March 1999, p. 3.
2. "AIDS in Context" International Conference, University of the Witwatersrand, Johannesburg, 4 to 7 April 2001. Opening address by E. Cameron, text available at http://www.hivnet.ch:8000/africa/af-aids /viewR?987
3. Panel discussion, "AIDS in Context" International Conference (*2*).
4. While with the Department of Health under Zuma, Shisana had supported the government's stalling on MTCT prophylaxis.
5. "African Summit on HIV/AIDS, Tuberculosis and Other Related Infectious Diseases," 24 to 27 April 2001, Abuja, Nigeria. Information available at www.un-aids.org/whatsnew/speeches/eng/index.html
6. G. Gray, address, South Africa's First AIDS Walk, Johannesburg, 9 September 2000.
7. Z. Achmat, responding to Simelela's address and exit from the panel discussion at the "AIDS in Context" International Conference (*2*).

DOE's Support of the Sloan Digital Sky Survey

THE U.S. DEPARTMENT OF ENERGY (DOE) rarely gets the credit it deserves for its science programs, and in the case of the Sloan Digital Sky Survey, it deserves a lot of credit. The contributions to the project from Fermilab and Los Alamos National Laboratory that Ann Finkbeiner discusses in her sidebar article "Funding the Sloan" (News Focus, 25 May, p. 1474) came from the DOE. DOE's contribution to the Sloan is considerably larger than that of the traditional astronomy funders, NASA and the National Science Foundation (NSF). That DOE made this contribution is a tribute to the vision of its program officers and laboratory researchers, who recognized the importance of the Sloan data to such topics as the nature of dark matter and the evolution of the early universe, as well as to traditional astronomy.

As for those who will be analyzing the data, I was startled to read that NASA and NSF have not put up funds to allow the builders of the Sloan to have a major shot at this opportunity. The Sloan will be a revolutionary instrument. The people who have spent so many years bringing it into being deserve a chance to use it.

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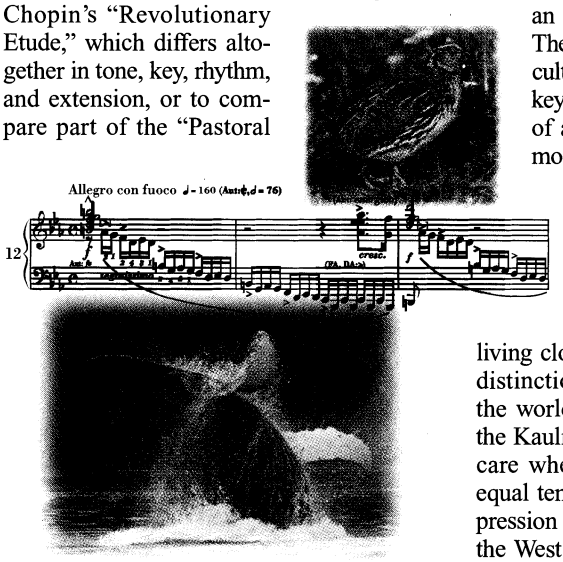
The Biology of Music

MUSIC WAS AT ONE TIME THE EXPLANATION OF universal order that supported the concept of the harmony of the spheres. From Pythagoras to Kepler, music and mathematics were inseparable and offered a means to understanding the mysterious relation between humans, nature, and the supernatural. In the Perspectives "The music of nature and the nature of music" by P. M. Gray *et al.* (*1*) and "The music of the hemispheres" by M. J. Tramo (*2*), the authors discuss recent research into the biological foundations of this unique human capability; however, they favor a biological and evolutionary origin of musical creativity.

The music produced by whales and birds and the physiology of human cochlea are analyzed and compared with the diatonic scale as if it were a universal and invariable series of musical notes. The diatonic scale is an artificial series of notes that is imperfect by its very nature. The scale we use in modern music was arrived at no more that three centuries ago. The uppermost note of a circle of fifths lands at a slightly higher frequency than the top note of a corresponding span of octaves, and the essential scaffolding of the 12-note scale does not fit the abstract ideal of arithmetic perfection (*3*). How, then, could evolution have shaped whale and bird songs or cochlear hair cells for specific tones in a recently human-made imperfect musical scale? Consequently, it is astonishing to find that whales might have chosen the same musical intervals and that they compose songs of the length of a symphony. However, to compare the descending cascade of notes of the wren's song with Chopin's "Revolutionary Etude," which differs altogether in tone, key, rhythm, and extension, or to compare part of the "Pastoral Symphony" by Beethoven, which is intended to mimic bird sounds, to the songs of the quail and cuckoo as evidence of the animal capacity to compose music certainly lies beyond scientific demonstration.



The nature of music—whether from humpback whales, quails, or the mind of Chopin.

Finally, the conclusion by Gray *et al.* (*1*), that the roots of music lie closer to our ancient brain (lizard brain) than to our neocortex, seems to contradict that of Tramo (*2*), who describes extensive cortical activity during musical perception. It appears more likely that musical creativity is a unique human quality similar to that of mathematical ability.

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References and Notes
1. P. M. Gray *et al.*, *Science* **291**, 52 (2001).
2. M. J. Tramo, *Science* **291**, 54 (2001).
3. T. Levenson, *Measure for Measure* (Touchstone, New York, 1995).

Response

THE BEGINNINGS OF THE DIATONIC SCALE are impossible to determine. However, ancient Greek theoretical writings on music describe its construction (*1*), and it also appears as the "Dheera Sankarabharanam," a Mela Raga in the Karnatic system of Indian music. This system is based on the Sanskrit writings known as the "Vedas," dating from 4000 to 1000 BC (*2*). In addition, we should also consider that practice usually precedes codification.

Benítez-Bribiesca refers to the diatonic scale as an "imperfect" combination of tones. The pleasure or "perfection" of the diatonic scale, however, is not dependent on whether the semitones are 100 cents (well tempered) or 112 cents ("just" tuning), but rather that it is an old, natural division of the octave. The intonation of this scale is a matter of cultural taste. Bach's Baroque world of keyboard music demanded the creation of an altered tuning system to accommodate the tyranny of thematic transposition through the circle of fifths. Well-tempered tuning did not create the diatonic scale (and many believe that it was not an improvement).

For many musical cultures still living close to the natural world, there is no distinction made between themselves and the world of the Other. They (the Bayaka, the Kauli, or the Jivaro, for instance) do not care whether scales are well tempered or equal tempered. Their forms of musical expression are not nearly as limited as those of the West. The birds, insects, mammals, and amphibians these people hear in their environments have a range of acoustic expression that extends well beyond the realm of those creatures we in the West would consider "musical" simply because they fit our models of music. Otherwise, why, with so many birds, insects, fish, mammals (marine and terrestrial), have we stuck to emulating and reflecting on only those that fit our particular models of what might seem musical to our limited ears?

In regard to the comparisons of bird song and Chopin's familiar composition, this reference was intended to be an example of the convergence of themes. The thesis is that avian song is a learned tradition, as is human music, and that ways in which music is learned in birds and humans are often similar (*3*). And as for music perception and the brain, figure 1 in Tramo's Perspective (*4*) does

CREDIT: (WHALE) IAIN KERR AND ROGER PAYNE/ OCEAN ALLIANCE; (QUAIL) ROBERT MAIER/ANIMALS ANIMALS; (SOURCE FOR MUSIC) LUIS BAPTISTA AND ROBIN KEISTER