Heard

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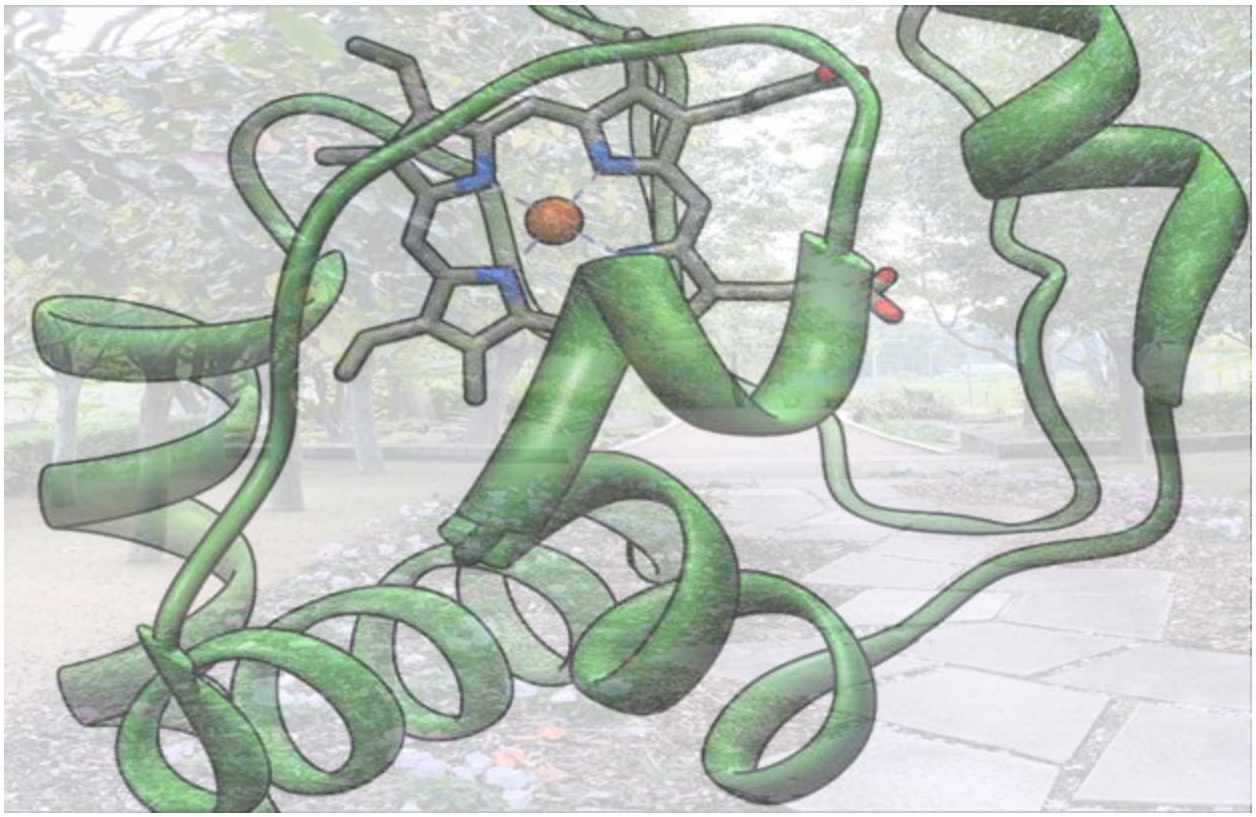
Abstract

Challenged to create a work for a garden, the authors started with a simple key word search in Google Scholar for "site specific installation“ and were returned articles about the movement of proteins into cells, or electroactive units into layers of dendrons. This exposed us, the creators of *Heard*, to a world of drawings, photos and diagrams, a library of analogues illustrating the chemistry of life. Fascinated by how the phrase "site specific installation" is shared between the disciplines of science and art, the authors looked to create a different kind of analogue. Using Wilson’s Consilience Theory, the authors/artists used multiple sources of evidence to drive a conclusion. In this case, the authors created an artifact that affords a glimpse of sometimes invisible but not insignificant, unheard and unseen connections between all living things. In pushing into the affordances of the materials and technologies, the final artefact challenges traditional conceptualisations of what chemistry, and therefore by extension, what life looks like.

Keywords

Transmedia story telling; science and art



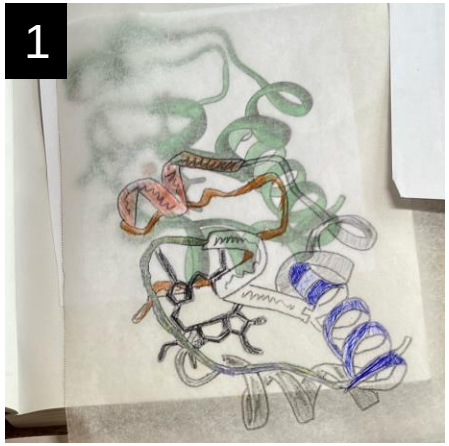
Introduction: The co-creation experience

It is important to note that we approach this experimental investigation through a lens of collaborative artistic endeavor. We are not designing according to the ideas someone else has established for us. We create together to include our different expressions of an investigation after the spark. By spark, we mean the germ of an idea. Crippa [1] (2023) says “I could forget everything I’ve learned about what is “good” or visually “successful” and go back to the simple question of what is *meaningful* for me” (p.126). Interdisciplinarity warrants input from different perspectives to create unity in meaning. Here, we do not attempt to embrace an aesthetic of ornamentation or beauty. It's not even a play on the axiom 'be seen and not heard'. Rather, we invite external participants to experience an impression of items crucial to the existence of living things.

We want the silence of this existence to be heard. Perhaps considered visually inaesthetic by some, *Heard* is beautiful to us due to its unashamed representation of our interpretation of the unseen. *Heard* was originally displayed as a site-specific installation (see Illustration 19) as part of ‘Eden Unearthed’ (see Illustration 20).

About Cytochrome C

Cytochrome C is found in the cells of all living organisms and plays an essential role in the vital process of generating energy by passing electrons along a chain of proteins in mitochondria. As the electrons move, energy is produced, which powers various cellular activities. Without Cytochrome C, this energy production would grind to a halt, leaving cells without the power they need to function, and the living organism would begin to shut down.



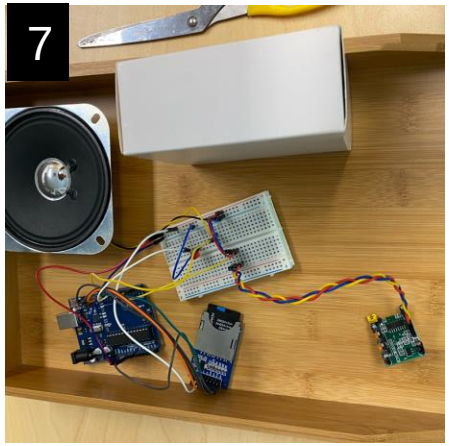
Process

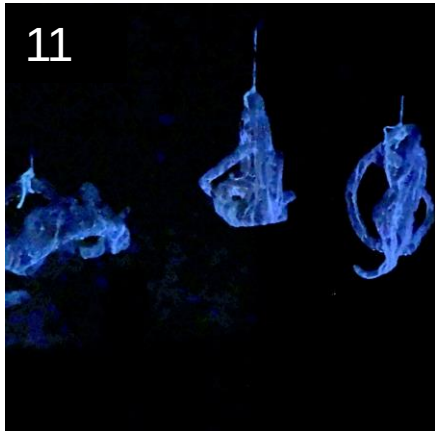
In *Heard* we express an abiding interest in that which we cannot see. Sparked by an interest in the wonders of biological forms and ways of articulating the intersection between the arts and sciences, our investigations led us to the Cytochrome C. We did some drawings (1). We experimented with materials and settled on clay due to its relationship to internal landscapes and its malleability (2). Clay responds to the human hand. It is a record of a conversation between human and material. Our first experiments were literal, then interpretive and notably non-digital (3+4).

Extending the concept of 'conversation', we recorded the dialogue from our production meetings (5) and entered the data into an online text to sound generator before manipulating the sound through digital multitrack audio mixing processes to represent what we imagine to be an auditory interpretation of the Cytochrome C (6).

It is difficult to confirm if such proteins emit sound. However, studies of the vibrations found in various overlaying patterns of proteins at a molecular level, behave in a variety of ways, incorporating a range of frequencies which manifest as sound [2].

Scientific impacts of such studies afford new ways of analysing mechanical behaviours measuring mutations in the fundamental chemical reactions between atoms. To the non-scientist, the extraction of audible frequencies is exciting from a creative arts perspective. The problem we faced in *Heard* was *how do we share our 'cytosounds' in a meaningful and memorable way?* The solution was found in interdisciplinary collaboration, proposing the inclusion of electronics to the work. Reliance on such technologies was an essential part of the realization of our creative process (7) thereby exposing the support of experts as necessary to our creative endeavor (8).





Six ceramic orbs were created in a most analogue fashion. The fragility of the orbs required careful manipulation into and out of a kiln. Transportation was also precarious. Continuing with the theme of unseen and unheard, we experimented with a photoluminescent surface treatment for the Cytochrome ceramic structures (9, 10, 11 & 21). The chosen environment in which the structures would be situated was external. A garden setting. Only visible to the public during daylight hours. Nonetheless we were intrigued by the idea of the Cytochromes being visible at all times, regardless of human interaction. The unseen and unheard nature of the work prevailed.

As mentioned earlier, our intention was for a human interactive element to trigger the Cytosounds embedded into the work. Integrating the .wav sound files in the Arduino code for infra-red motion sensor activation contributed to the interdisciplinary method of creating this experience (12). Figuring out how to use the Arduino (an open-source electronic prototyping platform enabling users to create interactive electronic objects [5]) resulted in several attempts in which a range of file types and mini-speakers were tested for appropriate volume emission. Randomisation in the code enabled the motion sensor to activate three different sounds when motion was detected according to a specified range. Parallel paths of activity leading to the installation of *Heard* in its site-specific location saw each orb suspended for a coating of photoluminescence (10 & 11) and a housing for the Arduino being designed and made from a simple plastic container painted with nail polish (13). Installation at the site required some adoption of the three Ss of engineering: strength, structure, and serviceability (14 & 15). Sustainability criteria for this work were a) waterproof; b) insect resistant; c) able to be attached at a height which prevented accidental activation but; d) serviceable, as the power source was a 3-volt battery that would eventually fail and be replaced.

Therefore, the unit was sealed, camouflaged, and secured at a two-meter height in a tree where the 180° parameter of the ultrasonic sensor would be safe from ground dwelling night animals and the large lizards whose habitat we were invading. Marine rigging with a series of crimps was used to hang the individual pieces as well as construct a matrix of rigging to prevent movement side to side that would result in collision. Upon testing, the entire unit was a success (19, over page).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Conclusion

Wilson (1999) says when we have unified enough certain knowledge, we will understand who we are and why we are here. We say the figuring undertaken as a result of our co-creation resonates beautifully with such synthesis. Wilson's consilience theory provides a ripe environment in which we are able to "put together the right information at the right time, think critically about it, and make important choices wisely" [3]. Likewise, the interdisciplinary nature or our work affords us many opportunities to collaborate with a wide range of people possessing a wide range of skills. *Heard* is one of myriad convergent art/science explorations undertaken by the curious. One attribute we all share at least, is curiosity.

Heard was an experience of convergence, heavily reliant on transactional relationships in which the subjective and personal states of co-creation were joyfully abundant. This was not a linear make. Analogue and digital streams were enacted and united to realize the experience. The essential role of Cytochrome C as energy generator never left our minds while developing and constructing this experience. The Cytochrome C exploration found us continually on the breach, as Keane & Keane (2016) frame it, describing how the divergent study of relationships is informed by the convergent study of particulars [6].

Postscript: Unseen but not unheard

Visitors to *Heard* may not even see the Cytochrome Cs. As you can see above, they are almost invisible – unseen. They will, however, hear them. As a postscript, access to the site-specific experience can be found here:

1. Cytosounds
2. Author interview

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We particularly enjoyed the relationship we forged with the reptiles.

References

[1] Crippa, Barbara. 'On Challenging Power Through the Individual'. In *Feminist Designer – on the personal and the political in Design*, edited by Alison Place, 126-226 MIT Press, 2023.

[2] Qin, Zhao, and Markus J. Buehler. "Analysis of the vibrational and sound spectrumof over 100,000 protein structures and application in sonification." *Extreme Mechanics Letters* 29 (2019): 100460.

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[4] Bushnell, Gordon W., Gordon V. Louie, and Gary D. Brayer. "High-resolution three-dimensional structure of horse heart cytochrome c." *Journal of molecular biology* 214, no. 2 (1990): 585-595.

[5] Arduino. 'What is Arduino?' Last modified 2023. https://www.arduino.cc/en/Guide/Introduction.

[6] Keane, Linda, and Mark Keane. "STEAM by Design." *Design and Technology Education* 21, no. 1 (2016): 61-82.

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Authors' Biographies

Work colleagues Dr. Sue-Ann Stanford and Dr. Melissa Silk are two artists who have recently begun collaborating in the creation of multi-media art works. Their first piece 'Dyadic, Generally' was selected for the international show Paper on Skin 2022. 'Heard' was their second collaborative piece and was selected for exhibition in Eden Unearthed (2022/2023). They share a common fascination with the intersection of maths, science, and art, working to bring these elements together in intriguing and original ways. 1st AUTHOR has an international reputation for their work; 2nd AUTHOR re-ignited her creative practice during the COVID-19 lockdowns, and has since exhibited her work, and presented at conferences, most recently with 1st AUTHOR on the use of GAI in the creative process. The authors are now working on a newly commissioned piece that combines origami, R Buckminster Fuller's engineering principles, and augmented reality projections of animated micro landscapes.

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