



<< The Long Lineage of Domestic Cats

Recent genomic information has solved the puzzle about the origin of the domestic cat. **Driscoll *et al.*** (p. 519, published online 28 June) used genomic and mitochondrial markers to piece together the origin of the domestic cat relative to its wild progenitors. The lineage that includes the domestic cat as well as several wild relatives originated much earlier than previously thought, more than 100,000 years ago. Furthermore, it seems that domestication occurred in the Near East in the region of the Fertile Crescent, and not in Africa.

Life Online

Most people begin surfing the Web by going to a search engine, whose function is to index, rank, and categorize Web sites. How these search sites actually find and then evaluate Web sites is a matter of active research and intense corporate competition. **Henzinger** (p. 468) surveys current research into overcoming the difficulties posed by the kinds of queries that Web surfers put to the engines. Some of today's most impressive virtual worlds are the creativity-oriented environment Second Life and the massively multiplayer online role-playing game World of Warcraft. Such online worlds have opened up the possibility of doing scientific research on human interactions—from economics to altruism—at an unprecedented level. **Bainbridge** (p. 472) describes the potential and early progress in this new research arena.

Icebergs and Surface Ocean Productivity

How will the increase in iceberg production from the Antarctic ice sheet, prompted by global warming, affect the surrounding pelagic ecosystem? **Smith *et al.*** (p. 478, published online 21 June) studied two drifting tabular icebergs and the surrounding waters in the northwest Weddell Sea during the austral spring of 2005. Terrigenous material, chlorophyll, krill, and seabirds were more abundant up to as much as 4 kilometers away than they were further from the icebergs. The authors, using a survey of nearby icebergs, calculate that almost 40% of the surface water was influenced by melting, drifting ice, assuming that the effects they measured were representative of icebergs in that general area. Thus, free-drifting icebergs may enhance

production and sequestration of organic carbon in areas that otherwise are not as productive.

Modeling Economic Development

Traditional economics has assumed that countries can always find a combination of goods to sell that put to use their human, physical, and institutional capital. The implication of this view is that the economic growth of a country is mainly a matter of increasing the amount of each form of capital. However, if each of these forms of capital is highly product-specific, the structure of the world of products becomes very important in determining the evolution of a country's productive capabilities. **Hidalgo *et al.*** (p. 482) used network theories and international trade data to build a dynamic model of country growth and development, which may help to explain in part why some countries continue to be poor while others grow economically.

Deterministic Entangled Pairs

A major challenge in quantum information processing and quantum computing is the ability to reliably store and transfer information from one node to another. The entanglement of the qubits, such as those based on photons, is a key feature of achieving such a goal, but has so far relied on probabilistic generation processes. **Wilk *et al.*** (p. 488, published online 21 June) report on the successful implementation of an interface between a stationary qubit (an atom) and a flying qubit (a photon) in a cavity-quantum electrodynamics setup and demonstrate the potential to

operate in an almost deterministic way. A sequence of laser pulses targeted on the trapped Rb atom can result in the deterministic generation of entangled photon pairs.

Aerogels Without the Oxygen

The inorganic porous materials used as molecular sieves, ion exchangers, and catalysts have primarily been oxides, but the higher polarizability and "softness" of chalcogenides, such as sulfides and selenides, could improve the ability of such materials to interact with heavy metal ions. **Bag *et al.*** (p. 490; see the Perspective by **Brock**) have prepared a series of gels from the reaction of anionic metal-chalcogenide clusters with Pt(II) salts in water. These gels were then transformed by supercritical drying into mesoporous aerogels that have high surface area and that are semiconductors with compositionally dependent band gaps. These materials can adsorb large quantities of mercury ions from solution as well as nonpolar organic molecules.



Charging Up Gold Catalysts

Asymmetric catalysis has predominantly relied on transition-metal complexes bearing chiral ligands. More recently, chiral anions have been used in metal-free systems to induce asymmetry in acid catalysis or phase-transfer pathways. **Hamilton *et al.*** (p. 496; see the Perspective by

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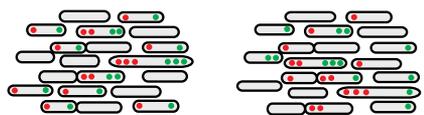
Lacour and Linder) combine these two approaches by pairing cationic gold(I) phosphine complexes with chiral phosphate counterions. A wide range of previously intractable cyclizations of O- and N-substituted allenes proceed in high yield and enantioselectivity. In certain cases, they achieve even higher selectivities by using synergistic combinations of chiral ligands and chiral counterions.

Variable Beginnings

Much work on the fossil record has revealed evolution among related species in a group—examples include horses, ammonites, or humans. What does the fossil record show about evolution within a species, as this is ultimately the building block of evolution? **Webster** (p. 499; see the Perspective by **Hunt**) explores this question by using the excellent fossil record of trilobites, which emerged in the Cambrian. Examination of more than 900 trilobite species shows that their morphological variation was greatest soon after they appeared. Later members of the species show more limited variation. This pattern within species mirrors the larger evolutionary variation shown by trilobites as a whole.

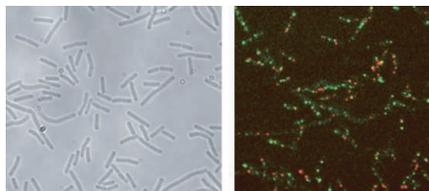
Ethylene Controls Root Meristem Production

In plants, undifferentiated meristem tissue provides stem cells to produce roots and shoots. The root meristem contains a few of these stem cells in a region called the quiescent center. **Ortega-Martinez et al.** (p. 507) studied *Arabidopsis* plants with a defect in a gene that controls ethylene biosynthesis and found that it produced more of the gaseous hormone ethylene. The quiescent center cells in these mutants went through more cell divisions than normal, resulting in extra stem cells in the root meristem. Adding exogenous ethylene also increased quiescent cell division, and blocking its synthesis in the mutants prevented extra divisions.



Noise, Gene Expression, and Competence

The soil bacterium *Bacillus subtilis* can become “competent”—it can take up genetic material from its surroundings. Competence is regulated by the protein ComK, which controls the genes responsible for DNA uptake. However, cells can only transition to competence in a random fashion during a limited period of time at the beginning of the stationary phase of growth. **Maamar et al.** (p. 526, published



online 14 June; see the Perspective by **Mettetal and van Oudenaarden**) now find that temporal regulation of *comK* transcription defines the “window of opportunity” during which cells can become competent, and intrinsic noise in gene expression controls the rate at which stochastic transitions to the competent state occur.

Aerobes Far and Wide

Aerobic phototrophic bacteria that utilize bacteriochlorophyll for light harvesting and charge separation were at first thought to be limited to selected, nutrient-rich environments, but similar organisms were later found to be ubiquitously distributed in the upper ocean. The subsequent discovery of proteorhodopsin-containing bacteria indicated that phototrophy is common among Proteobacteria.

Bryant et al. (p. 523) now describe another surprise, an aerobic bacterial phototroph within the phylum *Acidobacteria*.

Potential Parkinson’s Intervention

Several neurodegenerative disorders are associated with protein misfolding and are intimately associated with aging. **Outeiro et al.** (p. 516, published online 21 June 2007; see the Perspective by **Dillin and Kelly**) identified a compound that can modulate toxicity and aggregation of α -synuclein, a protein associated with Parkinson’s disease. The compound exhibited selective inhibitory activity against human sirtuin 2 (SIRT2) deacetylase and possessed efficacy in several Parkinson’s disease model systems, increasing the size of intracellular α -synuclein aggregates. The results suggest a cytoprotective role for larger inclusions.

CREDIT: MAAMAR ET AL.