RESEARCH HIGHLIGHTS

Selections from the scientific literature

NEUROSCIENCE

Brain signature for thermal pain

Brain activity could one day help physicians to monitor pain, for which there is no reliable physiological test.

Using a type of magnetic resonance imaging that shows when certain parts of the brain are activated, Tor Wager at the University of Colorado Boulder and his colleagues started out by scanning the brains of 20 volunteers as they experienced warm to painfully hot sensations on their arm. They used these data to find a pattern of neural activation and deactivation that consistently appeared when the volunteers were exposed to painful heat. Further tests showed that this signature could discriminate physical pain from other stimuli, such as social pain and recollections of pain. The signature was reduced by analgesics. Such patterns could one day lead to more-objective assessments of pain.

N. Engl. J. Med. 368, **1388–1397 (2013)**

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CLIMATE CHANGE

Desert plants reap no rewards

Atmospheres that are enriched with carbon dioxide can boost plant productivity in some ecosystems, but drought may prevent faster or greater growth in desert plants, such as those of the Mojave Desert (pictured) in the southwestern United States.

Researchers led by Beth Newingham then at the University of Nevada in Las Vegas measured productivity above and below ground for plants that were exposed to high levels of atmospheric carbon dioxide at experimental sites in the Mojave Desert for a decade.

They found that dominant shrub and grass species that were exposed to higher levels of carbon dioxide showed some gains in weight and photosynthesis in wet years compared with plants at control sites that were exposed to ambient carbon dioxide, but that these gains were not sustained during drought.

Desert ecosystems, which cover around one-third of Earth's land surface, may be more limited by water than by carbon, the authors suggest.

Glob. Change Biol. **http://dx.doi.org/10.1111/gcb.12177 (2013)**

SYMBIOSIS

Roots spur on helpful biofilms

Components of plant cell walls can induce a bacterium that is used as a plant fertilizer to assemble itself into sticky mats known as biofilms.

Biofilms are often associated with hard-to-treat infections in animals, but those formed by the soil bacterium *Bacillus subtilis* actually protect plants from pathogens. A team led by Roberto Kolter at Harvard Medical School in Boston, Massachusetts, reports how signals from the roots of the model plant *Arabidopsis thaliana* prompt bacteria to join up. Pectin and other polysaccharides on the surface of plant cell walls activate bacterial genes known to induce biofilms. The polysaccharides also form the raw materials that bacteria use to synthesize the extracellular matrix that holds the biofilm together. The plant, therefore, provides both the environmental cue and the building blocks to promote beneficial colonization of its roots.

Proc. Natl Acad. Sci. USA **http://dx.doi.org/10.1073/pnas.1218984110 (2013)**

CONSERVATION BIOLOGY

Old evidence for fewer fish

The price of fish in the 1800s has helped to reveal the long-term effects of bottom trawling, a fishing practice in which nets are dragged across the seabed.

Ruth Thurstan, now at the University of Queensland in Brisbane, Australia, and her colleagues examined the testimonies of hundreds of fishermen in the northeast of England about changes to fish stocks and practices during the nineteenth century.

Statements about catch rate, price and fish size, which were given during two Royal Commissions of Enquiry (in 1863–66 and in 1883–85), revealed a perception by fishermen that numbers of