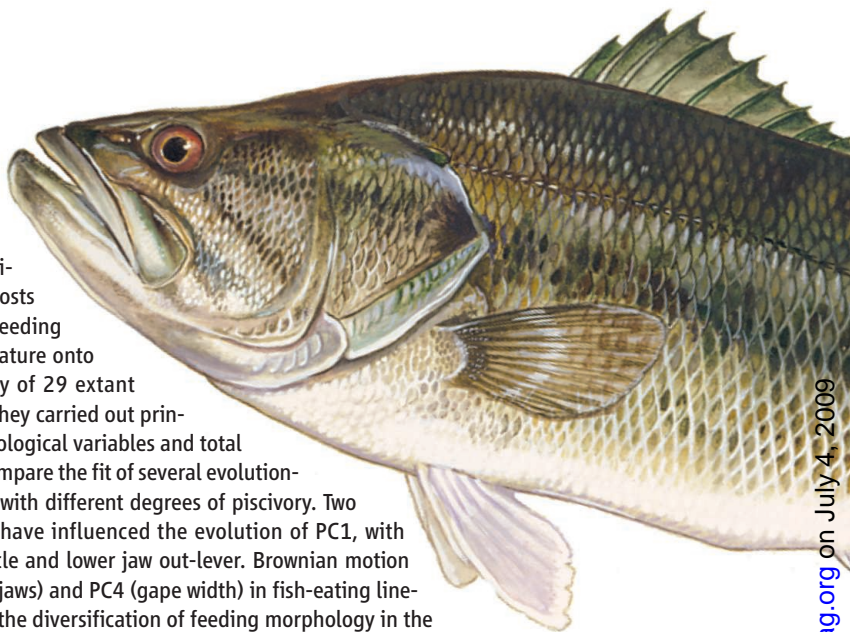


EVOLUTION

## Unable to Diversify

The decline in fitness with increasing distance from an adaptive peak can constrain morphological divergence between sister lineages. Collar *et al.* examine whether the functional demands of feeding on fish have limited morphological diversification in the Centrarchidae, an endemic clade of North American freshwater teleosts that includes sunfish and bass. To reconstruct ancestral feeding strategies, they map diet data synthesized from the literature onto a well-resolved, time-calibrated, multilocus phylogeny of 29 extant species. After measuring functional aspects of the skull, they carried out principal-components analysis of seven size-corrected morphological variables and total length. For each principal component (PC), the authors compare the fit of several evolutionary models, allowing parameters to vary across lineages with different degrees of piscivory. Two adaptive peaks (piscivory and nonpiscivory) appear to have influenced the evolution of PC1, with strongest loadings on the pharyngeal jaw adductor muscle and lower jaw out-lever. Brownian motion models reveal slow evolution of PC2 (muscle closing oral jaws) and PC4 (gape width) in fish-eating lineages. These findings indicate that piscivory has curtailed the diversification of feeding morphology in the centrarchids and that the effects have been strongest in highly piscivorous lineages. — SJS

*Evolution* 63, 1557 (2009).



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GEOCHEMISTRY

## Guiding Mercury's Meandering

Mercury's toxicity impels wide-ranging study of the binding and redox behavior of the element under varying environmental conditions. Sulfate-reducing bacteria in soils and sediments are known to enhance mercury accumulation in higher species such as fish and humans by methylating oxidized Hg(II) ions. To what extent do geochemical reactions at mineral surfaces play a role in controlling the fate of Hg? Lee *et al.* uncover sharp variations in Hg(II) adsorption behavior on muscovite as they shift the local concentration of naturally abundant organic acids; complexation by the organics in free solution appeared to enhance adsorption more effectively than did a preformed film on the surface. In a related study, Wiatrowski *et al.* show that when Hg(II) adsorbs

onto redox-active mineral surfaces such as magnetite, soluble Hg(II) is quickly reduced to highly mobile gaseous Hg(0). It remains unclear how organic layers on redox-active mineral surfaces specifically influence these and similar electron transfer reactions. Taken together, the two studies suggest that mineral-associated processes such as adsorption and phase transformation may provide stiff competition for the bacteria that catalyze Hg methylation reactions in mediating Hg fate and mobility. — NW

*Environ. Sci. Technol.* 43, 10.1021/es900214e; 10.1021/es9003608 (2009).

orphan nuclear receptor REV-ERB $\alpha$ . When miR-122 is knocked down, hundreds of mRNAs are expressed. Peroxisome proliferation-activated receptor (PPAR)  $\beta/\delta$  and the coactivator SMARCD1/BAF60a, two known metabolism regulators, are specific miR-122 targets, linking circadian rhythms with the PPAR family of nuclear receptors and liver metabolism. — BAP

*Genes Dev.* 23, 1313 (2009).

IMMUNOLOGY

## Maintaining Diversity

Exposure to infectious agents has exerted selective pressure on the evolution of one group of immune system genes. The hygiene hypothesis, proposed two decades ago, posits that the reduced exposure of inhabitants of modern industrialized societies to microbes and macropathogens (such as parasitic worms) has increased susceptibility to inflammatory conditions such as allergies and autoimmune disease. Taking a population genetics approach, Fumagalli *et al.* investigated how infectious agents have affected the genetic variability of interleukins, which are critical signaling molecules of the immune system, and their associated receptors. They found that pathogen richness, a measure of pathogen diversity in a specific geographic area, has driven the selection of several

MOLECULAR BIOLOGY

## Liverish Days and Nights

Biological processes with circadian rhythms show periodicity that correlates with the day/night cycle, and many metabolic pathways display such a regulatory mechanism. Prior work has suggested that between 2 and 10% of the liver transcriptome is under circadian control. Gatfield *et al.* show that miR-122, an abundant hepatocyte microRNA, is under circadian control. The abundance of the miR-122 precursor varies 4- to 10-fold during the day. However, accumulation is constant in the liver of mice lacking the



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