Winship named Director for Advancement

SFI welcomes Shirley Winship as its new Director for Advancement. A New Mexico resident for the past 15 years, Winship has forged positive donor relationships across the U.S. for two of the region’s most prominent performing arts organizations: The Santa Fe Opera, as Major Gifts Officer and Manager of Planned Giving; and the Santa Fe Chamber Music Festival, as their Director of Development.

In her prior home state of Oregon, she served as Director of Development for a large regional food bank before joining the Institutional Advancement team at the University of Oregon — first as Assistant Director of its Annual Giving Program, then as Director of Development for its School of Architecture and Allied Arts during the first three years of an $80 million university-wide comprehensive campaign. To individuals contemplating a gift to SFI, Winship has this to say: “Giving the great minds at SFI the time, resources, and freedom to pursue today’s ‘big questions’ has proven again and again to yield insights that impact our lives, and our world, for the better. So while the science itself is complex, the reasons for supporting SFI’s unique brand of collaborative research couldn’t be simpler.”

UPCOMING COMMUNITY EVENTS

Energy and matter at the origin of life: SFI Community Lecture, Nick Lane, Tuesday, November 7, 7:30 p.m., The Lensic Performing Arts Center

All living things are made of cells, and all cells are powered by electrochemical charges across lipid membranes — the “proton motive force.” We know how these electrical charges are generated by protein machines at virtually atomic resolution, but we know very little about how membrane bioenergetics first arose. By tracking back cellular evolution to the last universal common ancestor and beyond, scientist Nick Lane argues that geologically young electrochemical charges across semiconducting barriers were central to both energy flow and the formation of new organic matter — growth — at the very origins of life.

Lane is a professor of evolutionary biochemistry in the Department of Genetics, Evolution and Environment at University College London (UCL). His research focuses on how energy flow constrains evolution from the origin of life to the traits of complex multicellular organisms. He is a co-director of the new Centre for Life’s Origins and Evolution (CLOE) at UCL, and author of four celebrated books on life’s origins and evolution. His work has been recognized by the Biochemical Society Award in 2015 and the Royal Society Michael Faraday Prize in 2016.

SFI’s 2017 Community Lectures are made possible through the generous underwriting of Thornburg Investment Management, with additional support from The Lensic Performing Arts Center. Tickets for this event are free, but reservations are required; to reserve tickets, visit http://tickets.ticketssantafe.org. Watch lectures live on SFI’s YouTube page.

WHY DO PERU’S PARROTS EAT CLAY?

Amazonian Parrots in southeastern Peru gather along the clay banks of the Tambopata River to scoop up clayfuls of soil. It’s a confounding behavior — clay soil has no proteins or carbohydrates. Researchers have tossed around two leading theories about what drives this geology: that clay helps protect the birds from dietary toxins, or it’s a nutritional supplement. In a paper published in this, ASU-SFI Center Postdoctoral Fellow Elizabeth Hobson and co-author Donald Brightsmith (University of Texas Austin) analyzed data logged from more than 3000 hours of observations on the Tambopata — one of the most extensive datasets on tropical parrots ever gathered — adding evidence to the supplement theory; joining a large body of research suggesting that hunger for sodium, specifically, is that driver.

SEEING IN THE DARK: MINUS SUNLIGHT, A GENERAL THEORY REVEALS UNIVERSAL PATTERNS IN ECOLOGY

In a recent paper published in Global Ecology and Biogeography, SFI External Professor John Harte (University of California Berkeley), SFI Omidyar Fellow Andy Rominger, and Erica Newman (University of Arizona) suggest that a theory independent of mechanistic drivers, such as sunlight, can accurately describe the distribution of species across a forest. Drawing on Harte’s maximum entropy theory of ecology, the team re-analyzed data from a 2016 study that included light-limitation parameters, deriving nearly identical patterns. The team hopes their work will help open broader discussions about the benefits of using simpler models to understand complex patterns in ecology.

HAYEK’S MARKET ALGORITHM IS NOT THE ROAD TO LAISSEZ FAIRE

In a fresh look at 20th-century philosopher-economist Friedrich Hayek, three authors note how the Nobel laureate’s work exemplifies complexity economics. They also show how his political support of laissez faire economic policies needn’t necessarily follow. Hayek was among the first to recognize the perpetually adaptive nature of an economy driven “not to the notion of equilibrium. His work led him to embrace laissez faire policies. But these policies can lead to bubbles and crashes. ‘It is possible to appreciate [Hayek’s] insights into the functioning of a market economy without following him down the road to laissez faire,’ write authors Alan Kirman (University of Aix-Marseille), SFI Professor Samuel Bowles, and SFI External Professor Rajiv Sethi (Columbia University), who published their paper in the American Economic Association’s Journal of Economic Perspectives.

BIRDS CHOOSE MATES WITH ORNAMENTAL TRAITS

A recurring theme in nature documentaries is that of choosy females selecting brightly colored males. But in monogamous mating systems, such as the long-tailed widowbird, females choose their lifelong mates in much the same way, finds a new study published in Ecology and Evolution by SFI Research Fellow Caitlin Stern. Some traits, such as the colors of feathers oooip a cresser auklet, signal attractiveness to the opposite sex and competitive rank within the same sex. Research has traditionally focused on male competition for access to females or territory and on females choosing males based on their feathers and fights. But recent investigations suggest that females not only compete with each other, but also rely on such traits in deciding whether to engage or alter.

THE ROLE OF COLLECTIVE MEMORY IN PRIMATE CONFLICT

In new paper in the Journal of the Royal Society Interface, the team re-analyzed data from a 2016 study that included light-limitation parameters, deriving nearly identical patterns. The team hopes their work will help open broader discussions about the benefits of using simpler models to understand complex patterns in ecology.

Understanding how selection acts on risk preference is “crucial to interpreting and predicting behavior,” according to the researchers. Their paper, “Evolution of risk preference is determined by reproduction dynamics, He history, and population size,” was published in National Scientific Reports.

PERSONALITY TRAITS CORRELATE WITH SOCIAL NETWORK POSITIONS

A new network analysis by SFI External Professor Matthew Jackson (Stanford University) and colleagues corroborates findings from psychological research: students turn to one set of friends when they’re looking for shared fun and excitement, but a different set when they need empathy. The analysis, published in PNAS, draws on social network data from surveys and personality tests administered to nearly 2000 Stanford freshmen. It showed that different students occupy central roles in networks based on fun and excitement versus networks based on trust, suggesting that “individuals’ traits are related to their network positions and the functions of those positions, which they play in supporting their communities.”

BACTERIA COMPETE TO SHAPE YOUR MICROBIOME

A new paper by SFI External Professor Elfarane Borenstein (University of Washington) and colleagues shows that competitive interactions between bacterial species play an important role in shaping the composition of the human gut microbiome. The researchers used metagenomic analysis to map the landscape of strain and immunity factors from the type VI secretion system — a pathway that mediates interbacterial competition — in the gut microbiome. Examining this landscape and the presence of different bacterial strains in adult and infant microbiomes, they first evidence that competition between different gut bacterial strains may determine which strains will stick around and which may be competed away. The paper, published in Cell Host and Microbe, is part of Borenstein’s ongoing work to understand systems-level dynamics of the human microbiome.

RESEARCH NEWS BRIEFS

(cont. from page 5)

WHAT ALGAE CAN TELL US ABOUT POLITICAL STRATEGY

A new paper in Cell published by the Rogers Lab explores how and why political strategies evolve during electoral cycles. The authors explain dynamic voter behavior in a competitive electorate, while the science itself is complex, the reasons for supporting SFI’s unique brand of collaborative research couldn’t be simpler.
Humans have used the plants and animals in their ecosystems in myriad ways—we’ve eaten them, but we’ve also used them for clothing, tools, landscaping, and more. A group of ecologists, anthropologists, and archaeologists studying pre- and non-industrial human communities in places around the world are working to compile, analyze, and model data about how they vary or stay the same across cultures, ecospheres, and environments over time. The group, which met for the first time last February, gathers again November 6-8. This second meeting will include an additional study site, expanding the scope from five to six regional locations.

“We’re asking really outstanding researchers with deep expertise in their fields to compile new kinds of data that have never been collected before,” says SFI Vice President for Science Jennifer Dunne. “It’s exciting to bring everyone together and see opportunities for new kinds of questions to be asked and new hypotheses to be tested. This is a novel research frontier.”

Since February, the working group members have begun compiling and analyzing a wide range of data. Some existing datasets have focused on feeding interactions, like Stefania Cracraft’s recent analysis of ancient Puebloan food webs in the southwestern U.S. Some have focused more on other types of interactions, often in very species-specific ways. “For instance, in the Pacific northwest, ethnographers have spent entire careers studying one thousand and one uses for red cedar bark by First Nations people in Canada,” says Dunne. This project means collating scattered data sets, often ones that have never been digitized, and combining them with other data sets for more comprehensive, quantitative, big-picture analyses.

Dunne hopes that exploring both simple interactions — like a human gathering a mussel from the water, breaking it open and eating it raw — and complex interactions that require multiple species and types of interactions — like a human building a kayak out of wood, hide, and gut and using a bone-tipped wooden spear to hunt and eat sea lions — could provide a “biodiversity-focused” way to understand the dynamics of human technology use and innovation across time and in relation to ecology, climate, and culture.

SFI launches in-house press

If you search for “complexity” on a university press website, you’ll turn up a dozen or so in- riguing titles priced at a median of $49 for paperback, $99.95 for hardcover.

“The notoriously high price of scholarly books belies their primary purpose — to disseminate knowledge,” says SFI President David Krakauer. “It’s driven academics to read only the volumes they can borrow through their institutional libraries and the wider readership to ignore these writings altogether.”

In order to make SFI scholarship accessible to a wider audience, Krakauer decided last January to launch the SFI Press. He’s envisioned the in-house publishing service as a locus where the best work in complexity science — spanning new and archival SFI-related research — materializes as books that travel quickly through the publication process and cost far less to buy than comparable university press-published SFI volumes.

The SFI Press’ publishing strategy involves releasing titles as e-books and print-on-demand paperbacks that will cost below $15 and below $110, respectively, and can be ordered through Amazon.com.

The Press’ book list debuted with the publication on April 15 of History, Big History, and Metahistory edited by SFI President David Krakauer, John Lewis Lecky (Yale), and Kenneth Pomeranz (University of California Irvine). The e-book, released in October, is now available through Amazon and iBooks. On deck is The Emergence of Archaic States: New Perspectives on the Development of Complex Societies (editors: SFI External Professor and Past President Jeremy A. Sabloff and SFI External Professor Paula L.W. Saflkoff).

The Press accepts anthologies, papers, monographs, and proceedings of meetings not published before, and is also establishing permissions to re-publish seminal complexity science texts previously published by Addison-Wesley and Oxford University Press.

Jeremy Sabloff says the launch of the press “makes eminent sense.” His research group’s forthcoming anthology will include eight...
Life is short, evolution is long: Working group tackles temporal challenge

There’s a longstanding challenge in biodiversity research: how can we better understand the interplay between ecological processes — things like birth, death, and migration — and evolutionary processes like speciation, extinction, and long-distance dispersal? Researchers know that these two types of processes feed back on one another, but it’s hard to study because ecological processes happen locally and in short timescales while evolution often occurs across landscapes and over long periods of time.

A working group led by SFI Omnidyr Fellow Andy Rominger meets November 27-30 to explore ways to tackle this problem. They’re testing a unified approach that combines principles from statistical physics with data from modern ecosystems that have evolved, geographically isolated, in a specific chronology. Much of our understanding of evolution comes from the fossil record. But regions like the Hawaiian Islands and East Africa’s Great Rift Valley — two examples of geographically isolated ecosystems that evolved in chronological succession — provide a living window into evolution.

“You can almost treat them like a fossil record,” says Rominger.

In Hawaii’s case, as the Pacific Plate glided over volcanic hotspots 65 million years ago, the Hawaiian Islands began to form, one after the other, for millions of years or so. In that same sequence, they began to support life.

“These types of ecosystems are some of the best opportunities to merge the ecological with the evolutionary,” says Rominger. They could also help us understand how ecosystems move into and then back out of steady states of equilibria. Steady states occur when rates of input and output — for instance, energy requirements and production or immigration and extinction — balance each other out.”

There are ways to guess about past ecosystems and populations of extinct species, but there’s no real way to validate. Living systems along chronosequences is one way we can kind of get at that.

As human activity rapidly pushes ecosystems into non-steady states today, we’re seeing non-stationary dynamics that we don’t understand, says Rominger. “The ultimate goal of this work is to understand non-stationary from its biological causes and relate that to the kind of impacts humans have on evolutionary potential.”

Working group illustrates the seldom-seen side of contagion

When strangers become infected with a complex bacteria, they can no longer experience the world in isolation. Such is the predicament of the characters in Noli Timere, a forthcoming graphic novel based on recent scientific insights into the human microbiome and beneficial epidemics.

The developing graphic novel will show what happens when a contagion causes an unex- pected benefit on its host. Rather than harming the infected, the epidemic facilitates their interaction with fellow human beings.

According to Steve Green, the novel’s illustrator: “The infection ultimately gives our main characters a newfound appreciation of the rampant transfer of microbial gene flow between themselves and everything in their surrounding environment: people, pets, plants, and even inanimate objects in the urban environment. Even though the characters have never met, they understand each other deeply, as they have experienced life as each other; they begin to see each other as a single organism.”

Green is working with microbiome researcher and SFI External Professor Jessica Green (University of Oregon), story teller Anita Doron, and the SFI postdoctoral fellows to create the graphic novel. Through Noli Timere, which is Latin for ‘do not be afraid’, the collaborators hope to infect readers with a deeper understand- ing of how real-world epidemics can confer benefits.

Even language could be seen as a beneficial epidemic based on the way it spreads. “In the fictional story, sharing memories and ‘the live mind’ as a function of an infection may seem weird and undesirable to us, but was language any different?” asks SFI Omnidyr Fellow Vanessia Ferdinand.

Omnidyr Fellow Chris Kempes sees the novel as an opportunity to communicate the poised: recent research. “Last year we produced a paper that addressed the idea of spreading beneficial elements in systems ranging from bacterial evolu- tion to new concepts in a society,” he explains. “Noli Timere is an opportunity for us to show this seldom-seen side of contagion through top-notch storytelling and graphic art.”

In May, the Noli Timere coauthors met in Santa Fe to outline the scientific and philosophical aspects of the developing novel. During the three-day SFI working group, they decided to structure the novel as co-evolving portions of the fictional narrative, incorporated into non-fictional scientific essays.

Noli Timere is still under development, and publication details will be announced in a future issue of Parallax.
Companies are no strangers to complexity. As they work through aspects of complexity theory that apply to their problem domain and match the such phenomena, encouraging the beneficial interface with complex economies and human establishments.

New Studies deliver Action-able insights

Companies are no strangers to complexity. As they interface with complex economies and human social groups, they routinely encounter emergent, feedback loops, and other complex systems behaviors. The trick is to staff for spot and manage such phenomena, encouraging the beneficial feedback loops and curtailing the detrimental ones.

To that end, SFI’s Applied Complexity Network (ACiOn!) is offering a new program for its members. The Studio is a multi-day intensive work shop wherein a group of a dozen decision-makers convene at SFI and meet with SFI scientists to work through aspects of complexity theory that apply to their organizations’ specific challenges. It’s a great way to see how theories developed at SFI are applied to concrete problems,” says Will Tracy, SFI’s VP for Strategic Partnerships who runs ACiOn! and the Studio program. When an organization expresses interest in holding a Studio, Tracy works with them to establish which aspects of complexity science apply to their problem domain and match the best researchers to their studio.

Major data sources

The 2015 IJCAI Award for Research Excellence, and the 2017 Association for Computer Systems.

Network, email ACiOn@santafe.edu

Let us compute: The law

Legal systems generate staggering amounts of text, from judge’s decisions to court orders to lengthy warranties of regulations, rules, and laws. After major data sources. From a micro-view, these data encode the structure and evolution of our laws governing the stochastic growth and division of cells, and how legal ideas spread over time. “Anywhere the law matters, which is everywhere, the work is applicable,” he says.

PLOS ONE. A “quantitative theory of solid tumor growth, metabolic rate and vascularization.”

She also investigates uses of models of interaction design can improve the systems patients and physicians use for health care planning, coordination, and communication. She also investigates uses of models of collaboration for science and math education.

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Starostin received his Specialist degree in theoretical and applied linguistics and defended his candidate thesis in comparative Dravidian linguistics at the Russian State University for the Humanities, where he advances the work of his late father, George Starostin, in uncovering universal patterns in the emergence of complex societies like the Maya.

Participants in SFI’s online education platform, Complexity Explorer, now will be able to test their new knowledge on a tangible, real-world problem.

“At the end of the day, it doesn’t matter how much book learning you have or how many problem sets you solve,” says SFI external professor John Miller. “Creative, interdisciplinary complex systems thinking is best tested when applied to the real world.”

In August, Miller and SFI’s Education team introduced the Complexity Challenges, exercises meant to engage Complexity Explorer participants in open-ended, real-world problem-solving.

Here’s how a Challenge works: SFI teams up with a partner institution (often a member of the Applied Complexity Network) to identify a problem or business obstacle. Miller abstracts that problem into an open-ended puzzle for participants to solve any way they want.

Participants have one month to generate their solutions and to deliver written three-page reports and three-minute video presentations. They then review each other’s submissions. Mentors and partner-institution reps rank the top-scoring submissions.

“We don’t have some ‘right answer’ in mind,” Miller says. “What we care about is good solid scientific thinking that uses the various tools and ideas from complex systems science to derive novel solutions.”

For the inaugural challenge, which began August 16 and ends September 30, SFI teamed up with the MITRE Corporation and its longtime SFI Alcoa representative Matt Koehler. Fifty participants from SFI’s alumni and Complexity Explorer communities have signed up to participate.

The problem has to do with decentralized delivery – think warehouse organization, package delivery, airline routing, or self-driving ride service. In this case, the problem is abstracted as a giant checkerboard, with the challenge of getting checkers from varying starting and ending points using only simple rules and local information. The best two solutions will win a cash award.

“Because participants don’t know about the original concept behind the abstracted question, the solutions they come up with will potentially be really diverse,” says Gabby Beans, SFI’s Program Manager of Online Education. “And for the Acton members, we’re hoping they get some creative solutions,” she says. “For the students, along with the unique learning opportunity, we’re also hoping to showcase their talents to potential employers.”

In the future, if successful, Complexity Challenges may form the basis of capstone projects for online certificate or degree programs offered by SFI, she says. More at https://www.complexityexplorer.org/challenges.
New books by SFI authors

The Diversity Bonus: How Great Teams Pay Off (Princeton University Press, 2017) by SFI External Professor Scott Page (University of Michigan) investigates how businesses and other organizations can improve their performance by tapping a variety of cognitive repertoires. Page traces a causative path to the benefits that arise when teams composed of different kinds of thinkers come together to think, solve, and create. These “diversity bonuses” include improved problem solving, increased innovation, and more accurate predictions — all of which lead to better performance and results.

The Economy (Oxford University Press, 2017) is a textbook designed for a first course in economics, available in paper back format and as a free, online interactive text, the book aims to address the gap between complex, real-world economic problems and the topics traditionally taught in first-year courses. Several SFI co-authors contributed to its content as part of the Cursus Open-access Resources and Education (CORE) project, an international collaboration of economists, teachers, and students led by Wendy Carlin (University College London) and SFI Professor Sam Bowles.

Maya E Groups (University Press of Florida, 2017) is an anthology edited by David Fredel (Washington University), Arlen Chase (University of Nevada), Anne Dowd (ArchaeoLOGIC USA, LLC), and SFI Trussee Jerry Mundack. The book results from an ongoing series of SFI meetings exploring ancient Maya culture. E Groups, named after “Group E” at an archaeological site in Uaxactun, is some of the earliest permanent public structures that were rural centers and archaeological observatories.

History, Big History, & Metahistory (SFI Press, 2017) compiles a classic series of SFI writings that lay groundwork for a macroscopic understanding of written history. Edited by SFI President David Krakauer, John Gaddis (Yale), and Kenneth Pomeranz (University of California Irvine), the collection brings together insights from distinct fields because, according to the editors, “it seems likely that the disciplines themselves develop less than optimally when they lack ready access to each other’s insights and methods.”

SFI welcomes new Postdoctoral Fellow

Deepak Bhat seeks to understand systems in nature that have remained unsolved by classical statistical approaches. Such systems — biomolecules such as motor proteins, bacteria exhibiting chemotaxis, and fluctuations in stock markets, to name a few — are often characterized by a noisy environment, and are out of equilibrium. To better understand the macroscopic properties of these systems, Bhat uses tools from the nonequilibrium fluctuation-dissipation theorem. In recent years he has studied the statistics of a molecular transport process that organizes structures inside a cell. He has also been exploring the connection between information theory and thermodynamics through a theoretical, thermodynamic engine. His other research interests include stochastic thermodynamics of small systems, problems based on random walk models, first passage time problems, bacterial chemotaxis, active matter systems, and cytoskeletal filament dynamics.

Bhat joins SFI as a Program Postdoctoral Fellow under the mentorship of SFI Professor Sidney Redner. He received his Ph.D. from the Indian Institute of Technology of Madras, Chennai and Master of Science from Indian Institute of Technology Guwahati. He comes to SFI following a postdoctoral fellowship at the International Centre for Theoretical Sciences, Bangalore.

Limits, (from page 1166)

in light of the methods that sciences currently use. In Groth’s words, “We will ask about the real foundations of the kinds of tools that we are using, and we will try to place these on firmer ground.”

Proposed participants include philosophers, journalists, novelists, and scientific researchers, but the majority of invitees are practicing scientists who regularly confront the workshop’s questions in their research. The workshop will take place at SFI from Nov. 29-Dec. 1. Ultimately, the organizers hope that the workshop will clarify not only where the limits to scientific understanding lie, but also how science can surpass them.

What do you lose by moving to the suburbs?

Debarkin’s article is based on his personal experience moving from the city to the suburbs, where he found that his life had become more routine and less exciting. He also notes how the suburban lifestyle has led to a decrease in the number of social interactions and the overall level of community engagement.

Social reactors, past and present

A collaboration that began during the 2016 Complex Systems Summer School has resulted in a new book that explores the dynamics of social networks. The book, titled “Social Reactors,” is a collection of essays that examine the role of social networks in shaping human behavior. The contributors to the book include researchers from SFI and other institutions, and they cover topics such as the evolution of social networks, the role of social networks in the spread of ideas and information, and the impact of social networks on economic and political outcomes.

When species compete, it’s a colossal game of rock-paper-scissors

Organisms competing for contested resources like nutrients, light, and space play an important role in biodiversity. A recent paper co-authored by incoming SFI Omidyar Fellow Jacob Grill finds that the number of competitors may matter.

“The authors’ model potentially offers a better understanding than that provided by previous models of how diverse communities are maintained in nature, where it has often been hard to explain the high levels of biodiversity observed,” writes former SFI Omidyar Fellow James O’Dwyer (University of Bologna), in a review of the paper.

Think of two sawing killings to exploit the advantage of light streaming through a new opening in the forest canopy. One will emerge the winner in this simple pairwise contest.

But add a third sawing and a predictor a winner is a fair A strategy for one observer who wins in a three-person game of rock-paper-scissors. Paper rocks scissors, but paper covers rock, and it also returns to scissors. Now imagine the game with hundreds or thousands of different competitive moves. In their model, Grill and co-authors did just that. They allowed their competitive set “to grow by allowing non-standard outcomes every so often (this time, scissors cuts rock) — much like in nature, where many factors, from bugs to hunger, can make outcomes less predictable. As they tweaked the model’s parameters — by allowing new species to enter the system, for example — they were able to probe the dynamics of competition and diversity in new ways.

Their analysis probes, among other things, that higher-order interactions — those involving multiple competitors — may play a significant role in stabilizing an ecological system.

“The question is still open on whether the rhs is the right way to describe ecological competition,” says O’Dwyer, “but these results suggest these higher-order interactions are something to look for in real systems, and the model at least makes it more tractable to study these effects.”

The intersection of Grill and O’Dwyer’s work — and their common SFI pedigree — is no coincidence. Both are ecologists with backgrounds in physics. About five years ago, Grill read one of O’Dwyer’s papers and was drawn by its physics-inspired approach — one Grill had already been thinking about. Grill had not heard of SFI, but his interest in O’Dwyer’s paper eventually led to his application for the fellowship.

“It’s nice to see two generations of Omidyar Fellows consecutively building on and challenging each other,” says O’Dwyer.

Grill’s paper and O’Dwyer’s review were published Aug. 10 in Nature.

RESEARCH NEWS BRIEFS

MECHANISTIC MODEL DESCRIBES BIRD MIGRATION

A collaboration that began during the 2016 Complex Systems Summer School has resulted in a new paper published in August in Nature Communications. CSSS alums Christopher Revell (University of Cambridge) and Marius Somvile (University of Oxford) borrowed ideas from physics to develop a mechanistic model of bird migration. Most animal migration studies rely on statistical analyses of tracking data and don’t provide understanding of the underlying forces driving migration. To better elucidate these forces, the researchers combined models of evolution and the coexistence of species to produce an environmental potential landscape that accurately predicts migratory patterns for several albatross populations, allowing better predictions for how migration patterns might respond to environmental change.

WHEN WINNING WARS WAS A MATTER OF MARRYING WELL

For rulers in pre-modern states, marrying the right wife was often a path to military victory. In a paper published in the Journal of Archaeological Method and Theory, SFI External Professor Paula Saloff looked at several pre-modern states to uncover the strategies they used to win wars — or at least, reduce the risk of losing them. Saloff found that, with remarkable consistency, marriage alliances helped pre-modern rulers form networks of military support. By giving and receiving royal gifts, rulers sustained patron-client relations — contracts of obligation between unequal parties that fostered the link between marriage and military success. This model might help explain why many alliances have been established through conquest or other means.

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