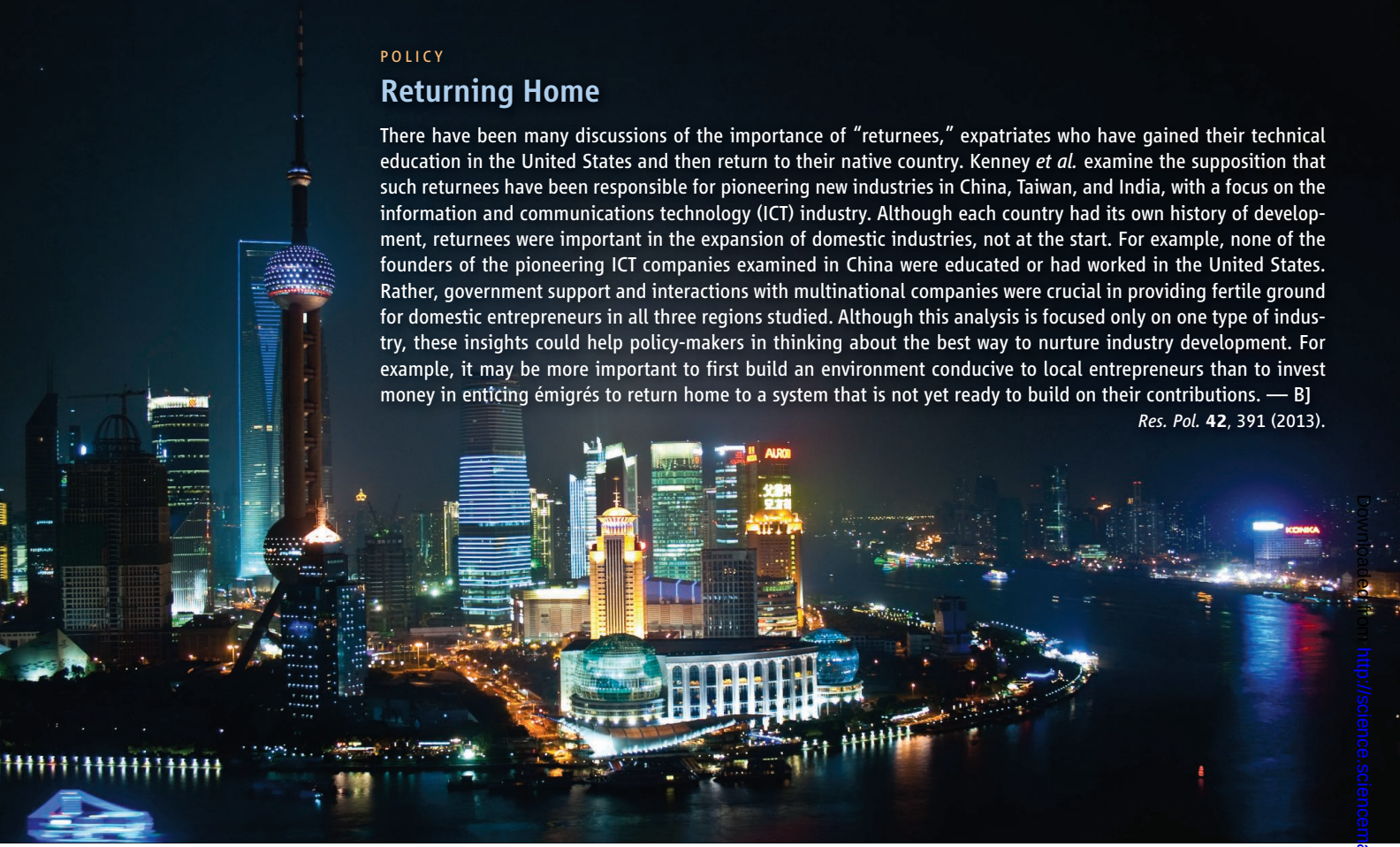


POLICY

Returning Home

There have been many discussions of the importance of "returnees," expatriates who have gained their technical education in the United States and then return to their native country. Kenney *et al.* examine the supposition that such returnees have been responsible for pioneering new industries in China, Taiwan, and India, with a focus on the information and communications technology (ICT) industry. Although each country had its own history of development, returnees were important in the expansion of domestic industries, not at the start. For example, none of the founders of the pioneering ICT companies examined in China were educated or had worked in the United States. Rather, government support and interactions with multinational companies were crucial in providing fertile ground for domestic entrepreneurs in all three regions studied. Although this analysis is focused only on one type of industry, these insights could help policy-makers in thinking about the best way to nurture industry development. For example, it may be more important to first build an environment conducive to local entrepreneurs than to invest money in enticing émigrés to return home to a system that is not yet ready to build on their contributions. — BJ

Res. Pol. **42**, 391 (2013).

CLIMATE SCIENCE

The Effects of Land-Use Change

Land-use changes around the world are affecting local and regional climate, but the exact patterns of these changes remain poorly understood. Georgescu *et al.* modeled the hydroclimatic effects of the boom in sugarcane production within south-central Brazil, where most of the sugarcane plantations are located and where further intensification is expected. In their model, conversion from other cropland or savannah to sugarcane leads to a cooling by around 1°C at the peak of the growing season, because sugarcane reflects more incoming sunlight than does the former land cover. Warming by ~1°C is found after harvest. Rainfall changes were more difficult to predict, but the authors suggest that a net annual drop in the transfer of water from land to atmosphere could lead to reduced rainfall. Christidis *et al.* analyzed past observations and model results to find out whether land-use changes across the world have had an effect on temperature extremes. Trees absorb more incoming sunlight than grassland; thus, replacing trees with grasslands tends to cool the climate. The authors find that this effect of land-use change can be detected in mean and extreme warm temperatures, although the effect is much smaller than the warming caused by other human influences on the climate. These two studies suggest that land-use changes must be included in projections of future climate change. — JFU

Geophys. Res. Lett. 10.1002/grl.50206; 10.1002/grl.50159 (2013).

CELL BIOLOGY

Stressful Lipids

Lipid perturbations activate the endoplasmic reticulum (ER) unfolded protein response (UPR), and UPR activity modifies cellular and organismal responses to changes in dietary lipids. The physiological ramifications of the lipid-UPR axis affect diseases of aging such as diabetes, atherosclerosis, and cirrhosis, but its molecular basis has remained obscure. It is unclear if the sensors of the UPR respond to altered membrane lipid composition because of its indirect effects on the protein-folding environment in the ER lumen or if direct sensing of lipids contributes to UPR activation. Working in mammalian tissue culture cells, Volmer *et al.* found that the mammalian UPR sensors PERK and IRE1 lacking their lumenal stress-sensing domains selectively lost the ability to respond to unfolded protein stress, but retained sensitivity to changes in membrane lipids. This sensitivity to changes in lipid composition was reconstituted in vitro in liposomes with defined acyl-chain saturation, which suggests that a UPR transducer can directly sense and respond to its lipid environment. — SMH

Proc. Natl. Acad. Sci. U.S.A. **110**, 10.1073/pnas.1217611110 (2013).

CHEMISTRY

3D Pathfinder

As laser technology grows ever more sophisticated, chemists continue to home in on a goal of precisely controlling reactivity through the use of light. Applied photochemistry, of course, is centuries old, and it has long been possible to vary outcomes by populating different excited states via different impinging wavelengths. In the

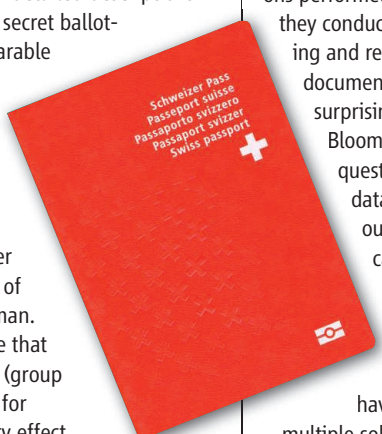
past several decades, however, the capability of fine-tuning phase in ultrashort laser pulses has helped to enable a degree of coherent control of the light-matter interaction. Nonetheless, steering molecules (or even atoms) through a maze of different quantum pathways in real time remains a major challenge, given the complexity of the energy landscape. Li *et al.* showcase a technique to map out this landscape in particularly fine detail, in the interest of facilitating coherent control. Termed optical three-dimensional (3D) Fourier transform spectroscopy, the method builds on previously developed 2D schemes, effectively resolving all the transition energies, dipole moments, and relaxation rates associated with the system Hamiltonian within the bandwidth of the excitation source. The authors applied the method to a sample of potassium vapor as a proof of principle. — JSY

Nat. Commun. **4**, 1390 (2013).

BEHAVIOR

People Like Us

Do I, a citizen of a country, want a legally resident immigrant to enjoy the rights of citizenship? There are, of course, many characteristics of an immigrant—such as country of origin, education or professional attainment, and language fluency—that might influence my answer. Hainmueller and Hangartner assess how citizens incorporate these factors into their votes for or against individual citizenship applications. They examined 2400 naturalization referendums held over a 30-year period in 40 Swiss municipalities; voters were supplied with detailed descriptions of each applicant before secret balloting. For otherwise comparable applicants, there was a large effect of country of origin (northern and western Europe favored over Turkey), a small effect of human capital status (skilled over unskilled), and no effect of proficiency in Swiss German. They went on to calculate that statistical discrimination (group membership) accounted for almost half of the country effect, with highly skilled or educated Turkish immigrants losing out by only 7 to 8 percentage points. Further analysis of temporal trends revealed that the remaining country of origin penalty could be linked to xenophobic attitudes evoked by feelings of out-group threat, or in other words, taste-based discrimination. — GJC



CREDIT: WIKIMEDIA COMMONS

Am. Pol. Sci. Rev. **107**, 159 (2013).

PHYSICS

Optical Beam-Steering

Antenna arrays have long been used for communication and sensing purposes. In the microwave and radio wavelength regime of the electromagnetic spectrum, arrays of antennas in which the phase and amplitude input to each element is varied can provide tailored beam profiles with controlled directionality. Applications can be found across many fields, from target tracking and guidance to astronomy and weather observations. Carrying over the principles of phased-array antenna technology, DeRose *et al.* have developed an optical phased array based on metallic nanoemitters patterned on a complementary metal-oxide semiconductor (CMOS)–compatible substrate. With the input to each antenna element fed in using a coupled waveguide integrated with a phase shifter, they show that electrical control of the phase results in wide-angle beam-steering capability. Operating at near-infrared wavelength, the ability to manipulate an optical beam over a two-dimensional area should find use in compact high-speed communication over free space. — ISO

Opt. Express **21**, 5198 (2013).

EDUCATION

Testing at a Higher Level

The development of higher-order cognitive skills (HOCSs) is central to recent education reform efforts, yet data indicate that few courses are able to successfully assess these skills. Lemons and Lemons performed qualitative analysis on interviews they conducted with biologists involved in writing and reviewing test questions in order to document their ideas relating to HOCSs. Not surprisingly, most study participants used Bloom's taxonomy to logically analyze questions. However, 62% of categorical data relating to question design fell outside of Bloom's category and into categories labeled question difficulty, time required, student experience, and correct answers. Regrettably, some participants demonstrated an assumption that questions have one correct answer and not multiple solutions, possibly highlighting their discomfort with HOCSs. Taken together, results suggest that, when asked to assess HOCSs, participants did not use Bloom's taxonomy in a vacuum. Instead, they integrated their own assumptions and misconceptions regarding HOCSs into the questions they wrote, suggesting that professional HOCSs assessment training may be useful. — MM

CBE Life Sci. Educ. **12**, 47 (2013).

In the Global Competition For Smart Minds, Germany Grows Its Catch

In This Issue

Ever since the European Council's decision in 2000 to transform the European Union into "a competitive and dynamic knowledge-based economy," Germany's federal government has been pumping money into research and development through various mechanisms. With good long-term funding prospects and attractive salaries, Germany has become a major contender in the global competition among nations to draw in top talent.

See the full story on page 1459.

Upcoming Features

Cancer Research Careers:
Academia vs. Industry—March 29

Biotech and Pharma:
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Regional Focus: Wales—April 26

The Effects of Land-Use Change

Julia Fahrenkamp-Uppenbrink

Science **339** (6126), 1360.
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