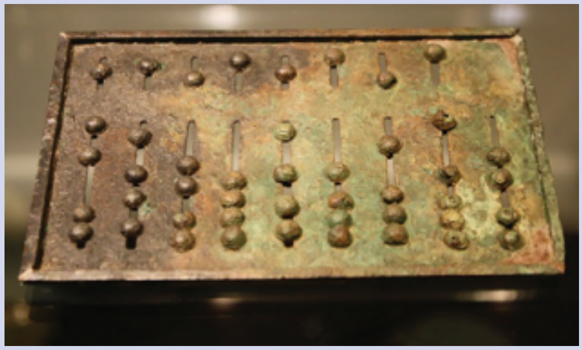
ABOUT THIS ISSUE

As you will read in this issue of *Elements*, our ability to model and quantify reactive transport in natural systems has advanced dramatically over the past 40 years. This advance is due, in part, to the exponential increase in the computational power of modern computers.

It could be said that computers today have their origins in the abacus, invented in the Middle East ~500 BC. It remained the fastest "calculator" until the middle of the 17th century. While the abacus, and other mechanical calculators developed since [Did you ever use a slide rule?], made doing mathematical calculations quicker and easier, they still needed human operators. A computer, on the other hand, can operate automatically, without human help, by following a series of stored instructions called a program. The origins of the modern computer can be linked back to the British mathematician Charles Babbage (1791–1871). His machines, the first mechanical computers, had an input (way of feeding in numbers), a memory (something to store the numbers while calculations were taking place), a processor (the number cruncher that made the calculation), and an output (a printing mechanism). Early mechanical "computers" were complex machines that often had tens of thousands of precision-made gears, belts, levers, and shafts. So, although they could carry out calculations, it could take days before results finally emerged.



A first century CE bronze portable abacus, part of a Roman scribe's kit. Credit: M. Cartwright

Computers have advanced from those wheel-cranking and belt-turning days. The advancement from mechanical gears, to relay switches (1830s), to vacuum tubes (1901), to the transistor (late 1940s), to integrated circuits (late 1950s) has allowed for the miniaturization in size and increase in computational capacity (and speed) of computers. For example, the first "general-purpose" computer developed in 1945, the ENIAC, could execute ~5,000 instructions per second. To put that in perspective, an iPhone 6 can execute ~3 billion instructions per second. Our smartphones are millions of times more powerful than all of NASA's combined computing power in 1969, yet that computing power could guide humans across 356,000 km of space from Earth to the Moon!

Today's computers—laptops, workstations, mainframes, supercomputers, and cloud computing—are powerful tools that make it possible to solve complex problems, such as modeling the reactive transport of nutrients and contaminants in the subsurface. Some geochemical calculations, which took months or years to perform in the 1970s, could take only seconds or minutes on a laptop today. Our geochemical models can be even more sophisticated, detailed, and robust for exploring complicated Earth systems because we now have the computational technology capable of handling such calculations.

We can't see what the future may hold for computer technology and modeling in the Earth sciences. But, as Alan Turning once said, "We can only see a short distance ahead, but we can see plenty that needs to be done." We hope this issue of *Elements* stimulates your curiosity and spurs on your own (computer-aided) research endeavors.

BREAKING NEWS

WELCOME TO THE INTERNATIONAL ASSOCIATION ON THE GENESIS OF ORE DEPOSITS (IAGOD)

With this issue, we warmly welcome the International Association on the Genesis of Ore Deposits to the group of participating societies who partner in the publication of *Elements*. Formed in 1963, the IAGOD aims to promote international cooperation in the study of the genesis of ore deposits and to further the growth of knowledge in this field. To learn more about IAGOD, you can visit their website at www.iagod.org

Elements itself is now in its 15th year of publication and continues to have a strong readership base with 18 scientific societies, and the more than 16,000 members, who faithfully support its core purposes:

- To promote and advance the disciplines of mineralogy, geochemistry and petrology;
- To increase the visibility of these disciplines, and to specifically emphasize the impact and importance of these disciplines to the broader scientific community and society;
- To provide a publication medium for the integration of these disciplines;
- To publicize the activities and publications of the participating societies and affiliated organizations.

We are thrilled to welcome IAGOD to the *Elements* family, and we look forward to their contribution.

FAREWELL & THANK YOU!

With this issue, Friedhelm von Blanckenburg (GFZ Potsdam, Germany) completes his term as an *Elements* Principal Editor. Friedhelm has been an integral part of *Elements* for the past 13 years, first as the DMG's *Elements* Executive Committee representative (2007–2015), then as a guest editor (the 2014 issue "Cosmogenic Nuclides"), and most recently as principal editor (2016–2018). Friedhelm's diverse scientific interests have been put to good use as he shepherded thematic issues that spanned from deep into outer space to the depths of the oceans. During his tenure, he oversaw the following issues: "Cosmic Dust" (v12n3), "Rock and Mineral Coatings" (v13n3), "Layered Intrusions" (v13n6), "Comets" (v14n2) and "Marine Biogeochemistry of Trace Elements and Their Isotopes" (v14n6), and the current issue "Reactive Transport Modeling" (v15n2). Although stretched to the limit at times, he handled thematic issues with grace as he worked closely with guest editors, authors, and the thematic content. Each greatly benefited from his guidance, resulting in *Elements* issues that were accessible and enjoyable to read. Friedhelm was also very active in soliciting thematic topics and working with scientists to develop robust and exciting topics for inclusion in *Elements*, several of which will be published in the years to come. We will miss working with him and wish him the best with future endeavors.

Nancy Ross, **Jon Blundy**, **John Eiler**, and **Jodi Rosso**