Cliodynamicists would like to see the historical fields sharing methods among themselves and adopting approaches and theories from physics and other long-quantified fields.

HISTORY AS Science

The past does not repeat itself, but it rhymes," Mark Twain once said, a reference to the patterns of history, perceived anecdotally.

Today, a new field is coalescing around the notion that historical patterns are, to some degree, measurable, and that the future can, also to some degree, be predicted. Researchers involved in the field call it "cliodynamics" after Clio, the Greek muse of history.

Scholars of human history traditionally have studied the past as a chain of idiosyncratic events, with each event a unique response to unique circumstances, says SFI External Professor David Krakauer. Historical fields such as paleontology have relied on collections of evidence—fossils, for example—to draw inferences about the past.

A few fields have made strides in approaching history as a science. In archaeology, for example, rigorous field survey methods have provided new, quantifiable information about the location, distribution, frequency, and organization of certain human activities. In population genetics, evolutionary outcomes are modeled as probabilities.

Cliodynamicists would like to see the historical fields sharing methods among themselves and adopting approaches and theories from physics and other long-quantified fields. The tools of complexity science are now beginning to make the task tractable, Krakauer says. Mathematical and computational techniques such as agent-based models, power-law relations, and more classical differential-equation models are in several fields helping scientists develop new theoretical frameworks, for example.

"A historical chronicle is like a random sequence, with very high complexity," Krakauer says. "But if there's a pattern, you can dispense with details and give a more parsimonious description. This description can help reveal the general principles of historical dynamics as they apply across fields."

Scientists affiliated with SFI are playing key roles in the emerging field. In March 2011, a special issue of *Cliodynamics*, a peer-reviewed journal edited by longtime SFI collaborator Peter Turchin of the University of Connecticut, led with an editorial, "An Inquiry Into History, Big History, and Metahistory," by Krakauer, John Gaddis (Yale University), and Kenneth Pomeranz (UC Irvine). Its authors define "history" as the study of written records, "big history" as all reconstructions of the past that do not rely on written materials, and "metahistory" as the "patterns that emerge from both modes of inquiry that make generalization, and hence analysis, possible."

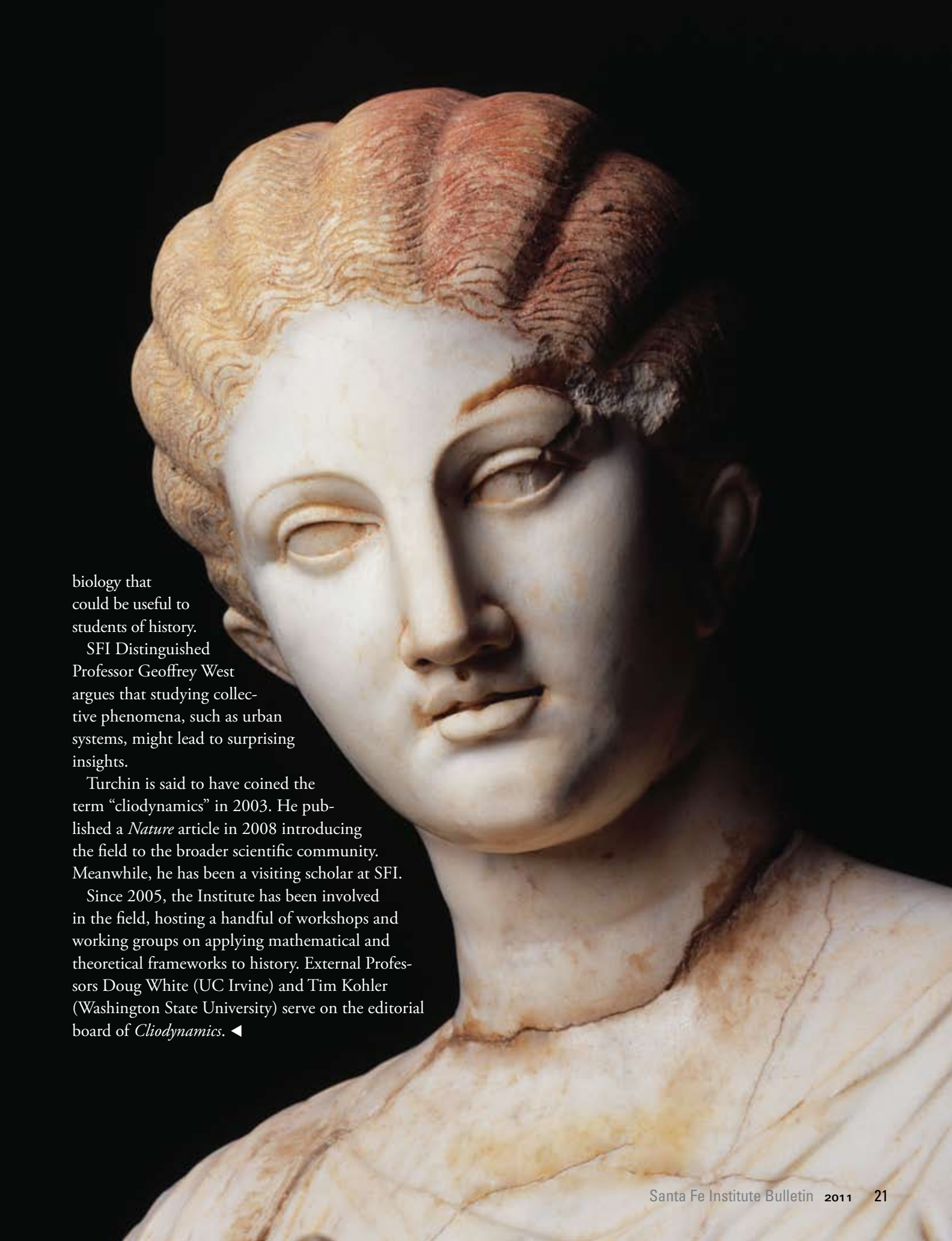
Also in the issue:

SFI Faculty Chair Doug Erwin explores how paleontologists deal with the vagaries of preservation, and how statistical techniques developed in biology have been applied to textual evidence.

SFI Distinguished Fellow Murray Gell-Mann illustrates how apparently complex histories and patterns can sometimes be organized using simple models of growth and scaling.

Krakauer shows how history often uses analogs of concepts and tools expressed quantitatively in the natural sciences, and introduces concepts from nonlinear dynamics, statistical physics, and evolutionary

Cliodynamics takes its name from Clio, the Greek muse of history, here rendered in marble: Roman 130–140 AD.



biology that could be useful to students of history.

SFI Distinguished Professor Geoffrey West argues that studying collective phenomena, such as urban systems, might lead to surprising insights.

Turchin is said to have coined the term "cliodynamics" in 2003. He published a *Nature* article in 2008 introducing the field to the broader scientific community. Meanwhile, he has been a visiting scholar at SFI.

Since 2005, the Institute has been involved in the field, hosting a handful of workshops and working groups on applying mathematical and theoretical frameworks to history. External Professors Doug White (UC Irvine) and Tim Kohler (Washington State University) serve on the editorial board of *Cliodynamics*. ◀