

Heavy Metal

An Interactive Environmental Art Installation

NIGEL HELYER, JOHN POTTS AND MARK PATRICK TAYLOR

ABSTRACT

This article discusses *Heavy Metal*, an interactive installation work by Nigel Helyer. The authors situate this work within the context of a collaboration among environmental science, art and media theory, a three-year research project entitled *When Science Meets Art: An Environmental Portrait of the Shoalhaven River Valley*.

Heavy Metal (2016) is an art installation with an interactive camera vision system and digital audio by Nigel Helyer (see Fig. 1). It was conceived and realized as part of a three-year Australian Research Council Linkage Grant project, *When Science Meets Art: An Environmental Portrait of the Shoalhaven River Valley*. This research project is a collaboration between artist Nigel Helyer, environmental scientist Mark Taylor and media theorists John Potts and Mark Evans.

The overall aim of the project is to create a complete environmental portrait of Bundanon, a region of 1100 hectares (2700 acres) in rural New South Wales bequeathed to the Australian people by the modernist painter Arthur Boyd in 1993. The project uses techniques from environmental science, artistic practice, information technology, media technology and cultural history. Data representing environmental quality at Bundanon is digitally transformed into visual information and sound and communicated by various means: in numerous artworks, on a website devoted to the project and through GPS onto smartphones for mobile users on site at the Bundanon property. The environmental portrait of Bundanon also incorporates the social and cultural history of the region as it pertains to its environmental condition. Science meets art in the communication of environmental data through artworks and media technology. *Heavy Metal* has been created as part of this process.

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To generate the data programmed into *Heavy Metal*, a handheld x-ray fluorescence spectrometer operated by Mark Taylor was directed at paints used in the unfinished oil painting *Return of the Prodigal Son* (c. 1997) by Arthur Boyd, situated in the artist's studio at the Bundanon homestead. The user of the *Heavy Metal* installation is able to activate the mineral analysis of the painting by moving a video camera aimed at the canvas; the screen interface displays a highly magnified color "target" area from the painting, along with the RGB values and the predominant minerals present, which are shown as elements of the periodic table. The installation system then translates the stream of mineral data into sound sampled from the Steinway piano at the Boyd homestead. The sound is layered in two components: a generalized harmonic chord structure that corresponds to the color overlaid by individual note highlights that are indexed to the distribution of the most prominent minerals. The computer monitor gives feedback on the area of interest, color ratios and a graphical display of the minerals detected.

ART, SCIENCE, ENVIRONMENT

The artworks created as part of the *When Science Meets Art* project, including *Heavy Metal*, draw on recent research that has sought to develop collaboration between art and science, particularly in the context of technology and the environment. Siân Ede has proposed that "[the fragile environment] might well become the most crucial matter for the future concerns of both artists and scientists" [1]. Concern for the environment has become a central political and artistic issue in the contemporary world. Recent publications have emphasized the heightened regard for the environment in eco-aesthetics, in art in support of ecological sustainability, and "art and ecology now," as manifest in land art incorporating landscape, earthworks, environmental art, sculpture and nature-based installation art [2]. Sean Cubitt has argued that ecopolitics is indeed "the single largest unifying political discourse of the early 21st century" [3]. Cubitt suggests that artworks can voice the contradictions of their period, including the role of technology. It may be demonstrated that "not



Fig. 1. *Heavy Metal*, installation view, Arthur Boyd's studio, Bundanon, 2016. (© Nigel Helyer)

all technologies are instrumental, that is, used as instruments for domination over nature" [4].

Environmental sustainability is integral to a number of previous installation artworks by Helyer, such as *Ecolocated* (2011) and *VoxAura; The River Sings* (2011), several of which depend on technology to convey ecological themes. The history as well as environment of specific locations is conveyed in the works, which operate as multifaceted sounding boards of history and culture [5]. Environmental artworks embrace a physical site, its social history and environmental recordings and scientific data to form a representation of the site that is readily accessible to the public.

A BRIEF ENVIRONMENTAL HISTORY OF BUNDANON

The Bundanon region is the site of our environmental portrait because of its distinctive natural and cultural character. The region has been overseen by the Bundanon Trust since 1993, when Arthur Boyd's gift to the Australian Commonwealth included adjoining properties as well as a huge collection of artworks and archive material. Bundanon today is an artists' retreat and education center, while the former homestead and studio of Arthur Boyd are open to the public. The 1100 hectares of the region, including a winding section of the Shoalhaven River, incorporate 11 different vegetation communities and an abundance of flora as well as native wildlife. Each year, around 300 artists take advantage of the artist residency program, living at Bundanon while work-

ing on art projects in all forms and media. Some of these artworks, when completed, have been based on, and within, the landscape [6].

The social history of Bundanon has left imprints on the land. The indigenous people whose traditional country encompassed the contemporary Bundanon Trust properties were part of the Yuin group, with close ties to the Wodi Wodi people to the north. The scant traces of indigenous habitation suggest that the lower Shoalhaven was an area moved through rather than settled, with the river an important means of travel by canoe [7]. European occupation brought a radical transformation of the landscape through tree-felling and then clearing for agriculture. Cedar-cutters felled valuable red cedar trees (cedar was reportedly Australia's first export) from 1811; in 1812 there were nine ships transporting cedar back to Sydney. The clearing of the forest removed the site of traditional indigenous life and opened the land for agriculture. Six hundred acres of land were sold to R.H. Browne in 1832, on the condition that "55 acres were to be cleared and cultivated and fences erected" [8]. This and other adjoining properties were bought by Kenneth McKenzie in 1838; the McKenzie family endured severe periodic flooding of the Shoalhaven River to establish their farm and farm buildings. The destructive flood of 1860, which wiped away buildings along the river, prompted McKenzie's building in 1866 of the two-story sandstone homestead. This house today is open to the public as the former house of Arthur Boyd.

The McKenzie agricultural estate of Bundanon focused on dairy farming and maize crops; other farmers cleared and cultivated land in adjoining areas. The property was leased to tenant farmers running dairy and beef cattle for half a century. The next major transformation of the Bundanon landscape occurred in 1968, when the property was sold to art historian Sandra McGrath and art dealer Frank McDonald. Most of the working farm buildings were removed, trees were planted and an English-style cottage garden installed. Bundanon was now less a working farm than an artists' community; it was this environment that Arthur Boyd visited in 1971. He was so captivated by the landscape that he bought the nearby property Riversdale in 1974, then Bundanon itself in 1979. Boyd built his studio at the rear of the homestead in 1981 (the studio was the initial site of the work *Heavy Metal* in 2016) [9].

During his tenure at Bundanon, Boyd fought to preserve the environment from development and damaging activities such as sandmining. He was quoted many times on his belief that "you can't own a landscape." He realized his vision of protecting the natural and cultural heritage of Bundanon when the Commonwealth accepted Bundanon as a gift in 1993, establishing the Bundanon Trust. Boyd saw Bundanon as "a place for the community to enjoy the bush and the river, and a place to be used as a forum where those from every facet of the arts and science could get together." Collaboration and interaction were essential: "I like the idea of people talking to one another," he stated [10]. *Heavy Metal*, with its collaboration between art and science and its focus on the landscape and environment of Bundanon, develops the spirit of creative inquiry advocated by Arthur Boyd.

LAND, MINERALS, CONTAMINATION: HEAVY METAL

The fusion of mineral sampling, the landscape and cultural representations of the landscape that are brought into focus in *Heavy Metal* relate to a wider and more longitudinal approach to sampling the mineral structure of the Bundanon environment. Mark Taylor is compiling a database that traces the distribution of elements left in the soil by the historical processes that have formed the landscape: flooding, upstream mining, architecture and the daily activities of farming. We have begun a process using the metaphor of footprints and fingerprints to forensically reveal these geochemical modifications to the land.

Environmental contamination from anthropogenic activity can be measured via changes to temporal environmental geochemical markers. Human activity has left a marked "footprint" on the landscape by way of altering the biosphere's composition across every facet (land, air, water). These footprints have left unique geochemical markers of former or current activity. Some pollutants, such as the inorganic toxic element of lead, have well-established histories—the latter was first emitted in significant quantities in Roman mining and smelting and as a result is found in Arctic ice dating from that period. Twentieth-century emissions of lead from its use as an additive in gasoline have resulted in millions of tons

being distributed throughout all global ecosystems, with the greatest impacts in major urban centers [11,12].

Other organic, humanmade pollutants are more recent and have become pervasive since the 1950s. One such group of compounds are the less-well-known and -understood group of perfluorinated chemicals. The presence of industrial chemicals in environmental media such as air, dust, lichens, soil, sediment and water provides opportunities to measure, source and "fingerprint" contaminants back to specific anthropogenic activities. Such data enables scientists to delineate the consequences of human activity for the environment and to quantify the extent of the impacts. Moreover, the use of isotopes can also reveal specific sources and shifts of contamination over time, which can be important in untangling causal links between human activity and environmental change.

Environmental contamination is pervasive, persistent and, in some circumstances, problematic due to the adverse effects that can arise from exposure to people, environment and the food chain. Delineating contamination in the environment superimposed with knowledge of human activity can unveil a history that is typically not accessible via the documentary record. The total number of contaminated sites is not necessarily indicative of the risk to human health and to the environment. Often this risk is not known, and it may lie dormant or unactivated until land use changes or an individual excavates, exposes or interacts with a contaminated source in a way that causes inhalation or ingestion.

The project *When Science Meets Art* at Bundanon aims to examine the site and the site's catchment changes in land use via analysis of environmental materials in soils, sediments and paints. The catchment of the Shoalhaven River was subject to exploration and mining, predominantly for gold, from the 1860s to 1900 [13]. The most well-known goldfield is that of Yawal, which lies in the headwater of the Shoalhaven, upstream from Bundanon. The mines were last reworked during the Depression years of the 1930s and have since been abandoned [14]. The environmental activities and impacts are not well described, but what information exists indicates the mining resulted in a range of upstream environmental impacts, including deforestation, damming and sluicing. Downstream, the "fingerprints" of mining activities on the landscape are even less well known. However, this knowledge gap provides a unique opportunity to understand how mining affected the floodplain environments through the dispersal and accumulation of contaminants over time.

Consequently, this project analyzes floodplain sediments for gold, silver, lead and zinc, which are common contamination markers of anthropogenic activity. Fingerprints of anthropogenic impact will be benchmarked against natural background values. The application of lead isotopic compositions to the deposited materials will allow determination of the sources in the sediments. Sampling of floodplain sediments will effectively provide a temporal sequence, with sediments aging with depth. Shifts in geochemical profile will be linked to the European catchment history relating to the ebb and flow of mining activity. In terms of the heritage curti-

lage at Bundanon, the project investigates the geochemical footprint created by European occupation. The project will analyze soil across the site to assess the land at Bundanon for “footprints” of former human activities. The database formed by directly sampling the landscape will be incorporated into a new work for mobile devices that will allow visitors to walk through the landscape with a GPS-enabled media-rich device, experiencing sonifications and visualizations of the mineral compositions beneath their feet.

At Bundanon, elements and minerals lie buried in the landscape, tracing diagrams of human activity. Specks of alluvial gold are washed down to the floodplain from worked-out mountain mine shafts; the mineral auras reveal the long-vanished outlines of farm buildings and the telltale chemical fallout from workplaces. Arthur Boyd painted this (mineralized) landscape with colors that were themselves formulated from earthy compounds and exotic metals, milled to a fine paste in linseed oil and turpentine. *Heavy Metal* invites us to interact with one of Boyd’s paintings to discover a hidden world of elements and minerals in an experience that is simultaneously chemical, visual and musical. The starting point was that Boyd was situated in this landscape, painting the physical features, and using (or making himself) colors that were substantially minerals (originally extracted from the earth), thus forming a metaphorical circuit.

HEAVY METAL: IMAGE AND SOUND

Data was extracted by Taylor in Arthur Boyd’s studio, from a hand-painted swatch of the paints used by Boyd (see Fig 2). Samples were taken directly from paint tubes that remained in the studio. The spectrometer analysis of the paints used

on the unfinished Arthur Boyd painting revealed that the paints contained up to 35% (350,000 mg/kg) cadmium and 60% lead. While paints such as these are stable on canvas, Boyd mixed many of his own paints from powder and, in doing so, may have inadvertently contaminated himself in the process. In addition, Boyd frequently painted with his fingers: He was convinced that painting with his fingers, palm and heel of his hand gave him a greater control of the paint, particularly in creating the landscape paintings he produced at Bundanon. Friends worried about “the potential cocktail of poisons which might get under his skin” due to his constant physical contact with the paints and chemicals [15]. His studio assistant at Bundanon, Anna Glynn, had been taught by Boyd to paint with her hands, but she ceased the practice after a year, complaining that “all the skin peeled off my neck from the fumes from all the solvents” [16].

Boyd’s health declined quickly from 1997, leaving the *Return of the Prodigal Son* painting unfinished. In the last two years of his life, he suffered seizures, dementia and a general enfeeblement. Doctors advised against toxins such as alcohol, but Boyd’s biographer Darleen Bungey notes that the damage from toxins had already been done from “a lifetime spent breathing poisonous fumes, absorbing poisonous minerals” [17]. Arthur Boyd, the great Australian landscape painter, appears to have been contaminated by the very minerals contained in the paint, which he used to depict the Bundanon landscape he loved. Further sampling of soil around Boyd’s studio will determine if these paints also entered and damaged the environment.

The geochemistry of Boyd’s paints is included in the *Heavy Metal* display: a huge database of minerals corresponding to



Fig. 2. Data analysis of paint samples for *Heavy Metal*, Arthur Boyd’s Studio, Bundanon, 2016. (© Nigel Helyer)

Boyd's palette. A computer lookup table was created, linking the actual paint color to an analysis of the elements contained in that color. Thus each available paint color has an associated list of elements displaying ratios. When the camera "sees" a color, it relates it to the range of colors in the lookup table and determines what elements are present and in what proportions. It can then process the type and amount of notes used to represent the elements present in any focus area.

The sound elements are drawn from two sets of samples made on the homestead's Steinway piano. The first set are simple key strikes recorded adjacent to the piano sounding board. The second set were recorded with microphones placed inside the sounding board of the piano with the sustain pedal down, resulting in highly reverberant audio recordings. These notes sound like drones or chords (see supplemental sound file).

The sonic dimension of *Heavy Metal* was constructed in collaboration with colleague Jon Drummond, an expert in

data sonification. In the installation the piano sounds are assembled and distributed in real time by the system in the following manner. As the camera (which is focused on a very small area of the painting at any moment) analyzes the overall "color sense," it selects resonant notes (to indicate a general range of colors—for example a dark blue or a light orange). Simultaneously it uses the lookup table to identify the predominant chemical elements in the colors and selects the appropriate notes to represent each element associated with the colors present: The more prominent an element, the more times its note will be played. These notes are distributed in a random order to produce a nonrepetitive soundscape.

Heavy Metal uses geochemical and environmental data to understand legacy footprints and fingerprints of anthropogenic activities, now overlain across the culturally important Bundanon site. The name *Heavy Metal* has currency in relation to both the chemical composition of paint as well as more generally in environmental pollution.

References and Notes

- 1 Siân Ede, *Art and Science* (London: I.B. Taurus, 2005) p. 12.
- 2 Malcolm Miles, *Eco-Aesthetics: Art, Literature and Architecture in a Period of Climate Change* (London: Bloomsbury, 2015); Linda Weintraub, *To Life! Eco Art in Pursuit of a Sustainable Planet* (Berkeley: University of California Press, 2012); Andrew Brown, *Art & Ecology Now* (New York: Thames & Hudson, 2014); William Malpas, *Land Art: A Complete Guide to Landscape, Environmental, Earthworks, Nature, Sculpture and Installation Art* (Maidstone, U.K.: Crescent Moon, Third edition, 2013).
- 3 Sean Cubitt, *EcoMedia* (Amsterdam: Rodopi, 2005) p. 9.
- 4 Cubitt [3] p. 4.
- 5 Nigel Helyer and John Potts have examined the intersection of art, science and environment in contemporary art, with particular reference to works by Helyer, in their article "Ecolocated: Art, Science, Environment," *Studies in Material Thinking* 8 (2012) p. 2012.
- 6 Janet Laurence's *Treelines Track* (2014–ongoing), for instance, is a walk that traces the history of plants and plantings at Bundanon.
- 7 An Indigenous Cultural Heritage Plan commissioned by Bundanon Trust in 2011 found only two sets of axe-grinding grooves and possible stone tools in the region. Sue Feary and Heather Moorcroft, *An Indigenous Cultural Heritage Plan for the Bundanon Trust Properties* (Bundanon Trust, 2011) pp. 34–35.
- 8 *Bundanon Conservation Heritage Plan 2* (Bundanon Trust, 1997) pp. 3–4.
- 9 *Heavy Metal* was also exhibited in 2017 as part of the exhibition *Nigel Helyer: Landscape/Portrait*, Macquarie University Art Gallery, Sydney, 1 March–13 April. For this exhibition, a different Arthur Boyd painting, *Nebuchadnezzar with blue flowers and white dog* (1969), was lent by the Bundanon Trust for inclusion in the *Heavy Metal* installation.
- 10 *Siteworks: Field Guide to Bundanon* (Bundanon Trust, 2014) p. 236.
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- 15 Darleen Bungey, *Arthur Boyd: A Life* (Sydney: Allen & Unwin, 2007), p. 528.
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