Van Allen Variation
The two rings of relativistic particles called Van Allen Belts that encircle Earth were discovered during the space age, and are known to pose risks to satellites in geostationary orbit. NASA launched twin spacecraft, the Van Allen Probes, on 30 August 2012 to measure and characterize Earth’s radiation belt regions. Baker et al. (p. 186, published online 28 February) have shown that a third, unexpected and temporary, radiation belt formed on 2 September 2012 to disappear 4 weeks later in response to changes in the solar wind.

Of Flies and Men
Similarities of brain structure, function, and behavior are usually ascribed to convergent evolution. In their review, Strausfeld and Hirth (p. 157) identify multiple commonalities shared by vertebrate basal ganglia and a system of forebrain centers in arthropods called the central complex. The authors conclude that circuits essential to behavioral choice originated very early across phyla.

Fast and Young
Type Ia supernovae are thought to result from the thermonuclear explosion of a white dwarf star accreting material from a companion star in a binary system. Their adoption as cosmic yardsticks has led to the discovery of the accelerated expansion of the universe. Wang et al. (p. 170, published online 7 March) show that supernovae with higher expansion velocities are located in the central, brighter regions of their host galaxies and are found in larger, more luminous galaxies, suggesting that they are associated with younger stellar populations.

Preparing Pactamycin
Microbially derived organic compounds often have remarkably intricate structures that confer striking bioactivity, but such complexity may become an impediment to drug development. Pactamycin is one such case—a potent antibiotic used to probe ribosomal structure and function that in its native form is too cytotoxic for therapeutic application. Malinowski et al. (p. 180; see the Perspective by Codelli and Reisman) present a 15-step laboratory-scale synthesis of this molecule that offers prospects for the generation of structural analogs that could facilitate further exploratory medicinal research.

Hide-and-Seek Virus
Human cytomegalovirus (HCMV) establishes latent infection in human progenitor dendritic cells, causing significant morbidity and mortality on reactivation, which may occur in transplantation patients who are immunosuppressed. Neither detection nor selective removal of rare latent HCMV-infected cells has been possible. Weekes et al. (p. 199) have found that the multidrug-resistant ABC transporter, multidrug resistance–associated protein-1 (MRP1) is down-regulated during latent HCMV infection. Consequently, cytotoxic MRP1-specific substrates are not exported from HCMV-infected cells and accumulate—leading to cell death, which could potentially provide a mechanism for eliminating infected cells prior to transplantation.

Permafrost Thaw Predictions
Permafrost contains twice as much carbon as the atmosphere which could have serious consequences if it were to be released by widespread thawing. Vaks et al. (p. 183, published online 21 February) present a 450,000 year-long record of speleothem growth at selected locations in Siberia, which traces changes in the extent of permafrost over that time period. The authors conclude that conditions only slightly warmer than those of today would cause widespread thawing of continuous permafrost as far north as 60°N.

Simply Folding
RNA chaperones simplify what would otherwise be complex and slow RNA folding events. Grohman et al. (p. 190, published online 7 March) show that the Moloney murine leukemia virus (MuLV) nucleocapsid (NC) protein, which chaperones MuLV RNA dimerization promotes MuLV RNA folding by binding to exposed guanosine bases and destabilizing strong guanosine interactions. With base-pairs being rendered roughly of the same energy, RNA assembly pathways are simplified, promoting proper folding.

The Smaller, the Better
New semiconductor device technology enables injection of light-emitting diodes, silicon devices, actuators, and sensors at precisely controlled locations within biological tissues, such as the brain. Kim et al. (p. 211) show how wireless control of animal models using these technologies and the techniques of optogenetics provide new insights into basic behavioral neuroscience.

Music Was My First Love
Why do human beings enjoy music? Salimpoor et al. (p. 216) combined behavioral economics with brain scanning to explore how a piece of music is considered rewarding to an individual when it is heard for the first time. They discovered that neural activity in the mesolimbic striatum during listening to a novel piece of music was the best predictor of the money listeners were willing to spend on buying the piece. These observations implicate sensory cortical areas in reward processing, which the authors attribute to the aesthetic nature of the judgment.
Quantized and Anomalous

The Hall effect, an electromagnetic phenomenon with a straightforward explanation, has many exotic counterparts, including a quantized version occurring independently of the presence of external magnetic fields. Inspired by a theoretical prediction of the quantum anomalous Hall (QAH) effect in magnetically doped topological insulator thin films, Chang et al. (p. 167, published online 14 March; see the Perspective by Oh) prepared thin films of the compound Cr0.15(Bi0.1Sb0.9)1.85Te3, with Cr as the magnetic dopant. They observed a plateau in the Hall resistance as a function of the gating voltage without any applied magnetic fields, signifying the achievement of the QAH state.

INTERFER(ON)ing Persistence

During persistent viral infections, a dysregulated immune response fails to control the infection. Wilson et al. (p. 202) and Teijaro et al. (p. 207; see the Perspective by Odorizzi and Wherry) show this occurs because type I interferons (IFN I), critical for early responses to viral infection, contribute to the altered immunity seen during persistent infection. Antibody blockade of IFN I signaling during chronic lymphocytic choriomeningitis virus (LCMV) in mice resulted in reduced viral titers at later stages of infection, reduced expression of inhibitory immune molecules and prevented the disruptions to secondary lymphoid organs typically observed during persistent infection with LCMV. Whether type I IFNs are also detrimental to persistent viral infection humans, such as HIV and hepatitis C virus, remains to be determined.

More Criegee Sightings

The reaction of ozone with unsaturated hydrocarbons produces short-lived molecules termed Criegee intermediates. The simplest such molecule, H2CO2, was recently detected and monitored in the laboratory. Su et al. (p. 174; see the Perspective by Vereecken) have obtained its vibrational spectrum, which could ultimately enable direct measurements of its reactivity in the atmosphere. Taatjes et al. (p. 177; see the Perspective by Vereecken) report on the laboratory preparation and reactivity of the next heavier Criegee intermediate, which bears a methyl group in place of one of the hydrogen atoms.

Variants and Regulation

Genomic DNA is packaged into nucleosomes by spooling around histone proteins. Histone variants and the composition of nucleosomes can influence gene expression, as well as other chromatin-mediated processes. For example, the H2A.Z histone variant flanks RNA polII promoters, and such nucleosomes show rapid turnover, as well as enrichment for histone H3 acetylated at lysine 56 (H3-K56Ac). Watanabe et al. (p. 195) show that H3-K56Ac alters the substrate specificity of the chromatin remodeling enzyme SWR-C, which normally evicts nucleosomal H2A.Z such that it now rapidly exchanges both canonical H2A and the variant H2A.Z, modulating nucleosome turnover and therefore influencing gene regulation. Pathways are dramatically simplified, promoting proper folding.