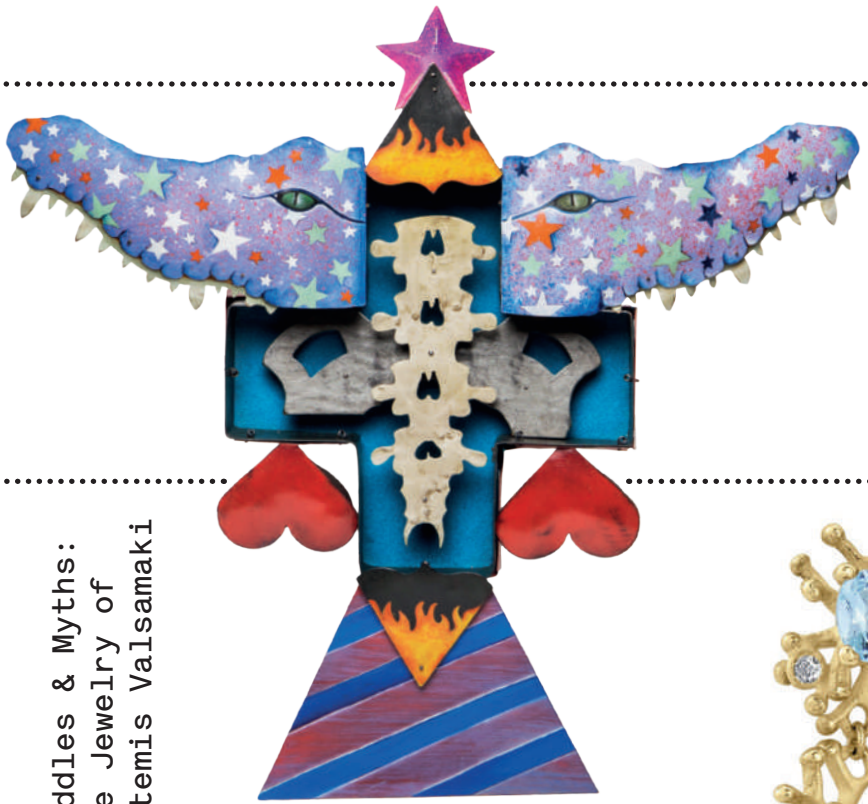
METAL 40 YEARS SMITH

ART
DESIGN
JEWELRY
METAL



Riddles & Myths:
The Jewelry of
Artemis Valsamaki

$12.00 USA & CAN
SNAGMETALSMITH.ORG

Artists in Flux

The New Gold Rush:
Precious Metals
Mined from
Electronic Waste

40 YEARS

METALSMITH

4 FOREWORD

6 LETTERS TO THE EDITOR

14 FINDINGS
New & Noteworthy
Sasha Nixon

16 IN PRODUCTION
Chris Boland
Andrea DiNoto

18 IN THE STUDIO
MJ Tyson
Sasha Nixon

20 LOOK
Smitten Forum
Marissa Saneholtz and Sara Brown

24 DOSSIER
Beijing International Jewelry Exhibition
Sharona Muir

28 UNDER THE COVERS
Bejeweled: The World of Ethical Jewelry
Rebecca Grady

FEATURES

30 Riddles and Myths: The Jewelry of Artemis Valsamaki
Demystifying the layered, dreamlike imagery and surrealistic assemblages that render the artist an outlier in the Athens art jewelry scene. *Bella Neyman*

38 The New Gold Rush: Precious Metals Mined from Electronic Waste
An investigation into the golden possibilities of electronic waste as a mining alternative and jewelry metals source, paired with a first-hand account of the author's research into individual-scale extraction. *Sandra Wilson*

46 Artists in Flux
An intimate look inside the daily lives and living spaces of artists, highlighting the ecosystems that support their practices. *Rachel Reichert*

REVIEWS

58 The Hand and The Body
Rebekah Frank

IN MEMORIAM

60 Lois Etherington Betteridge
Barbara Isherwood

Cover:
• Artemis Valsamaki
Cross My Heart, 2019
(see p.36)

• Eliza Walter
The Nine Mile Reef Earrings, 2019
(see p.41)

• Hyun-Seok Sim
(see p.48)

Metalsmith is published by the Society of North American Goldsmiths

Artists. Designers. Jewelers. Metalsmiths.
www.snagmetalsmith.org

The Society of North American Goldsmiths advances jewelry and metalsmithing by inspiring creativity, encouraging education, and fostering community.

Editor
Adriane Dalton,
adalton@snagmetalsmith.org

Contributing Editor
Kate Hensler Fogarty

Advertising
John Garbett,
jgarbett@snagmetalsmith.org

Graphic Design
Heather White,
Pixel37 Design

SNAG Managing Director
John Garbett

SNAG Board of Directors
President
Kat Cole
Secretary
April Wood
Treasurer
Michael Brehl

Dominique Bereiter
Dianne deBeixedon
Anne Havel
Patricia Madeja
Elizabeth Shypertt
Kee-ho Yuen

Printer Freeport Press, committed to using environmentally friendly materials and methods.

Metalsmith (ISSN 0270-1146) is published both in print and digital formats in February, May, August, and November by SNAG, PO Box 1355, Eugene, OR 97440, 541.345.5689, www.snagmetalsmith.org.

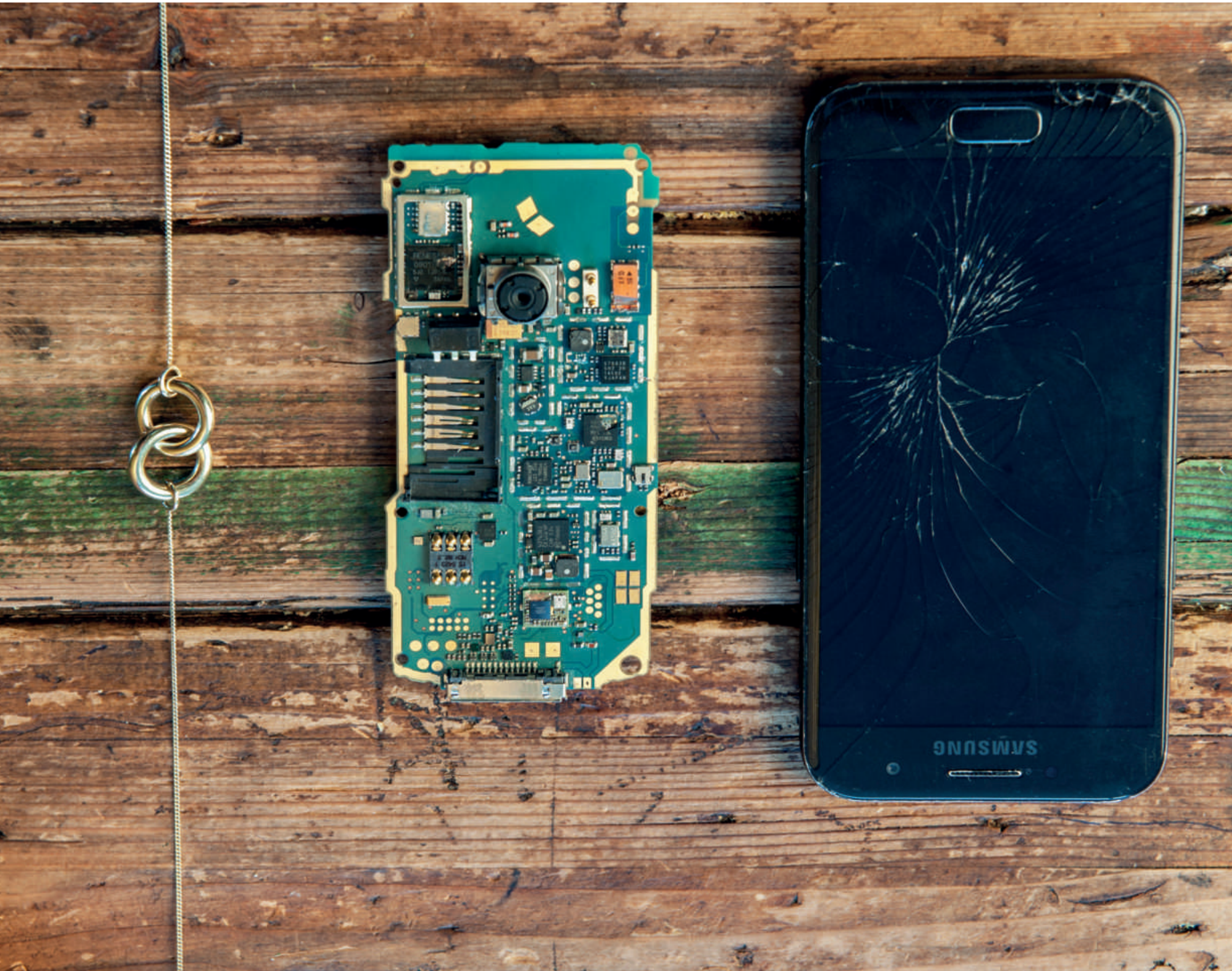
Membership rates: $94/year and up, full membership includes four-issue subscription to *Metalsmith*. Special rates available. Subscription to only *Metalsmith*: $33/year and up.

Postmaster/Members/Subscribers/Copies
Metalsmith is not forwarded by the post office. Send all address changes and any other requests, including missing issues, to SNAG, PO Box 1355, Eugene, OR 97440, 541.345.5689, info@snagmetalsmith.org. Claims for missing issues are accepted only if received within three months of publication.

The opinions expressed in *Metalsmith* are those of the authors and not necessarily those of the staff or directors of SNAG or *Metalsmith*.

Metalsmith is indexed in the Art Index and EBSCO Media. Newsstand distribution: COMAG Marketing Group, 155 Village Blvd, Princeton, NJ 08540.

Printed in the U.S.A.


SAMSUNG

the NEW GOLD RUSH

Precious Metals *mined from* Electronic Waste

By Sandra Wilson

Nowa – Seeing the beauty in waste.

Photo: Pam Kat Photography

Raw materials being smelted on an industrial scale.

Courtesy of Tokyo 2020

The next Gold Rush will not draw prospectors to the hills of California, but rather to its landfills. Today, about nine percent of the world's supply of gold is tied up in electronics, and electronic waste is growing faster than any other solid waste stream.[1]

Humans have been mining gold for around 6,000 years. In 2017, the World Gold Council estimated that a total of about 190,040 metric tons has been unearthed.[2] What may come as a surprise is that around two-thirds of this quantity has been mined since 1950. Estimates vary, but it is generally accepted that around 54,000 tons of viable gold sources remain underground. Globally we are currently mining around 2,500–3,000 tons of gold a year—so it is clear that we have a limited supply of this precious metal. Gold is now included on the European Chemical Society's Endangered Elements list, as are silver and copper. Gold and copper are considered of "limited availability with a future risk to supply," while silver is considered to have a "serious threat of extinction in the next 100 years."[3]

Of the gold that is mined today, around 52 percent is used by the jewelry and metal design industry, but an increasing proportion is used in the electronics industry on computer circuit boards, SIM cards, and smartphones.[4] While copper and silver are also used in such devices to conduct electricity, a thin coating of gold, which is non-reactive, is added to these materials to prevent corrosion. "Urban mining" is a term coined in the 1980s by Professor Hideo Nanjyo from Tohaku University Japan describing the stockpile of rare metals in discarded electronic equipment and devices. Interestingly the

yield from urban mining is considerably higher than from traditional ore mining processes. Whereas one ton of ore produces around six grams of gold, one ton of electronic waste, or e-waste, generates around three hundred grams of gold. It only takes around forty-one mobile phones to recover one gram of gold.

Figures vary from country to country, but generally as little as 20 percent of e-waste is recovered and recycled. In some countries this figure is even lower: for example, in India, the world's fifth largest producer of e-waste, the recovery rate is as low as 1.5 percent. For the first time in human history, we have started to *consume* gold; that is, we have started to lose gold in the discarded electronics deposited in landfills.

The most widely used and most cost-effective method for precious metal recovery is *pyrometallurgy*, in which the e-waste is separated into component parts, and parts containing precious metals are smelted. In this process, large quantities of e-waste are deposited into a high-temperature furnace and incinerated until only the precious metals remain.[5] Currently there are just a handful of centers worldwide where pyrometallurgy is conducted on an industrial scale.

With the growing desire among makers to use ethically sourced materials, there is increased interest in using recovered metals from e-waste for jewelry and metalwork. While most precious metals recovered from pyrometallurgy are put back into general circulation and combined with other recycled metal, some jewelry makers are beginning to manufacture collections from precious metals sourced from e-waste.

Eliza Walter
The Nine Mile Reef Earrings, 2019
Sea Treasures Collection
Salvaged 9k gold, man-made aquamarines, recycled antique diamonds
49 x 13 mm
Photo: Zoe Warde Aldam

In 2018, Dell computers collaborated with American actress and jeweler Nikki Reed and her company BaYou with Love on a line of 14-carat gold rings, earrings, and cufflinks using gold from recycled electronic waste.[6] The line was actively promoted in a Dell marketing campaign featuring videos describing the process and showcasing the jewelry, as well as several media articles and interviews.

London-based goldsmith Eliza Walter is another jeweler sourcing all of her gold from "urban mining" for her brand Lylie's.[7] Walter teamed up with Vipa Designs which works with refiners to ensure that the metal is traceable and recovered from e-waste. Lylie's describes itself as a sustainable jewelry brand that recognizes the diminishing source of precious metals, and therefore turns to using gold recovered from e-waste.

Ashley Heather Jewellery, based in Cape Town, South Africa, is another brand that

continues on page 44

BaYou with Love is a lifestyle brand focused on sustainable, ethical fashion and production within jewelry, apparel, home and beauty. Founded by actress and environmentalist Nikki Reed.

Image courtesy of BaYou with Love

Professor Sandra Wilson in the Love Chemistry Laboratory with a solution of gold chloride.

Photo: David Cheskin

MODERN ALCHEMY:
HYDROMETALLURGY AND BIOMETALLURGY

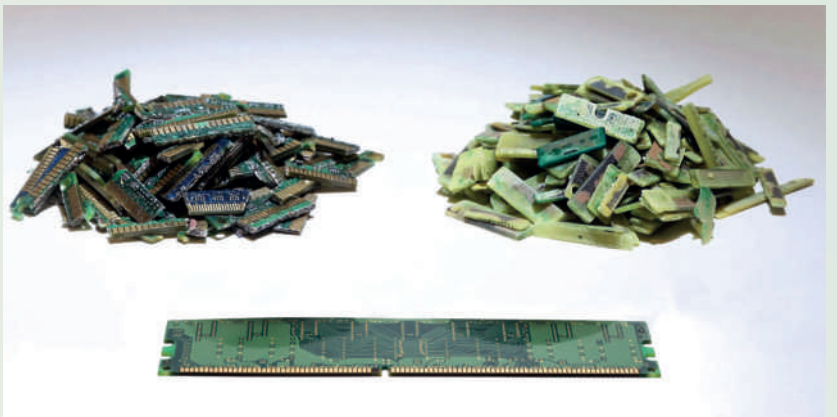
BY SANDRA WILSON

WHILE THE PRACTICE OF THE ANCIENT ALCHEMIST was based on mystical and supernatural beliefs, the modern alchemist puts more store in direct experience, playful practices, and serendipity. Increasingly, scientists and professionals from other disciplines are recognizing the value and benefits of working alongside jewelers and are actively seeking collaborators.

In 2017, I was approached by the Edinburgh University Chemistry Department with an opportunity to act as an artist in residence in Professor Jason Love's laboratory. Professor Love's research group was working on a new chemical compound for recovering gold from electronic waste (e-waste) using a hydrometallurgy process. Hydrometallurgy is a greener and smaller-scale method of recovering precious metal from e-waste that uses aqueous solutions. The chemical combines with gold in such a way that it can be extracted from a solution of the other metals found in an electronic device. This developing hydrometallurgy technology is set to rival the more established pyrometallurgy process.

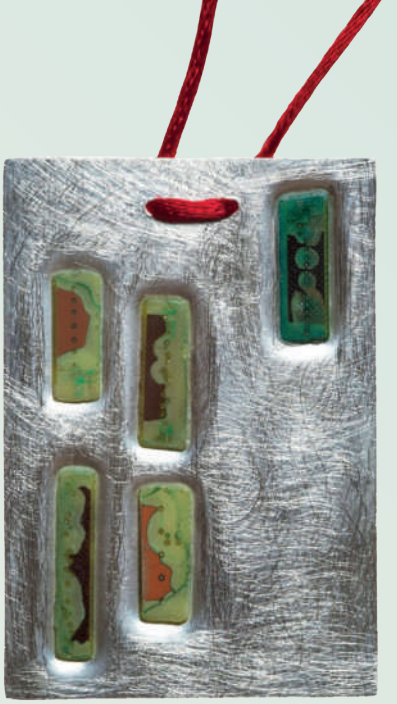
Over a six-month period, I spent one day a week in the laboratory supported by Euan Doidge and Jamie

Sandra Wilson
Gold Chloride Bowl, 2018
Britannia silver
10 x 7 cm
Photo: Diarmid Weir

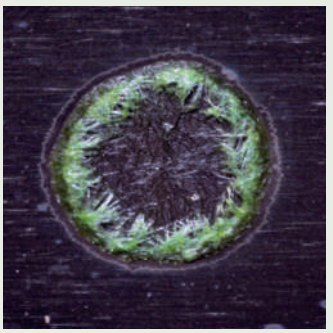


Computer circuit board fingers before and after metal recovery.

Photo: Diarmid Weir



Sandra Wilson
Pendant, 2018
Fine silver, recovered e-waste plastic fragments
5 x 7 cm
Photo: Diarmid Weir



A still image from the time lapse video of a droplet of solution containing all the metals recovered from e-waste.

Photo: Diarmid Weir

Hunter, two of Professor Love's Ph.D students. For my research I used circuit board "fingers" I purchased on eBay (around 250g for about $25). I cut up and collected the areas of the board where the precious metal was concentrated. The material was stirred vigorously in hydrochloric acid for around two weeks using a large agitator to recover all of the different metals present. Doidge describes this process as "molecular gold panning"!

Guiding my practice during this time in the laboratory was a quote from anthropologist and professor Tim Ingold: "The maker is more of an alchemist than a chemist, because as an alchemist the maker is looking at what the materials can do rather than what they are!"[1]

Although I was interested in the chemistry, I had to remind myself that I did not need to become a chemist, and thus did not need to understand everything that was happening—it was enough just to know how to replicate some of the effects.

For me as a jeweler, the benefits of collaboration included the opportunity to work with a new process; to create new surface finishes using an ancient technique of electrochemical replacement plating;[2] and to create new work that raises awareness of the importance of recycling precious metals from e-waste. The next stage of this research is for us to work with metallurgists in India who are recovering on a larger scale which will enable the creation of collections of jewelry made solely with metal recovered from e-waste using hydrometallurgy.

A third method of recovering precious metals from e-waste is biometallurgy. In this process, micro-organisms such as bacteria and fungus are used to recover the precious metals. This method is promising as it uses very little energy and—like hydrometallurgy—can be conducted on site without the need to transport materials. This unique low-carbon method is currently being developed in many chemistry laboratories around the world. Biometallurgy, although a very slow process, may be the next big metal recovery technology.

The ancient alchemists aim was the transmutation of base metals to gold, but the modern alchemist can contribute to the transmutation of an exhaustive to a more sustainable use of precious resources and become a force for societal and environmental change.

1 https://www.diaphanes.net/titel/an-ecology-of-materials-3064. /
2 This is a branch of chemistry that looks at "reduction" and "oxidation" reactions. Interestingly this type of surface metallurgy was common in pre-Hispanic Andean metalwork and the Romans also used it to plate iron with copper.

Mélisande and Niels collected 400 mobile phones to be made into their wedding rings.

Photo: Charella Hulsbosch

Top right:

Mélisande and Niels at their wedding.

Photo: Ik Trouw van jou

creates collections of minimalist jewelry from precious metals reclaimed from circuit boards. Heather says, "We believe that while some metal mining may always be necessary, ultimately our most important extraction operations should be taking place in scrap yards and recycling centres rather than sensitive ecological areas and ancestral lands."[8]

Closing the Loop (CTL) is a Dutch company that offers users, buyers, and phone retailers an easy way to render their device waste free. For each phone the company sells, it recycles a broken phone from partners in Africa to create a "closed loop." When CTL's communications manager got engaged in 2017, the couple made their wedding rings out of gold recovered from mobile phones. They calculated that they would need around 400 mobile phones to get the gold required. Within a year they secured phones from family and friends, traded in these devices with a bullion recycler for the equivalent amount of precious metals, and employed the designer and maker Judigje to make the rings.[9] They maintain that "making rings from mobile phones is about love," and that they received abundant messages of congratulations and support.[10]

In March 2019, two former employees of CTL launched a new jewelry brand called Nowa ("no waste") to highlight the advantages of electronics recycling and the potential to create pieces from gold and silver collected from e-waste.[11] The inaugural line, *Eternal Connection*, was designed by Mickey Phillips, and funded through a Kickstarter campaign.

Only recently have product designers and the electronics industry started considering the **importance of establishing and designing for a "circular economy,"** *that is, an economic system that eliminates waste and considers the whole life cycle of a product.*

Precious metal recovery made the headlines a few years ago when it was announced that the Olympic and Paralympic medals for the now-delayed Tokyo 2020 games were to be made entirely out of metal recovered from e-waste. In 2017, the Tokyo Organising Committee launched a campaign encouraging members of the public and industry to donate their old, broken, or discarded small electronic devices. "The aim was to collect 30.3 kg of gold, 4,100 kg of silver, and 2,700 kg of bronze. Municipal authorities across Japan collected 78,985 tons of e-waste, and around 6.21 million used mobile phones were donated to local recovery centers."[12] Within two years the committee secured 100 percent of the metal they needed to create 5,000 medals. This high-profile project may bring the concept of recovered metals to the forefront of public awareness.

The winning medal designs were chosen after a national competition that invited both professional designers and design students to submit ideas. From 400 entries, that of Junichi Kawanishi, director of the Japan Sign Design Association and Osaka Design Society, was chosen.

Creating jewelry from precious metals recovered from e-waste is clearly growing in popularity, but in some cases the process may be considered a marketing gimmick or "greenwashing," i.e., a tactic used by a company trying to persuade the public that it is doing more to protect the environment than it actually is. After all, moving large quantities of electronic components over long distances generates significant volumes of CO_2. Furthermore, the standard

pyrometallurgy extraction method requires smelting the materials at high temperatures, using a significant amount of electricity, and potentially releasing toxic heavy metals such as lead, arsenic, and mercury into the air, soil, and water. However, smaller scale and potentially less environmentally damaging methods of recovering precious metals from electronic waste such as *hydrometallurgy* and *biometallurgy* are being developed in laboratories (see sidebar, page 42).

To make it easier to recover precious metals and other recyclable materials, electronics companies could make their device components detachable and interchangeable. For example, the Netherlands-based company Fairphone has designed a modular device for which all the parts are repairable.[13] Only recently have product designers and the electronics industry started considering the importance of establishing and designing for a "circular economy," that is, an economic system that eliminates waste and considers the whole life cycle of a product.

Fairphone has developed a free downloadable manual for people to run their own "urban mining" workshop.[14] These workshops raise awareness of the different materials contained inside our electronic devices, and creates public pressure on electronics manufacturers to move toward a circular economy model by making products that are modular, so that metal components can be easily removed, extracted, replaced, and recovered. Jewelers and organizations such as Ethical Metalsmiths may also be interested in running these "urban mining" workshops in schools and the community.

The industrial scale of the pyrometallurgy process means that for individual jewelers there is no way to transform collected e-waste into a specific piece of jewelry. Personally collected e-waste must currently be traded for gold that has previously been recovered from other sources. But even within the restrictions of pyrometallurgy, there is scope for jewelers interested in a more ethical approach to sourcing their materials.

In these examples of jewelry relying on pyrometallurgy, the design focus appears to be on minimalism, simplicity, and the provenance of materials, and so offers art jewelers and metalworkers scope to develop work. In contemporary culture, where relationships are increasingly created online, choosing to make or purchase gold jewelry made from recycled e-waste adds another layer of meaning to traditional forms of jewelry such as engagement and wedding rings. In the future, precious metal suppliers may therefore want to offer jewelry and metalworkers a separate stream of e-waste metal. It could be possible to add a trace element to precious metals from e-waste to ensure its provenance through a chain of custody. Such an approach would also potentially enable jewelers to charge a premium for their work and raise awareness among the public about the need to recycle precious metals from e-waste.

An important way, therefore, to halt the threat to the supply of gold from traditional ore mining in the next 100 years is to place a stronger emphasis on metal recovery from electronic waste. This is vital if we are to stop the loss of gold that ends up in landfill and ensure a sustainable future for this important and significant metal.

The Olympic and Paralympic medals for the now-delayed 2020 games are made from recycled electronics.

Courtesy of Tokyo 2020

Sandra Wilson is a professor of metal design at Duncan of Jordanstone College of Art & Design, part of the University of Dundee, in Scotland. Her research is funded by various UK research councils and her award winning jewelry and silversmithing is exhibited internationally.

1 Based on a lecture given at the Goldsmiths Centre, London, May 2019 / **2** https://www.gold.org/about-gold/gold-supply/gold-mining/how-much-gold / **3** https://theconversation.com/periodic-table-new-version-warns-of-elements-that-are-endangered-110377 / **4** https://www.statista.com/statistics/299609/gold-demand-by-industry-sector-share / **5** The waste is treated in a smelter, ultimately to generate a precious-metal rich "bullion" which is then processed using solvent extraction to separate the precious metals. / **6** https://www.youtube.com/watch?v=WuGiE5oNOlA/ **7** https://lylies.com/pages/biography / **8** https://ashleyheather.co.za/pages/our-story / **9** https://www.judigje.nl / **10** https://www.closingtheloop.eu/news/400-scrap-phones-wedding-rings / **11** https://thisisnowa.com / **12** https://tokyo2020.org/en/games/medals/project / **13** https://www.fairphone.com/en/story / **14** https://www.fairphone.com/en/2015/03/02/host-an-urban-mining-workshop