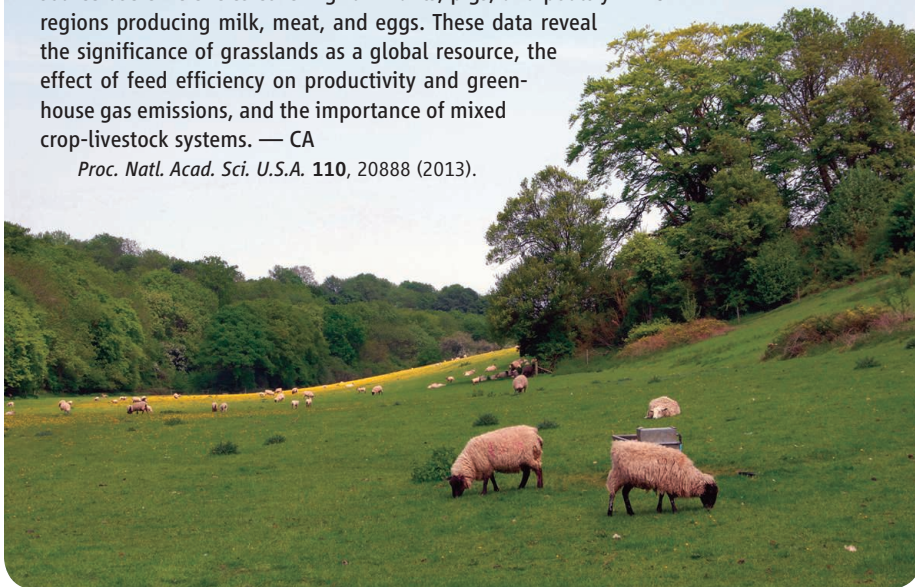


ECOLOGY

## Domestication Duality

Livestock occupy a third of Earth's ice-free surface, use a third of its freshwater supplies, and contribute to pollution, climate warming, and obesity. Yet they also feed and provide income for billions of people, supplying critical micronutrients and 40% of global agricultural gross domestic product. But Herrero *et al.* contend that we lack microdata that would allow us to assess and mitigate these challenges at meaningful scales, and they have produced a spatially disaggregated data set on biomass use, productivity, emissions, and resource-use efficiencies covering ruminants, pigs, and poultry in 28 regions producing milk, meat, and eggs. These data reveal the significance of grasslands as a global resource, the effect of feed efficiency on productivity and greenhouse gas emissions, and the importance of mixed crop-livestock systems. — CA

*Proc. Natl. Acad. Sci. U.S.A.* **110**, 20888 (2013).



PSYCHOLOGY

## Self-Esteem

Being identified as a member of a group associated with unfavorable stereotypes can evoke behavior that conforms to those stereotypes. One remedy for which there is empirical support from field experiments is to elicit a brief episode of autobiographical self-affirmation. Hall *et al.* have adapted this methodology to enhance the performance of soup kitchen habitués on two standard cognitive function tests: fluid intelligence and executive control. In the treatment group, some of these impoverished individuals were asked to describe verbally an event that had made them feel successful or proud; people in the two control groups were asked either to describe their daily diet, which might have served to make the poverty stereotype more salient, or to watch a funny video, which did in fact serve to elevate their mood. The self-affirming group performed significantly better than the control groups on both tests. Furthermore, as one would predict, the performance-enhancing effect of self-affirmation was not observed when wealthy people (whose average annual income was 10

times that of the poor participants) were tested. Finally, the upside potential for this kind of intervention was revealed when three times as many treated (versus control) individuals stopped on their way out of the soup kitchen to collect fliers containing information about benefit programs aimed at the working poor. — GJC

*Psychol. Sci.* **10.1177/0956797613510949** (2013).

BIOPHYSICS

## Collagen Clarity

The cornea is not merely the front layer of the eye; it also provides the majority of the focusing power. It is an unusual kind of tissue because it is transparent to light; hence, it does not contain blood vessels. The bulk of the cornea consists of the stroma, which contains stacked layers of aligned collagen fibrils. In order to

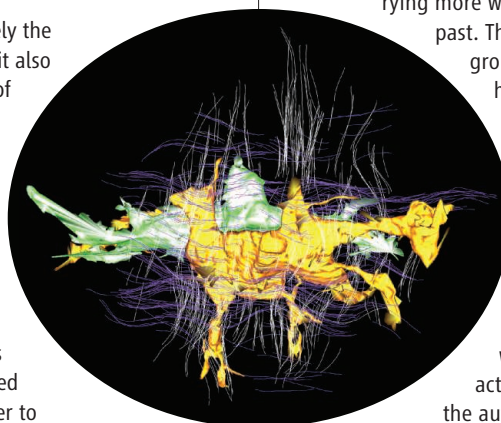
develop a three-dimensional picture of what happens as the stroma develops, Young *et al.* collected a series of scanning electron microscope images, where either a focused ion beam or an ultramicrotome was used to scrape away the surface. Corneas were harvested from 10- to 18-day-old chick embryos, and over that time period, the collagenous matrix increased from 20 to 70% of the cornea volume. But the authors were surprised to find that 20% of the cornea was occupied by keratocytes. These cells adopt a flattened morphology featuring extended cell membranes that align with the collagen fibrils. They observed an orthogonal network of actin filaments that resembled filopodia, with tubular membrane projections sometimes traveling more than 30  $\mu\text{m}$ . Some clusters of cells attached to one set of collagen bundles, whereas others would bridge between two or more. The authors believe that this extensive network of cells and collagen bundles is key for the construction of the lamellar structure of the stroma. — MSL

*Proc. Natl. Acad. Sci. U.S.A.* **10.1073/pnas.1313561110** (2014).

PSYCHOLOGY

## Simulating Metaphors

Embodied cognition refers to the association of abstract concepts, such as interpersonal warmth, with concrete sensations, such as physical warmth; psychologists have begun to explore how the abstract and the concrete are linked. A bidirectional conduit would imply that individuals who feel warmer would offer more positive judgments of others and those who are lonely would feel colder. Another view is that sensory processes can influence cognitive ones, but not the other way around. Slepian and Ambady taught people contrasting embodied metaphors: For the first group, past history was described as being weightier than present experience, whereas for the second group, the decisions of the present were described as carrying more weight than those of the past. They found that the first group rated old books as heavier than the same books camouflaged with a new dust jacket, whereas the pattern reversed for the other group. Furthermore, these differences were only observed when the books were actually touched, leading the authors to propose that



sensorimotor simulation of a learned metaphor creates the potential for concepts to influence sensations. — GJC

*Cognition* **130**, 309 (2014).

#### ENVIRONMENTAL SCIENCE

### Lead in the Blood

Exposure to lead can lead to numerous adverse health effects in humans, with particular concern over neurotoxic effects. Between the mid-1970s and the early 2000s, the use of lead compounds in gasoline was phased out in most industrialized countries, and since then, the lead content of ambient air has fallen markedly. In the United States, the national ambient air quality standard is set for the lead content of ambient air (PbA), but humans can be exposed to lead via sources other than air, leading to the total lead measured in blood (PbB). Using PbB data from the National Health and Nutrition Examination survey and PbA data from the U.S. Environmental Protection Agency Air Quality System for 1999–2008, Meng *et al.* investigated the relationship between PbA and PbB since the phase-out of leaded gasoline. They found that the emission sources for lead have changed,



leading to a shift from a fine to a coarse PbA particle size distribution, and show that PbA in coarse airborne particles is a statistically significant predictor of PbB. The PbB levels of children are more sensitive to changes in PbA concentrations than are those of adults. — JFU

*Environ. Sci. Technol.* **10.1021/es4039825** (2013).

#### APPLIED PHYSICS

### Reading Speckle Patterns

Intensity and pinpoint focus over long distances are probably the most familiar features of laser light. It is the spatial and temporal coherence of the light, with the photons in the laser beam marching in lockstep, that lends itself to the above features but also provides the most valu-

able properties for the vast applications in communication and imaging. When a laser beam hits a random medium, such as a wall or sheet of paper, the coherence of the photons results in the formation of a speckle pattern. This pattern is determined by the properties of the propagating light and the diffusing medium. Using a thin layer of alumina particles as a highly scattering medium, Mazilu *et al.* show that they can “read” the generated speckle pattern, and by modeling it with a number of principal components describing the propagating light beam can determine the wavelength of the light with high resolution. Because the speckle pattern is dependent on a number of parameters that can be encoded onto the propagating laser light, the relative simplicity of the technique may find application in areas such as lab-on-chip spectroscopy or security features in bank notes or sensitive documents. — ISO

*Opt. Lett.* **39**, 96 (2014).

#### PHYSICS

### A Very Thin Superconductor

Manipulating the dimensionality of materials can lead to profound changes in their electronic properties. The iron-based superconductor FeSe has a relatively low superconducting transition temperature  $T_c$  of about 8 K in the bulk; however, spectroscopic measurements have suggested that a single-unit-cell layer of this material has a much higher  $T_c$ . Transport measurements needed to confirm this finding proved challenging; now, Zhang *et al.* overcome these difficulties by growing the FeSe layer on a SrTiO<sub>3</sub> substrate and capping it with FeTe, with an additional layer of Si deposited on top of the FeTe to prevent its exposure to air. By measuring the electrical resistance as a function of temperature, they detected the onset of superconductivity at a temperature higher than 40 K; the critical current density, important for practical applications, was much higher than in the bulk. Because neither the substrate nor the capping layer exhibited superconductivity, and the transport characteristics power laws were consistent with the Berezinskii-Kosterlitz-Thouless transition, the superconductivity appears to be a genuine property of the FeSe layer and has a two-dimensional nature. Because of its relative simplicity, the system presents a good testing ground for unconventional superconductivity. — JS

*Chin. Phys. Lett.* **31**, 017401 (2014).