

TABT Update and URL of the Week

August 2008

Item 1 – Science in the News

Cyril Herry, *et al.*, “Switching on and off fear by distinct neuronal circuits”

(*Nature*, 454:7204, 31 July 2008, Pages 600-608)

Switching between exploratory and defensive behavior is fundamental to survival of many animals, but how this transition is achieved by specific neuronal circuits is not known. Using the converse behavioral states of fear extinction and its context-dependent renewal as a model in mice, these authors show that bi-directional transitions between states of high and low fear are triggered by a rapid switch in the balance of activity between two distinct populations of basal neurons. These are integrated into discrete neuronal circuits differentially connected with the hippocampus and the medial prefrontal cortex. Targeted and reversible neuronal inactivation prevents behavioral changes without affecting memory or expression of behavior. The findings indicate that switching between distinct behavioral states can be triggered by selective activation of specific neuronal circuits integrating sensory and contextual information. These observations provide a new framework for understanding context-dependent changes of fear behavior.

W. Renema, *et al.*, “Hopping Hotspots: Global Shifts in Marine Biodiversity”

(*Science*, 321:5889, 1 August 2008, Pages 654-657)

Biodiversity hotspots are a prominent feature of modern global species diversity patterns. Fossil and molecular evidence is starting to reveal the history of these hotspots. There have been at least three marine biodiversity hotspots during the past 50 million years. They have moved across almost half the globe, with their timing and locations coinciding with major tectonic events. The birth and death of successive hotspots highlights the link between environmental change and biodiversity patterns. The antiquity of the taxa in the modern Indo-Australian Archipelago hotspot emphasizes the role of pre-Pleistocene events in shaping modern diversity patterns.

Item 2 – URL of the Week 8/04

Siphonophores

This site contains information about siphonophores, communal relatives of jellyfish and corals. Each of the communal units (called zooids) resembles an individual animal. Pages explain how one zooid gives rise to a siphonophore's elongated body.

<http://www.siphonophores.org/>

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Item 1 – Science in the News

The American Association for Cancer Research Human Epigenome Task Force & European Union, Network of Excellence, Scientific Advisory Board, “Moving AHEAD with an international human epigenome project”
(*Nature*, 454:7205, 7 August 2008, Pages 711-715)

Breakthroughs in the prevention, diagnosis and treatment of human disease may be obtained through a thorough study of epigenomics. This feature article explains that epigenetic processes are essential for packaging and interpreting the genome, are fundamental to normal development and are increasingly recognized as being involved in human disease. It describes epigenetic mechanisms that include, among other things, histone modification, positioning of histone variants, nucleosome remodelling, DNA methylation, small and non-coding RNAs. These mechanisms interact with transcription factors and other DNA-binding proteins to regulate gene-expression patterns inherited from cell to cell. These patterns underlie embryonic development, differentiation and cell identity, transitions from a stem cell to a committed cell and responses to environmental signals such as hormones, nutrients, stress and damage.

Geerat J. Vermeij and Peter D. Roopnarine, “ECOLOGY: The Coming Arctic Invasion”
(*Science*, 321:5890, 8 August 2008, Pages 780-781)

The current episode of climate warming is having consequences for animal and plant life worldwide. Besides the expected pole ward expansion of temperate and tropical species and the latitudinal contraction of cold-adapted ones, an inter-oceanic invasion will likely ensue in the Arctic. North Pacific lineages will resume spreading through the Bering Strait into a warmer Arctic Ocean and eventually into the temperate North Atlantic.

Item 2 – URL of the Week 8/11

Flying Snake Home Page

Learn more about the five species of flying snakes of Asia at a site created by Jake Socha of Argonne National Laboratory in Illinois. These snakes launch themselves into the air and parachute, flattening their bodies to slow their descent. Nobody knows why the snakes adopted the aerial habit. The site showcases photos and videos of the reptiles flinging themselves from high perches.

<http://www.flyingsnake.org/>

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Item 1 – Science in the News

Shiven Kapur and Chaitan Khosla, “Biochemistry: Fit for an enzyme”

(*Nature*, 454:7206, 14 August 2008, Pages 832-833)

Some enzymes are of particular interest as an assembly system that might be adapted for the production of novel bioactive compounds with possible therapeutic activity. This article explains one enzyme that can flip open to reveal the carrier-protein binding site of the enzyme. This movement allows the tether of the carrier protein to access the active site.

Robert J. Diaz and Rutger Rosenberg, “Spreading Dead Zones and Consequences for Marine Ecosystems”

(*Science*, 321:5891, 15 August 2008, Pages 926-929)

Dead zones in coastal oceans have spread exponentially since the 1960s and have serious consequences for ecosystem functioning. The formation of dead zones has been exacerbated by the increase in primary production and consequent worldwide coastal eutrophication fueled by riverine runoff of fertilizers and the burning of fossil fuels. Enhanced primary production results in an accumulation of particulate organic matter, which encourages microbial activity and the consumption of dissolved oxygen in bottom waters. Dead zones have now been reported from more than 400 systems, affecting a total area of more than 245,000 square kilometers, and are probably a key stressor on marine ecosystems.

Item 2 – URL of the Week 8/18

Moths and Butterflies of Europe and North America

This site, hosted by three Italian scientists and insect enthusiasts, covers some 1450 kinds of European and North African moths and butterflies.

<http://www.leps.it/>

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Item 1 – Spring/Summer Edition of *The Nucleus*

The Nucleus Online

The Spring/Summer edition of *The Nucleus* to all members. Some emails were returned to us with an error message. You can download your copy directly from the TABT Web site at:

<http://www.texarkanacollege.edu/~mstorey/TABT/index.html>. Please contact Alton Biggs (altonb@ix.netcom.com) if you have any problems. Additionally, Joe Stanaland, Editor of *The Nucleus*, requests your manuscripts for future editions. Please send them to Joe at Alton Biggs's email address and he will forward them.

Item 2 – Science in the News

Mansi Srivastava, et al., “The *Trichoplax* genome and the nature of placozoans”

(*Nature*, 454:7207, 21 August 2008, Pages 955-961)

Often touted as the simplest free-living animal alive, *Trichoplax* is central to the debate on early animal origins. It is a disk-shaped placozoan (meaning a ‘flat animal’) about a millimeter across and was first observed growing on the walls of an aquarium. Now the genome of *Trichoplax adhaerens* has been sequenced and analyzed. The organism retains many features of the last common ancestor with cnidarians and bilaterians, calculated to have existed more than 600 million years ago. But *Trichoplax* also contains genes for developmental patterns and cell types which have never been seen in this animal, suggesting that there may be stages in its life cycle that have not yet been observed.

Roberto Ferrari, et al., “Epigenetic Reprogramming by Adenovirus e1a”

(*Science*, 321:5892, 22 August 2008, Pages 1086-1088)

Adenovirus e1a induces quiescent human cells to replicate. These authors found that e1a causes global re-localization of the RB (retinoblastoma) proteins (RB, p130, and p107) and p300/CBP histone acetyltransferases on promoters, thereby stimulating cell cycling and inhibiting antiviral responses and cellular differentiation. Soon after expression, e1a binds transiently to promoters of cell cycle and growth genes. e1a also associates transiently with promoters of antiviral genes, causing enrichment for RB, p130, and H4K16ac; increased nucleosome density; and transcriptional repression. At later times, e1a and p107 bind mainly to promoters of development and differentiation genes, repressing transcription. The temporal order of e1a binding requires its interactions with p300/CBP and RB proteins. The authors' data define epigenetic reprogramming leading to cellular transformation.

Item 3 – URL of the Week 8/25

Evolution Resources from the National Academies

To help teachers and other visitors better understand evolution, the U.S. National Academies have released a collection of previously published reports, position statements, and other documents. The offerings include a synopsis of the evidence for evolution and a guide to using it to help students learn how science works.

<http://nationalacademies.org/evolution/>

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