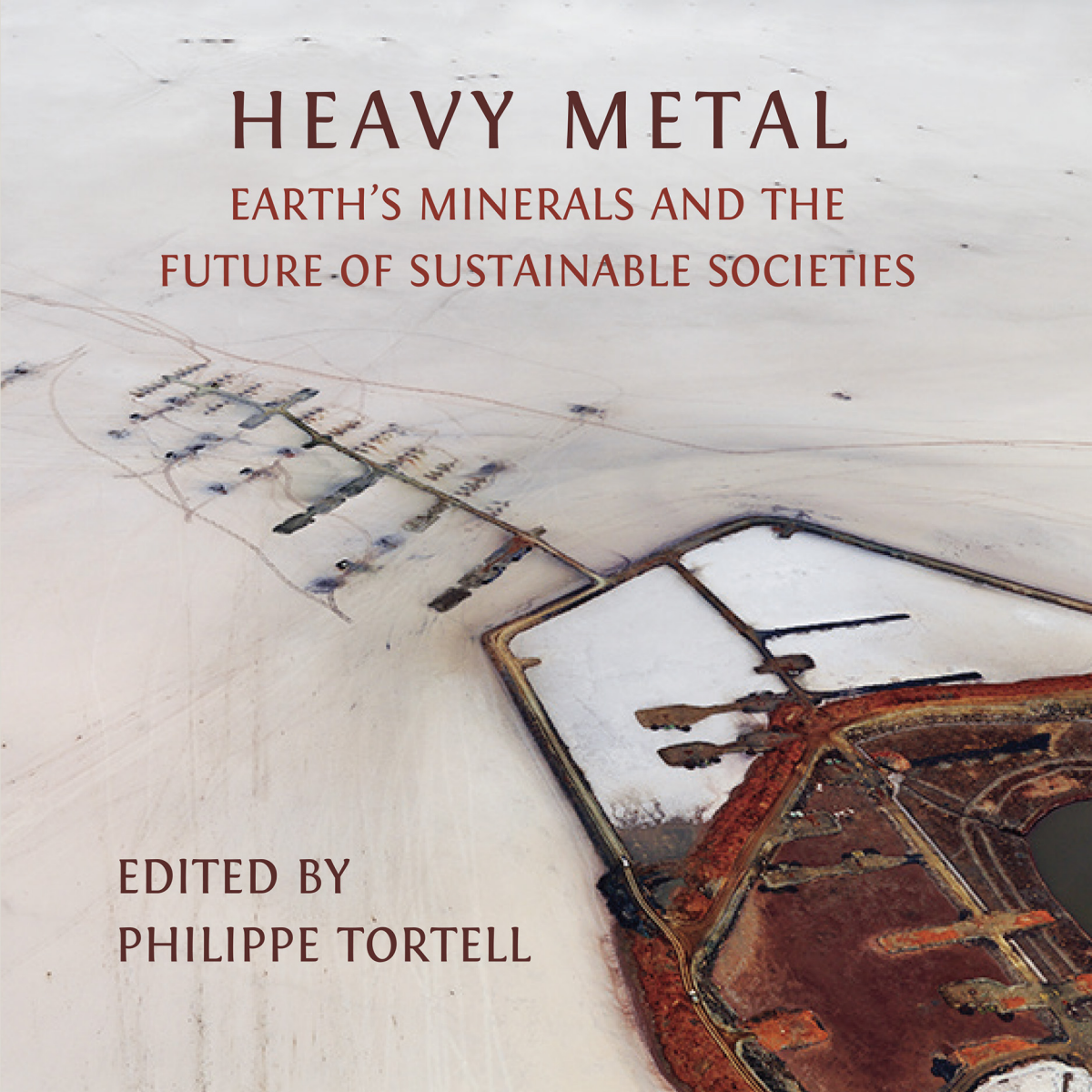
HEAVY METAL

EARTH'S MINERALS AND THE FUTURE OF SUSTAINABLE SOCIETIES



EDITED BY
PHILIPPE TORTELL

https://www.openbookpublishers.com

©2024 Philippe D. Tortell (ed.). Copyright of individual chapters is maintained by the chapters' authors.

This work is licensed under a Creative Commons Attribution 4.0 International license (CC BY-NC 4.0). This license allows you to share, copy, distribute and transmit the text; to adapt the text and to make commercial use of the text providing attribution is made to the authors (but not in any way that suggests that they endorse you or your use of the work). Attribution should include the following information:

Philippe D. Tortell (ed.), *Heavy Metal: Earth's Minerals and the Future of Sustainable Societies*. Cambridge, UK: Open Book Publishers, 2024, https://doi.org/10.11647/OBP.0373

Further details about CC BY-NC licenses are available at https://creativecommons.org/licenses/by-nc/4.0/

Photographs by Edward Burtynsky in this book are published under an 'all rights reserved' license and have been reproduced at 72 dpi in the digital editions due to copyright restrictions. All other images are published under CC BY-NC 4.0 license.

All external links were active at the time of publication unless otherwise stated and have been archived via the Internet Archive Wayback Machine at https://archive.org/web

Digital material and resources associated with this volume are available at https://doi.org/10.11647/OBP.0373#resources

ISBN Paperback: 978-1-78374-956-0
ISBN Hardback: 978-1-78374-958-4
ISBN Digital (PDF): 978-1-80064-977-4
ISBN Digital eBook (EPUB): 978-1-80064-390-1
ISBN HTML: 978-1-80511-043-9

DOI: 10.11647/OBP.0373

Cover image: Edward Burtynsky, *Silver Lake Operations #15*, Lake Lefroy, Western Australia, 2007. Photo © Edward Burtynsky, all rights reserved.

Cover design: Jeevanjot Kaur Nagpal

The *Heavy Metal Suite*

Introduction

Philippe Tortell and Dorival Puccini, Jr.

Over much of human history, art and artists have been at the forefront of social movements for change, holding up a mirror for us to critically examine our triumphs and failures. In the words of the poet Cesar A. Cruz, 'art should comfort the disturbed and disturb the comfortable'. Like the arts, mining has also created comfort and disturbance. The industry generates enormous wealth for some segments of society, and provides the mineral resources necessary for work, transportation and leisure in our digital age. At the same time, mining has left enormous environmental and social impacts that continue to this day. In the face of these challenges, the creative and performing arts can be a powerful vehicle to open dialogue and help us reimagine alternative possibilities.

The *Heavy Metal Suite* provides a creative and collaborative approach to explore the future of minerals and mining. We first conceived the project in 2022, as an offshoot of a collaboration that began the previous year, when Axiom Brass, led by Dorival, performed a concert at the University of British Columbia (UBC), where Philippe is a Professor and Head of the Department of Earth, Ocean and Atmospheric Sciences (EOAS). The show, *Limitless*, was a multi-media exploration of the place of

©2024 Philippe Tortell and Dorival Puccini, Jr., CC BY-NC 4.0 https://doi.org/10.11647/OBP.0373.15

humankind in the cosmos. For many years, Axiom has worked with researchers from across disciplines to explore the intersection of art and science, so it was only natural for the quintet to connect with local scientists during the stay in Vancouver. We first met through a mutual contact in UBC's Pacific Museum of Earth, and we soon began working together, along with other EOAS faculty members to incorporate powerful visual projections into the show, alongside short presentations, interspersed with the music, exploring a range of topics from climate change and extreme weather to mineral resources.

From this initial collaboration, things developed quickly. The following year, Axiom returned UBC to hold a 'collaboration fair' with students from EOAS and the School of Music who were working on a new project called *Earth Sounds*—a series of original musical compositions inspired by Earth System processes. At some point during the visit, we began chatting about a new, much larger and more ambitious project—one that would eventually lead to the *Heavy Metal Suite*. The idea was both simple and complex; how could we use music to explore the challenges and opportunities in supplying the world with much needed mineral resources? From the outset, we knew the project had to be international in scope, with representation from composers around the world who could bring a global perspective to the work. We thus began searching, far and wide, for composers who had the creativity and talent to rise to this occasion; composers who were not only outstanding in their own right, but who would be willing to work together to form a whole that was more than the sum of its individual parts. The search was neither quick nor easy, but in the end, we managed to assemble an extraordinary group of artists from across the globe; Valeria Gisel Valle Martinez (Chile), Christopher Sainsbury (Australia), Yao Chen (China), T. Patrick Carrabré (Canada), Augusta Read Thomas (United States), Roberto Morales-Manzanares (Mexico), Chris Chafe (United States) and Vuma Levin (South Africa). Collectively, these individuals represent some of the most important countries in the global supply of copper, lithium, zinc, gold, silver and platinum. In addition to these minerals, we also wanted to represent water, an element that is essential for mining, as

well as silicon, which is critical for the digital chips that underpin our metal-intensive technologies.

Over a period of several months, we held regular video conferences, often joined by members of the UBC Future Minerals Working Group, to discuss artistic representations of Earth's minerals. The researchers shared insights about mineral resources and mining, from Earth sciences and engineering, to economics, law and public policy. The composers took these ideas, turned them around playfully, and reshaped them into sonic abstractions. Strong themes surfaced, encompassing the legacies of colonialism, capitalism and consumption, along with the significance of recycling and circular economies. We also explored the theme of conductivity as a common musical motif running through each movement, weaving together the diverse compositions into an over-arching work. This concept has multiple expressions, each of which is relevant to the themes of the *Heavy Metal Suite*. Electrical conductivity, the ability of a material to carry an electrical current, is a key characteristic of metals such as copper and silver that are used in electronic devices. Hydraulic and thermal conductivity represent the flow of water and heat, properties that are fundamental to the formation of mineral deposits in the Earth's interior. At a societal level, conductivity represents a fundamental inter-connectedness among individuals and nations. Tackling the climate crisis and supplying mineral resources for the future green economy will require global connections, as represented by the diverse composers who came together for the creation of the *Heavy Metal Suite*. Building on these themes, Augusta Read Thomas created a short *conductivity* motif, offering the composers an expansive sonic canvas to explore this concept in their individual movements, melodically, harmonically, rhythmically, or in any way that supported their artistic vision.

After much inspired effort, the composers created a truly unique piece of music, which is both highly individualistic and yet somehow integrated into a larger narrative. The *Heavy Metal Suite* premiered on Earth Day (22 April), 2024 in a performance by Axiom Brass at the Vogue Theater in downtown Vancouver. A recording of the performance is available at https://doi.org/10.25740/hw495rk5901, along with a short documentary describing the creative process driving the work. Everyone involved

in the conception and creation of the *Heavy Metal Suite* has come away with a new perspective about the foundational elements needed to support society's renewable energy transition. We hope that the work will open a broad global conversation, and inspire listeners to think differently about the future of Earth's mineral resources.

Diloo

T. Patrick Carrabré

I was born Ronald Joseph Nault. My other family names include Bruneau, Elémond, Racette, Landry and Lagimodière. These names all have deep roots in the unique Indigenous culture that developed in the Red River region, before it became Manitoba, a province in what is now known as Canada. My people have been known as *Otipemisiwak* (those who rule themselves), *Bois-Brûlé* (burnt wood) and, more recently, as Métis. I am a survivor of the Sixties Scoop, a mass removal of Indigenous children into the Canadian child welfare system. Along the way, I have been processed and refined through the colonial education system, studying the practices of Western art and music. But since being reclaimed by my community, I have embarked on a voyage of unlearning, trying to craft an identity that reflects the complexity of my personal truth.

I grew up near the waters of the Red River, which, along with the Assiniboine and the Winnipeg Rivers, helped define my relationship to the land. I'm now a guest in xwməθkwəy'əm (Musqueam) territory, where I can look out each day at the stal'əw' (the Fraser River) and the Salish Sea. Water means many things to Indigenous peoples. Not only is it a source of food and an avenue for transportation, it is also an integral component of many ceremonies.

Canada has more available fresh water than any other country on Earth, and Canadians are the second-highest consumers of freshwater after the United States.

©2024 T. Patrick Carrabré, CC BY-NC 4.0
https://doi.org/10.11647/OBP.0373.16