**Molecular Biology**

Local Connections Matter

Noncoding (nc)RNAs participate in many cellular processes; they are often associated with the regulation of gene expression, and most specifically with gene silencing—for example, XIST RNA in X-chromosome inactivation and AIR RNA in imprinted gene expression. Telomeres are protein–nucleic acid structures that cap and protect the ends of linear eukaryotic chromosomes. Recently, a noncoding, telomere-repeat–encoded RNA (TERRA) has been found to be transcribed from telomeric DNA.

Deng et al. show that knocking down the levels of TERRA results in a series of telomere defects. TERRA was found to associate with the proteins TRF1 and TRF2, which are components of shelterin, a complex that binds to telomeres. The interaction with TRF2—which localizes TERRA to telomeres—occurs through a domain of the protein that also binds to and localizes the origin recognition complex protein 1 (ORC1) to telomeres. ORC1 is suggested to be part of the telomere maintenance machinery, and TERRA facilitates the interaction between TRF2 and ORC1. Depleting TERRA resulted in both the loss of ORC1 from telomeres and a reduction in heterochromatin at chromosome ends. Furthermore, TERRA is capable of interacting with heterochromatin protein 1, indicating that, as for other ncRNAs, TERRA is involved in promoting heterochromatin formation specifically at telomeres, and that its various interactions contribute to chromosome integrity. — GR


**Ecology**

Not in My Backyard

It is generally thought that anthropogenic noise is a contributing factor to declining nesting success for urban birds, but it appears that in some locales noise can have indirect and positive effects on some bird species. In woodlands adjacent to natural gas wells situated in the state of New Mexico, Francis et al. found that noise decreased the extent to which western scrub jays (*Aphelocoma californica*) preyed upon the nests of other birds. The relative intolerance of this predator for noisy habitats may result from the acoustic masking of their vocalizations by the compressors used in gas extraction. Although there was a general decline in nesting success and a reduction in species richness in response to noise, the escape from predation appeared to benefit species such as black-chinned hummingbirds and house finches, whose higher-frequency vocalizations are less vulnerable to interference from the sounds of human activities. — AMS


**Geochemistry**

Included Clues

When natural diamonds form deep within Earth’s interior, they often acquire small inclusions of other minerals that can change physical properties such as hardness and color. Although impurities tend to decrease a gem’s aesthetic and economic value, mineral inclusions can provide valuable clues to how and where their more glamorous hosts were formed. Using high-resolution transmission electron microscopy and spectroscopy,

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**IMMUNOLOGY**

**Long-Distance Commuting**

B cell–mediated immunity is compromised in HIV-infected individuals even though these cells are not infected by the virus. How does HIV do this? One clue comes from the recent observations that B cells can express the viral protein Nef and that these Nef-expressing B cells exhibit impaired immunoglobulin class switching, a process whereby B cells expand their immunoglobulin repertoires to include additional classes and thus enhance the response to pathogens. How Nef ends up in B cells, however, has been puzzling.

Xu et al. report that this occurs via long-range intercellular conduits formed between HIV-infected macrophages and B cells. Nef expression in macrophages drove conduit formation via an actin- and guanine nuclear exchange factor–dependent pathway. Nef then entered B cells via these conduits and once present in B cells, inhibited class switching. The authors then established the in vivo relevance of these findings by demonstrating that long-term nonprogressors (patients who have not developed AIDS) infected with Nef-deficient HIV showed evidence of normal class switching, whereas class switching was aberrant in patients harboring wild-type HIV. — KLM


**PHYSICS**

**Guiding a Rupture**

Chemical transformations often involve two coupled stages of motion—electronic rearrangements within fractions of a trillionth of a second, followed by nuclear motion on a time scale one or more orders of magnitude longer. Over the past several decades, advances in laser technology have introduced pulses compressed sufficiently in time to glimpse these ultrafast dynamics, and in some cases to manipulate nuclear vibrational motion. A more recent goal is to achieve active control over electronic motion, by shaping even shorter pulses to map out the potential energy landscape and select particular pathways for the electrons to follow. The development of attosecond optics, using strong-field laser pulses of just a few optical cycles, with a controlled phase relationship between pulses, opens up the ability to pursue such designer reaction pathways. Experiments to date, however, have tended to probe the dynamics of rather simple, single-electron systems. Now, Znakovskaya et al. extend the principle of steering electrons with attosecond pulses to a more complex, multielectron system. They show that they can control the direction and energy of C⁺ and O⁺ fragments during the dissociative ionization of carbon monoxide molecules. Accompanying theoretical calculations explore the interplay of electronic excitations underlying the observations. — ISO


**ASTRONOMY**

**A Pulsing Trio**

Pulsars are rapidly rotating neutron stars that emit beams of electromagnetic radiation like distant lighthouses. It is estimated that 100 to 1000 pulsars orbit the galactic center with periods of less than 100 years, but only a very small fraction of these can be detected with current telescopes. Searching for the pulsars is important because they can inform us about the environment at the galactic center. Analysis of pulse arrival times can be used to derive the properties of the space-time and interstellar plasma there, and the number and ages of the pulsars can tell us about this region’s past star formation history. Until recently, only two pulsars were known within 1° of the center of our galaxy. Now Deneva et al., using data obtained with the Green Bank Telescope, a 100-m radio telescope, report the detection of another three pulsars. The observed properties imply that the trio is part of a population of pulsars associated with the galactic center. Monte Carlo simulations indicate that this population could be more numerous than previously estimated. — MJC