

PLANETARY DYNAMICS

Close planet friends get out of line

Some “warm” giant exoplanets orbit much closer to their star than do similar planets in our solar system. Dawson and Chiang argue that understanding how such orbits have evolved can answer an outstanding question: How do “hot” giant planets (which are more common than these “warm” ones) get so close to their host star? These planets frequently have giant companions. Numerical simulations revealed that planets with an eccentric giant companion may have just the right mutual inclination for the inner planet to be pushed slowly toward the star. This process could then produce systems with “warm” rather than “hot” Jupiters. — MMM

Science, this issue p. 212

CELL-FREE ASSAYS

Reconstituting the right stuff for division

Cytokinesis, when two daughter cells are physically separated from one another, is the final stage of cell division. How dividing cells assemble a cleavage furrow ready for cytokinesis has long interested cell biologists. A major stumbling block to probing the underlying mechanisms has been the lack of a cell-free and fully controllable experimental system. Now, Nguyen *et al.* have reconstituted cytokinesis organization outside living cells, using a system derived from frog eggs. In the cell-free system, the cell cycle state is “frozen,” and the spatial scale is unusually large. The authors examined the biophysics involved in signaling during cytokinesis over many minutes and

many micrometers using powerful imaging techniques. — SMH

Science, this issue p. 244

ADULT NEUROGENESIS

Astrocytes’ hidden ability to generate neurons

New neurons could be useful in the brain to respond to damage done by disease, trauma, or just plain age. But the adult brain does not produce many new neurons. Working in mice, Magnusson *et al.* hunted for intrinsic genetic programs that can help adult brains produce replacement neurons. They found that astrocytes, spidery cells that are interspersed between neurons, carry a latent neurogenic program. The ability to entice astrocytes to replace neurons could obviate the need for neuronal replacement strategies. — PJH

Science, this issue p. 237

ECONOMIC DEMOGRAPHY

Adjusting to fewer kids and more elderly

In many countries, populations are aging as retirees live longer, and the rates of population growth have declined as fewer babies are born. These demographic changes have evoked alarmist predictions that future retirement pensions will need to be curtailed, constraining future generations’ purchasing power. Lee *et al.* point out that compensatory factors, such as more women working more years, along with a better educated workforce, may mitigate these demographic impacts (see the Perspective by Smeeding). — GJC

Science, this issue p. 229; see also p. 163

IN OTHER JOURNALS

Edited by Kristen Mueller and Jesse Smith



ASTRONOMY

Do young star clusters follow the law?

One of the enduring puzzles of astrophysics is how mass is distributed among a population of stars at their birth. Astronomers currently use modified power-law functions in an attempt to describe the initial mass function (IMF), effectively a histogram of stellar masses. Sami Dib employed Bayesian statistics to find the probability distributions of IMF parameters for eight young star clusters with similar environments and ages, in order to discover if a universally descriptive IMF exists. Surprisingly, the resulting parameters did not overlap (within 1 sigma), suggesting that there is no universal description for young clusters. These findings demonstrate the power and necessity of Bayesian statistics in IMF studies as next-generation telescopes that can resolve stellar populations in many more clusters come online. — MMM

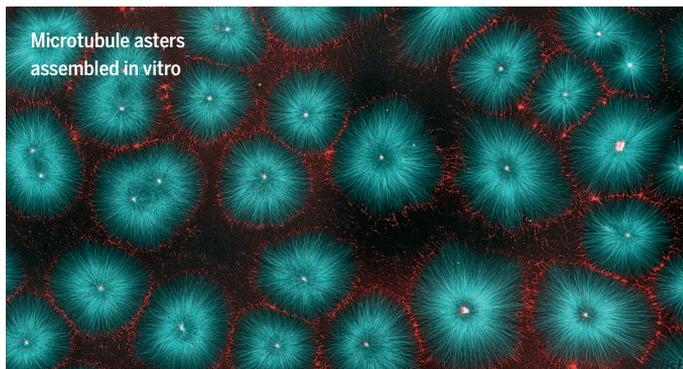
Mon. Not. R. Astron. Soc. 10.1093/mnras/stu1521 (2014).

TROPICAL FORESTS

Tree diversity benefits light capture

Higher plant diversity in ecosystems often benefits ecological processes such as nutrient cycling and rates of growth. To better understand how such improvements might work in tropical forests, Sapijajankas *et al.* set up experimental

plantations in Panama using seedlings of native tree species and varied the number of species in the plots. Eight years later, they measured light penetrating through the tree canopy and found that plots with six species captured more light and grew taller than those with three species or only one. The researchers linked these effects to changes in tree



Microtubule asters assembled in vitro



EVOLUTIONARY BIOLOGY

Whales put their pelvic bones to good use

As organisms adapt to their environment, they lose traits that are no longer beneficial or keep them in much reduced form. Such “vestigial” traits may be on their way out, but sometimes they can also acquire new functions. Dines *et al.* show that the reduced pelvic bones of cetaceans (marine mammals such as whales, porpoises and dolphins) may fall into the latter category. They found that these bones anchor the muscles that control the highly dextrous penis found in many cetacean species. Moreover, species in which male competition for females is high have both large pelvic bones and penises relative to their body size. —SNV

Evolution 10.1111/evo.12516 (2014).

structure at the different levels of diversity and to differences in seasonal growth patterns of the trees. — AMS

Ecology 95, 2479 (2014).

EDUCATION

Mind the (gender) gap...it's still here

Unlike in mathematics, engineering, and other areas of science, the number of undergraduate female biology majors exceeds that of male biology majors. To determine whether gender disparities still exist, however, Eddy *et al.* looked at whole-class discussion participation and academic achievement in 23 introductory undergraduate biology classes at a large university. Despite being the numerical majority at 60%, females responded to instructor-posed questions less than 40% of the time. Moreover, females scored lower on exams than their male counterparts with a similar grade point average. These results show that closing the gender gap in science education may require more than just recruitment alone. — MM

CBE Life Sci. Educ. 13, 478 (2014).

METABOLIC CONTROL

Membrane protein signals to mitochondria

Cell adhesion proteins called Fat cadherins control cell growth

and tissue organization. Sing *et al.* now report a new function for Fat cadherins: They launch a signal that helps cells generate energy in the mitochondria. During fly development, an enzyme cuts off the cytoplasmic portion of the large Fat cadherin that spans the cell membrane. Freed from the membrane, this peptide then moves to the mitochondria, where it drives oxidative phosphorylation. These results may provide insight into the role of Fat cadherins in tumors (Fat cadherin 4 is mutated in several human cancers), which require careful metabolic regulation in order to grow. — LBR

Cell 10.1016/j.cell.2014.07.036 (2014).

LOW-COST DIAGNOSTICS

A blood test for those who need it most

People with sickle cell disease have abnormally shaped red blood cells, which can cause anemia and disrupt blood flow, leading to organ damage. Sickle cell disease can be managed effectively when diagnosed early. But in places such as sub-Saharan Africa, which lacks the infrastructure needed for advanced diagnostic procedures, many children die of the disease. To overcome this, Kumar *et al.* developed a diagnostic test that is rapid, inexpensive,

and could be implemented in low-resource areas. Starting with blood from a fingerstick, they used aqueous solutions of polymers to separate cells by their density. Because sickle cells have a higher density than normal cells, the scientists could easily detect them by visually inspecting the samples. — PAK

Proc. Natl. Acad. Sci. U.S.A. 10.1073/pnas.1414739111 (2014).

FLUOROCARBONS

An elusive ion caught sticking around

Trifluoromethyl groups are found in a wide variety of compounds, including such well-known drugs as Prozac and Celebrex. Chemists often incorporate them into molecules through methods that might seem to involve the intermediacy of the negatively charged CF_3^- anion. However, this intermediate has stayed out of sight in solution, leaving its stability in doubt. Prakash *et al.* now have succeeded in catching it on camera, so to speak (actually in nuclear magnetic resonance spectra). To make it, they treated

CF_3H and several silyl-substituted analogs with potassium *t*-butoxide base, and then bound the potassium counterion in a crown ether. The anion persisted for days in tetrahydrofuran solvent at minus 78°C. — JSY

Angew. Chem. Int. Ed. 53, 10.1002/anie.201406505 (2014).

PLANETARY SCIENCE

Moon's ancient magma plumbing system

Several kilometers below a lunar dark spot called Oceanus Procellarum lies a giant rectangle: the remnants of a geological plumbing system that spilled lava across the Moon 3.5 billion years ago, scientists say. Andrews-Hanna *et al.* studied density variations on the Moon's surface, mapped by NASA's GRAIL (Gravity Recovery and Interior Laboratory) spacecraft, which spotted the mysterious rectangle. Procellarum is rich in radioactive elements that produce heat; as the rock cooled, the team theorized, it would have cracked, forming rift valleys that later became channels for upwelling magma. Spilled lava created the dark spot, and the weight of that dense material formed a topographic low. The rectangular shape also casts doubt on the decades-old theory that the circular Procellarum region is a crater created by the impact of a large asteroid. — EH

Nature 10.1038/nature13697(2014).

