were used to assist in writing this proposal, including Chat GPT and Claude. Nano Banana 2 was used to assist with the conceptual image generation from hand-drawn sketches and textual descriptions.

IX. REFERENCES

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