In This Issue

Sleepers among scientific articles

Researchers' scientific impact, which influences salary, tenure, and grant awards, is often assessed via measures that rely on the citations garnered by their papers. Typically, scientific papers attract most of their citations within a few years of publication. However, some papers that are little-noticed for years suddenly experience a spike in citations. Several studies suggest that such sleepers among scientific articles are rare, but Qing Ke et al. (pp. 7426–7431) attempted to quantify their frequency with a systematic, large-scale, multidisciplinary analysis. Previous studies either analyzed across a single discipline or measured articles in the previous few decades. The authors identified so-called Sleeping Beauties (SBs) by accounting for both the intensity of the delayed recognition and the duration of the sleeping period using a database of 22 million scientific papers published in all natural and social sciences over more than a century. The authors discovered that many SBs become highly influential more than 50 years after initial publication. In addition, particular disciplines, including physics, chemistry, and statistics, produce SBs at higher rates than other disciplines. Many SBs achieve delayed recognition in fields different from the ones in which they were originally published. The findings suggest that measuring scientific impact with short-term citation metrics may be misleading, according to the authors. — B.A.

Targeting individual species in oral microbial communities

The lack of tools to target individual species has made it difficult to determine their specific contributions within a complex microbial community. Lihong Guo et al. (pp. 7569–7574) report that a targeted antimicrobial peptide called C16G2 selectively killed the pathogen *Streptococcus mutans* within an oral multispecies community derived from saliva. *S. mutans* is one of the causative agents of tooth decay worldwide, and using broad spectrum antibiotics to treat the pathogen results in the loss of the entire oral bacterial community, often leading to reinfection by *S. mutans*. C16G2 treatment caused a significant change in the overall structure of the microbial community and in the relative amounts of different *Streptococcus* species. Removal of *S. mutans* from the community reduced the abundance of bacterial species that had direct physical interactions with the pathogen and increased the abundance of various other *Streptococcus* species that are highly prevalent in healthy oral cavities. The authors suggest that C16G2 may have therapeutic potential to remove pathogenic *S. mutans* and help achieve a healthy oral microbiome. The study demonstrates the ability of targeted antimicrobials to modulate microbiome structure and investigate the community role of bacterial species, according to the authors. — S.R.

Genetic basis of songbird communication

Songbirds' ability to vocalize and perceive birdsong develops shortly after birth, but the interplay of genes and the environment in this process is not well understood. Experiences in the postnatal period can influence gene expression through a mode of transcriptional regulation that depends on neural activity. To explore this regulatory process, Kentaro Abe et al. (pp. 7599–7604) generated transgenic zebra finches (*Taeniopygia guttata*) with enhanced or suppressed expression of the cAMP response element-binding protein (CREB), a gene switch known to play a key role in neuronal plasticity and memory formation. During the postnatal period, the songbirds participated in an experimental song-training paradigm to separately manipulate both genes and the social environment. The findings reveal that postnatal song learning in songbirds depends on an appropriately functioning CREB protein. Though naturally acquired vocalizations and hearing ability were not affected, the transgenic birds learned their own songs with a lower quality compared with native birds, and also displayed a reduced ability to remember songs from other birds of their species. According to the authors, the study reveals the unique opportunity offered by CREB transgenic birds to separately manipulate genetic and environmental factors that influence postnatal song learning. — A.G.

Male zebra finch nursing chicks.

Profitability of organic agriculture

Although organic production practices enhance the sustainability of farming, the expansion of organic cropland throughout the world may depend on whether or not organic agriculture is economically competitive with conventional agriculture. To determine the financial sustainability of organic agriculture, David Crowder and John Reganold (pp. 7611–7616) analyzed the financial performance of 55 crops over 40 years on five continents, grown using both organic and conventional practices. The authors found that when price premiums were not applied to organically grown crops, the benefit–cost ratios were significantly less than those for conventionally grown crops, and the net present values of organic agriculture, measures of profitability, were up to 27% less than those for conventional agriculture. Applying cost premiums, however, made organic agriculture up to 35% more profitable than conventional agriculture, and while premiums ranged between 29% and 32%, breakeven premiums were between 5% and 7%. Yields were up to 18% lower and labor costs were up to 13% higher for organic farming, compared with conventional farming. The results suggest that although organic cropland currently constitutes only 1% of agricultural land, organic practices may continue to expand even with declines in organic price premiums and contribute to an increased share of the global food supply, according to the authors. — P.G.

Image courtesy of Wikimedia Commons/René Piamonte.

Organically grown vegetables at a farmers' market in Argentina.

Controlling huanglongbing transmission

Current strategies to control huanglongbing (HLB), a disease of citrus trees, involve insecticide spraying and removal of infected trees after symptoms begin to appear. Because symptoms do not appear until months or years after infection, Jo Ann Lee et al. (pp. 7605–7610) exposed healthy young citrus leaves to infected Asian citrus psyllids, which transmit HLB. Within 10–15 days, the exposed plants tested positive for infection, and the psyllids' offspring had in turn become infected within 22 days. The authors used the data to simulate the spread of HLB through a grove of citrus trees, and the simulations showed that without intervention an entire grove can become infected before most trees display symptoms. However, eliminating 75% of the psyllid population during flush periods, when new leaves develop, can delay the spread of infection by at least 240 days. The results suggest that control strategies should be implemented as soon as psyllids invade a grove and well before HLB symptoms appear to efficiently control the spread of HLB, according to the authors. — B.D.

Image courtesy of the Florida Department of Agriculture.

Asian citrus psyllid, which transmits huanglongbing.