

SCIENCE TOURISM

Some Stops for Summer Trips

Because we suspect that you already have an ever-growing stack of unread books, this year we offer some different suggestions for summer escapes: a few exhibits, events, and sites for science-minded travelers. The following is a very small sample of such destinations, and recommendations for future coverage are most welcome (science_bookrevs@aaas.org). If you won't be traveling this summer or are otherwise still looking for reading material, you may wish to check our summer reading ideas from past years: e.g., *Science* 324, 2167 (2009), *Science* 316, 1845 (2007).

—Sherman J. Suter

Reflecting Berlin, Past and Present

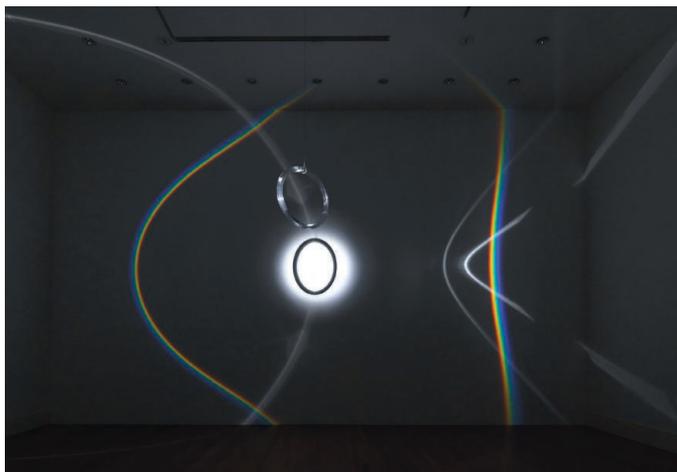
Olafur Eliasson: Innen Stadt Außen. Daniel Birnbaum, curator. Martin-Gropius-Bau, Berlin. To 9 August 2010. www.gropiusbau.de

WeltWissen [Universal Knowledge]: 300 Years of Science in Berlin. Martin-Gropius-Bau, Berlin. 24 September 2010 to 9 January 2011. www.gropiusbau.de

Berlin is a city of contrasts, with landmarks that reflect depraved dictatorships and peaceful revolutions, Prussian order and anarchist chaos—sometimes all on a single street corner. Two intriguing exhibits this summer and autumn offer visitors a chance to see the city in a new light.

Playing tricks with light, reflections, and human perception is a trademark of the Danish-Icelandic artist Olafur Eliasson. His latest show, in his adopted hometown, is no exception. The exhibit, *Innen Stadt Außen*, began last winter with more than a dozen temporary works scattered throughout the city. These included bicycles with mirrored wheels that seemed to melt into their surroundings as well as logs, collected from the coast of Iceland, that were placed across intersections and pedestrian walkways. (The exhibit's title is a pun: Literally "Inner City Outside," it also sounds like "inside instead of outside.")

The main installation, at the Martin-Gropius-Bau, starts playfully, with curved mirrors and multicolored shadows. But then the visual tricks get more intense and become more intriguing for enthusiasts of optics and visual perception. One room seems to turn the world into shades of gray. A film shows a truck with a huge mounted mirror driving through Berlin, reflecting and bending the cityscape onto itself. A mirrored hall, titled *Microscope*, can make it appear as if one is standing on top of the museum's famous glass portico. The final piece draws the visitor through



a rainbow-colored fog that is disorienting enough to warrant a warning for claustrophobics.

For visitors who don't arrive until later in the summer, one outdoor installation, *The Blind Pavilion*, will remain at the Pfaueninsel, an island in Wannsee Lake in southwest Berlin, until 31 October. By then, the Martin-Gropius-Bau will be hosting an exhibit reflecting another side of this multifaceted city: *WeltWissen: 300 Years of Science in Berlin*. Berlin is currently celebrating a "Year of Science" in honor of multiple anniversaries: The 300th of both the Berlin-Brandenburg Academy of Sciences and the Charité Hospital, one of Europe's largest research hospitals; the 350th of the city's library, the Staatsbibliothek; the 200th of the Humboldt University; and the 100th of the founding of the Kaiser Wilhelm Society, the forerunner of today's Max Planck Society. *WeltWissen* will spotlight scholars who have lived and worked in the city, such as explorer and biologist Alexander von Humboldt, Albert Einstein, Fritz Haber (whose work on ammonia synthesis revolutionized agriculture), and Gerhard Ertl (the 2007 Nobel laureate in chemistry). Its coverage does not ignore less-welcome discoveries (e.g., Haber's World War I work on chemical weapons). And the exhibit will also examine lows and highs of scientific research in the city, from the Nazi-era persecution and expulsion of scientists to the postwar attempts to rebuild science both east and west of the Berlin Wall.

—Gretchen Vogel



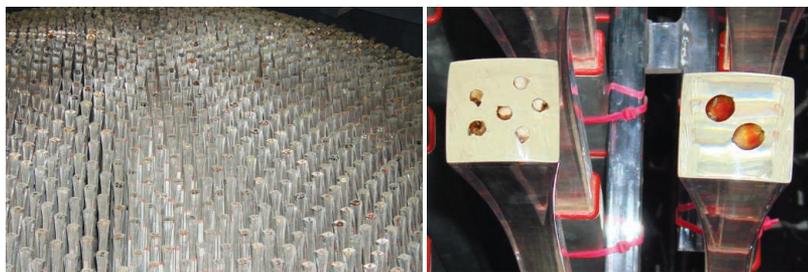
Science After Dark

Synchronous Fireflies. Great Smoky Mountains National Park, Tennessee. www.nps.gov/grsm/naturescience/fireflies.htm

The event is not really a festival, it's not at a museum, and you have missed it this year. Despite all of that, during the second week of June, Great Smoky Mountains National Park provides a scenic stage for the displays of the synchronous firefly, *Photinus carolinus*. The males gather in groups whose members synchronize their flashing lights; how this concerted effort pays off with the females remains unclear. Fireflies, which like a damp environment, can be seen throughout the park, but most visitors view them on the Little River Trail, starting at the Elkmont campground. On evenings during the synchronous firefly season, visitors to the site must use the trolley service from the Sugarlands Visitor Center, just south of Gatlinburg. Several hundred people can be accommodated each night, but the parking lot can fill (especially on weekends), so you may want to arrive early. However, the firefly action will not start until after sundown (around 9 p.m.); if you come early, plan on enjoying other aspects of the park. The rangers recommend a flashlight covered with red cellophane, and only a heavy rain stops the show. If the night is clear, bring a star chart and binoculars, as the night sky in the Smokies is wonderfully dark.

—Phillip Szuromi

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The Largest World's Fair

World Expo 2010. Shanghai, China. To 31 October 2010.
<http://en.expo2010.cn/>

The more than 200 pavilions at the current world's fair in Shanghai offer countless fun and science-related exhibits, unique multidimensional movies, and interesting activities. These range from ancient fossils (including 125-million-year-old flowers, early flying birds, and dinosaurs) to futuristic, cutting-edge sound, lighting, and sensor technologies that stir the imagination. Visitors can join interactive multimedia programs and enjoy spectacular views and outdoor performances. Exhibitors comprise 189 countries, 57 international organizations, and each of China's 31 provinces—municipalities—autonomous regions.

The Expo's theme, "Better City, Better Life," underscores the goal for environmental and socioeconomic sustainability in our rapidly urbanizing world. Reflecting the theme, the Expo displays numerous innovative ideas and emerging technologies that promote higher efficiency, lower CO₂ emissions, less waste, and the renewable use of energy and other resources. One example is the United Kingdom's visually awe-inspiring "Seed Cathedral," with 60,000 swaying fiber optic rods (filled with seeds, which will later be planted) that provide interior light during the day and become an enormous glowing piece of art at night. Another is on display in the Chinese national pavilion: the world's first "carbon negative" concept car, which would run on renewable energy and emit oxygen.

The first world's fair to be hosted by a developing country, Shanghai 2010 is expected to draw a record 70 million visitors. The most popular pavilions require reserved tickets and patient waits in dragonsque lines. Those unable to get away to Shanghai may enjoy virtual tours of the fair at <http://en.expo.cn>.

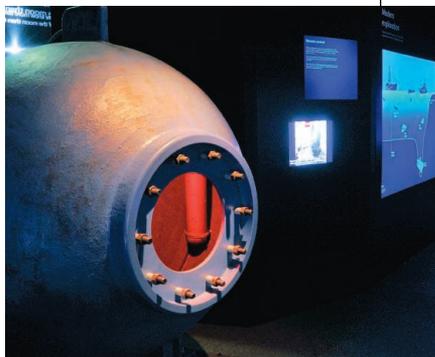
—Jianguo Liu and Shuxin Li (Michigan State University)

Sink into the Depths of the Sea

The Deep. Natural History Museum, London, in collaboration with Natural History Museum, Basel, and the Senckenberg Research Institute and Nature Museum, Frankfurt am Main. To 5 September 2010.
www.nhm.ac.uk/thedeep/

In the pitch-black water, 3 km down, under crushing pressure, food is problematic. So when a whale falls to its death, it's a bonanza for abyssal creatures. At the center of the exhibition *The Deep* is a partial skeleton of a sperm whale, used to illustrate what happens after a succession of scavenging hagfish and crustaceans have done their work. Next it's the turn of the snotworms (*Osedax*), recently discovered annelids that burrow into whale bones and, with the help of symbiotic bacteria, digest away the final traces of the behemoth. No wonder fossil whales are very rare.

In the gloom of the exhibition, projections of self-illuminating life forms swim around models of a giant squid and a sperm



whale hanging from the ceiling. There's a case of giant radiolarians, miraculously magnified in blown glass by Leopold and Rudolf Blaschka, who are famous for the exquisite collection of glass flowers commissioned by Harvard University's Museum of Natural History. Round the corner is a replica of William Beebe's bathysphere; if you put your head inside, you will hear the voices of the pilots describing the constellations of flashing lights they saw emitted from myriads of unexpected animals. And there are

indeed nightmare monsters, as the arrays of bizarre pickled fish attest to, with their huge eyes, glowing lures, and extensible jaws adapted to surmount the difficulties of snaring a morsel in the dark cold. Sailors imagined mermaids and krakens populated the deep; we know little better now, even of creatures as huge as giant squid. Despite the best efforts of ocean explorers, research in the deep is difficult and expensive; we learn that the crew of the *Challenger* voyage (1872–1876) complained mightily of the relentless tedium of trawling and hauling nets on their global survey. This exhibition supplies visitors with the chance to taste deep-ocean travel without any risk of dampness. You can step inside the submersible *Mariana*, take the captain's seat, and watch the endless snowfall of dying surface organisms drifting across a video porthole. Don't stop here though: Dip into *The Deep* to cool off for an hour, and then make your own voyage through the multitudes of extraordinary natural wonders and many spectacular exhibits the museum has to offer.

—Caroline Ash



Once Upon a Time on an Ancient Reef

Geikie Gorge National Park. Western Australia. www.dec.wa.gov.au/component?option=com_hotproperty/task/view/id,43/Itemid,1584/

Scenic Geikie Gorge, in the rugged Kimberley region of Western Australia, offers visitors two journeys back in time. As the National Parks boat trip winds its way upstream, the towering cliffs of white and buff-gray limestone will whisk them back to the Devonian period, around 380 million years ago, when most of northwestern Australia was flanked by a reef system almost the scale of the living Great Barrier Reef. Geologists hail the gorge as one of the most spectacular exposures of rocks this age anywhere. Myriad bizarre life forms once flourished on, in, and around this fossil reef. It was built up not by coral but by algal communities called stromatolites aided by layered, sponge-like stromatoporoids.

The Devonian reef exposed along the Fitzroy River runs for 325 km across the Kimberley landscape, in remote places graced by the giant bottle trees (boabs). Just south of Fitzroy Crossing (the town closest to the gorge), jagged outcrops of the reef are expressed as sharp, linear mountain ranges, albeit low ones. Here some of the world's best fossil fishes can be found as three-dimensional, uncrushed skeletons entombed in limestone concretions that litter the valley floors for 80 or so km. In his 1979 series *Life on Earth*, David Attenborough traveled here (to a cattle ranch called Gogo) to teach us about fish evolution. Expeditions I have led to the site over the past 25 years have been fortunate to stumble on some interesting discoveries: an armored placoderm fish (a long-extinct group) that held an unborn embryo inside her, still linked by a mineralized umbilical cord; a fish specimen with

the oldest complete male mating structures, intact; a lungfish that revealed to us how fish first began to breathe air, while still living in marine conditions. The Gogo has been instrumental in refining our view of vertebrate evolution, as so much of the human body plan first developed in these early fish.

Where the boat turns around to head for home, visitors can glimpse green patches of dense, vine-thicket rainforest between the cliffs of pale rock. Trees cling to rocky ledges, their slender tap roots at times penetrating 20 m of solid rock to reach the water underneath. There is a huge wealth of wildlife to be seen, heard, and at times encountered unexpectedly. In spring, you might be alarmed by the sound of thousands of large screeching fruit bats ("flying foxes"). All year round, 160-cm-tall broilga cranes stride in the shallows, keeping a wary eye on groups of toothy, narrow-muzzled, freshwater crocodiles that sun themselves on sandy banks and fallen logs. If you stay overnight at a lodge near the river, you will surely be woken by a magnificent dawn chorus of almost-deafening bird calls.

The second journey the visitor takes here is back to a time before Europeans came to Australia, to the dreamtime land of the Bunaba people. Their rock paintings adorn caves throughout the region, and guides from the tribe can take you on a tour to demonstrate the abundant wealth of native foods in the region. The Fitzroy River links the ancient, the present, the cultural, and the spiritual themes of the landscape. One can truly learn many lessons from the past here.

—John Long (Natural History Museum of Los Angeles County)



Facing Higher Water

Rising Currents: Projects for New York's Waterfront. Museum of Modern Art, New York. Barry Bergdoll, curator. To 11 October 2010. www.moma.org/visit/calendar/exhibitions/1031

By 2080, climate change may deliver a 60-cm rise in sea level along with more frequent and more violent storm surges to New York City's waterfront. *Rising Currents* (the first of five exhibitions in the series "Issues in Contemporary Architecture") presents five proposals for reconfiguring the area's shores to adapt to such a threat. Each multidisciplinary team of architects, engineers, and landscape designers addressed a different terrain—from the low-lying landfill areas around Bayonne and Jersey City to the heights on either side of the Verrazano Narrows bridge. Their solutions are depicted in models, maps, and drawings as well as described in videos by the teams. In one concept, existing piers and warehouses are transformed into a recycling facility to convert discarded glass into building blocks for a glass reef. The reef would act as a breakwater and home for marsh grasses and marine life. Another group envisioned the polluted area around the Gowanus canal converted into a vast weblike structure that would support an oyster farm. A third would deal with storm surges by having buildings hanging from a shared bridge. Rather than fighting climate change, the teams envisioned infrastructures that exploit altered conditions to reimagine what an urban environment can provide for its inhabitants.

—Barbara Jansy

A Sporting Chance

Athletes and Science. Le Musée Olympique, Lausanne, Switzerland. To 13 March 2011. www.olympic.org/en/content/The-Olympic-Museum/

Walking under a high-jump bar set at the long-standing world record of 2.45 m makes it clear that the Olympic Museum celebrates the remarkable feats of athletes. Therefore, it is no surprise that the museum's new *Athletes and Science* exhibition projects a somewhat guarded view of science's role in sports. As visitors enter, a cautionary message proclaims that despite the advantages science and technology provide, "sport must remain human."

Along those lines, the exhibition suggests that science and technology may aid the supporting participants in sports as much as they help the athletes themselves. For instance, coaches have tools that track player movement in team sports, trainers count on state-of-the-art physiological monitoring to improve performance, referees rely on technology to obtain unambiguous results from photofinishes, and judges use technology to eliminate bias from subjectively evaluated sports such as figure skating. As to what the athletes stand to gain (or lose), the exhibition does not discuss perhaps sports' largest concern—doping—because the museum itself houses a permanent, surprisingly open and apprehensible exhibition on that topic.

Unfortunately, the exhibition generally fails to distinguish technological advancements (such as touch-pad sensors and stop-motion cameras) from scientific research. There are, however, a few short presentations on topics such as how muscles twitch, how different materials absorb shock or propagate vibration, and the basics of hydrodynamics. Whereas the exhibition's general theme—that science and technology deliver both benefits and harms to sports—is clear throughout, there is only a brief mention that sport provides a "fabulous research opportunity for science" or researchers.

One futuristic display portrays an Olympic Games (2150) in which the world of sport has become too reliant on technology: A swimmer sets a new world record over three times as fast as the current mark thanks to both a "polymeta-superflottanyl" bodysuit that dynamically controls muscle movement and a rigorous course of gene therapy that increased the surface area of hands and feet. Tennis players face missile-like serves that are aided by cylindrical carbon nanotube implants in their opponent's arms. At least such "advances" have not been incorporated in any of the exhibition's several interactive displays. Instead, visitors can explore how oxygen is absorbed in the blood (by riding a stationary bike in a low-oxygen chamber to simulate high elevation bicycling) and how our brains control our bodies' reaction times (by timing how long it takes to come out of sprinters' starting blocks).

—Nicholas S. Wigginton

Lions, Tigers, Bears, and Much More

San Diego Zoo. San Diego, California. www.sandiegozoo.org/zoo/

Not far from downtown San Diego, one can view a great variety of animals and learn about biological diversity, ecology, evolution, and conservation, all while having fun. The San Diego Zoo hosts "charismatic megafauna" such as elephants, lions, tigers, polar bears, bonobos, and California condors. Its 40-hectare site in Balboa Park also houses hundreds of other species of mammals, birds, reptiles, amphibians, and insects. Additionally, the grounds double as a botanical garden and boast an impressive collection of plants (many of which are rare), including acacias, bamboos, cycads, bromeliads, figs, palms, and orchids. For younger visitors, there are animal shows and a children's zoo (with petting area and playground). My sons particularly enjoyed the zoo's Lost Forest zone, as it highlights many of the large animals.





Education and conservation are major themes, both at the exhibit level and behind the scenes. Many exhibits offer details about ecology, behavior, adaptations, and evolutionary history. The biologist and anthropologist in me are pleased that the Monkey Trail exhibits (which include three of our four closest living relatives, missing only common chimpanzees) provide a phylogenetic perspective on primates and humans' place within them as well as information on aspects of primate communication and anatomy.

The zoo is famous for its work with giant pandas, and watching the newest cub romp around delights kids of all ages. Displays explain which species are threatened and what visitors can do to help. As an example, the zoo facilitates cell-phone recycling to reduce the demand for coltan, a rare metallic ore obtained from central Africa (where increased mining has led to habitat loss and increased poaching). The Elephant Odyssey area does a particularly nice job integrating a historical perspective on extinct animals from the Pleistocene of Southern California (mammoths, American lion, sabertooth cat), their living relatives (elephants, lions, jaguars), and the zoo's ongoing efforts to study and save modern elephants in Africa (Project Elephant Footprint). By placing its animals in context, the zoo helps us to better understand them and the world around us—and to contemplate how bleak the future would be if we lost them.

—Tasha Altheide (University of California, San Diego)

Magical Gadgets from Manga

Doraemon's Scientific Future. Nippon Kagaku Miraikan [National Museum of Emerging Science and Innovation], Tokyo, Japan. Through 27 September 2010. www.miraikan.jst.go.jp/en/spevent/doraemon/

One of the classic Japanese Manga cartoons features a cat robot, Doraemon, from the future. Children, the cartoon series' primary viewers, are fascinated about the amazing gadgets Doraemon introduces to help out his friends when they are in need. When I was growing up, one of my favorite inventions from the show was the "Takecopter," a special propeller you attach on top of your head to fly.

The Doraemon exhibition at the Miraikan showcases 25 of the most creative, advanced, or promising technologies, such as an "invisible cape" using metamaterial, medical microrobots, and a nodding and talking robot. Each display describes the usefulness of the technology and the challenges of developing it. Each also introduces the researchers behind the invention. In fact, many of those scientists are also big fans of the cartoon. They have been inspired by the technological possibilities depicted in the show and are contributing to the advancements that may actualize these devices. With my attraction to the Takecopter, I enjoyed the GEN H-4, the world's smallest helicopter (visitors can pose in its seat). The fascinating invisible cape



seems normal but is made from metamaterial that bends light rays. The state-of-the-art science and technology presented in the exhibit should stimulate curious minds of adults and children alike.

—Satomi Maeda (Leave a Nest Company, Tokyo)

When the Universe Was the Size of a Football

Evolution of the Universe. Deutsches Museum, Munich, Germany. Through December 2011. www.deutsches-museum.de/en/exhibitions/natural-sciences/astronomy/exhibition/cosmology

How did the universe begin? How do galaxies, stars, and planets form and evolve? What is the universe's ultimate fate? These are some of the foremost questions cosmologists are trying to answer, and they underlie the Deutsches Museum's exhibition *Evolution of the Universe*. Put together by five leading local research institutions, this Munich exhibition presents a snapshot of modern cosmological knowledge, organized as a journey through time from the Big Bang (13.7 billion years ago) through to the present day.



After finding their way through the museum (one of the world's largest science and technology museums) and through the several floors of the permanent (and quite comprehensive) astronomy displays, visitors arrive at a small circular room. In its center stands the Universe Cinema—a round purple couch from which a 10-minute video is projected onto the ceiling. It will be tempting to lie down and simply gaze at the beautiful images, perhaps even taking off your shoes and relaxing, as some people did the day I visited. But don't leave before exploring this exhibition that invites you to think and to use your imagination. Through printed text and images, interactive screens, models, and hands-on demonstrations, you will be introduced to complex concepts such as cosmic inflation and gravitational lenses.

The matter-antimatter asymmetry in the universe, for example, is imaginatively illustrated with two boxes of colored sand. One, containing a billion grains of sand, represents antimatter; the other, with one extra grain, represents matter. After pairs of particles and antiparticles annihilated one another in the early universe, one extra particle remained for each billion pairs, the surplus of matter from which everything in the universe is made. The origin of this asymmetry remains unknown. In another intriguing demonstration, a box filled with metal spheres being shaken over hidden magnets demonstrates how dark matter determined the large-scale distribution of luminous matter over cosmic time.

Some demonstrations are more effective than others, and the quality of the images in the Universe Cinema could certainly be improved. Nonetheless, I enjoyed the exhibition's noncondescending tone and, above all, the fact that visitors are exposed to questions that are being actively researched—some in research centers not far from the museum.

—Maria Cruz

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