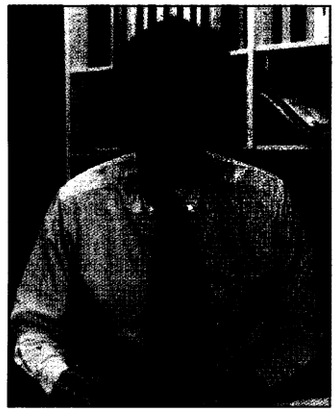
BIOTECHNOLOGY

Pharma Giant Creates Genomics Institute

Most pharmaceutical companies seeking to apply the wealth of genomic data now being produced to the hunt for new drugs have turned to specialized start-up companies for help (*Science*, 7 February 1997, p. 767). But one drug giant is bucking this trend. On 8 April, Novartis Pharma of Basel, Switzerland, announced that it is committing $250 million to create its own research institute dedicated to tracking down the functions of the many genes being discovered.



NOVARTIS PHARMA AG.

Looking ahead. Novartis's Paul Herrling expects his company will profit from the new institute.

The Novartis Institute for Functional Genomics, to be based in La Jolla, California, should be up and running in 2 years and will be home to some 100 researchers, says neurobiologist Paul Herrling, head of research for Novartis. The company decided to set up the institute, he adds, because it expects to get "a large competitive advantage" if it can efficiently translate genetic information into drug targets. Other biotech experts question whether Novartis's approach is better than linking up with smaller companies, however.

The institute will combine under one roof the various kinds of expertise it takes to perform studies of gene function on a large scale. This functional genomics, as it's called, incorporates bioinformatics, DNA chip technology, animal models, and other approaches to pin down the genes that cause human diseases and are therefore prime targets for drug development. "What we want to create is an institute that integrates these technologies," says Herrling. In addition, its scientists "will help develop high-capacity methods" that will speed up and streamline the determination not only of the functions of individual genes but also of how those genes and their protein products interact.

According to Herrling, the institute will not be part of any Novartis company but instead will be operated by the Novartis Research Foundation, although the exact nature of this foundation and its relationship to the corporate side of this pharma giant has not been worked out. The institute's scientists will be funded entirely by the foundation—to the tune of $20 million a year for the next 10 years—and will not seek public or government support. Broadly speaking, the goal will be to find genes causally related to disease that Novartis can evaluate as potential drug targets. But otherwise, the researchers would have "a large latitude" in pursuing their research interests, he explains. He expects, too, that they will be encouraged to publish their results once intellectual property rights arising from the work have been protected.

"I think this will be a world-class center, like Bell Labs was in its day," comments Richard Lerner, president of The Scripps Research Institute, which is located across the street from the proposed institute site in La Jolla. Scripps receives $20 million a year from Novartis, in return for first rights of refusal on some Scripps discoveries and inventions (*Science*, 20 May 1994, p. 1077).

But although Lerner welcomes the institute, Lee Babiss, a molecular biologist and vice president of biological sciences for Glaxo Wellcome in Research Triangle Park, North Carolina, like many pharma executives, argues that forging links with start-up genomics companies may be a better way to go. G. Steven Burrill, who runs Burrill and Associates, a private merchant bank in San Francisco that specializes in life sciences companies, agrees. In general, he says, few companies have tried to build such extensive expertise in-house because "that model has not been successful by and large." In his experience, the best minds in functional genomics are much more likely to start their own companies, where they can be owners and entrepreneurs, not just employees. In these start-ups, "the technology gets further, faster," he adds.

Novartis takes advantage of such partnerships, says Herrling, but still opted to create an institute with the hope of coming up with better ways to do high-throughput functional genomics. It is betting $250 million that its new institute will prove the exception.

–Elizabeth Pennisi

ENVIRONMENTAL POLICY

Panel Scores EPA on Clean Air Science

When the Environmental Protection Agency (EPA) unveiled a plan last summer to reduce levels of fine soot particles in urban air, industry critics assailed it for relying on what they viewed as flawed science (*Science*, 25 July 1997, p. 466). To appease its detractors, EPA promised to review new research findings before spelling out how states should implement the regulations, which could cost $104 billion a year. And Congress told EPA to expand its current air pollution research program. Now, a National Research Council (NRC) panel assembled to help design and critique that research effort has concluded that the EPA once again is giving science short shrift.

The panel issued a report last week urging EPA to revamp its research program to better understand how much soot people inhale and why fine particles appear to cause harm. It also took the agency to task for moving ahead with a new, costly network to monitor fine particles without a clear idea of which ones are most dangerous. "We were disappointed" by the agency's priorities, says panelist Phillip Hopke, a chemist at Clarkson University in Potsdam, New York.

EPA's new regulations focus on levels of particulate matter 2.5 micrometers or less in diameter ($PM_{2.5}$), produced mainly by combustion, because dozens of population studies suggest that this class of pollutants may worsen respiratory and heart problems, especially in the young and elderly. EPA predicts that its new limits—which won't go into effect until after 2002—should prevent about 15,000 premature deaths each year. But the agency also acknowledges gaps in its under-

SELECTED AIR POLLUTION RESEARCH RECOMMENDED BY NRC (IN $MILLIONS)

(Areas shaded purple are currently underemphasized by EPA)

Topics	1998	1999	2000	2001	2002
Outdoor measurements vs. human exposure	3	3	3	—	—
Assessment of hazardous PM components	8	9	9	14	14
Deposition of PM in the respiratory tract	3	1.5	1.5	1.5	—
Interactions between PM and other pollutants	4	9	10	10	10
Susceptible subpopulations	2	2	3	3	3
Toxicity mechanisms	9.5	9.5	9.5	9.5	9.5

SOURCE: NRC

standing of how $PM_{2.5}$ causes harm. Last year, Congress handed EPA $49.6 million for PM research in 1998—nearly twice what the agency had asked for—and, in an unusual move, asked the NRC to help decide how to spend it.

The panel's report, the first of four, says that EPA's Office of Research and Development (ORD) needs to focus its PM research dollars on 10 topics, ranging from exposure studies to toxicology (see table). The NRC's vision of a research program would cost about $440 million and not wind down until 2010, several years after the regulations are first implemented. EPA, says Hopke, has failed to devise "an overall research plan that would, over time, address some of the underlying questions." The agency's research tends to be short-term, because it's "geared to [immediate] regulatory needs," adds panel chair Jonathan Samet, an epidemiologist at Johns Hopkins University. The panel's approach, he says, "would extend beyond the usual horizon."

The report says that EPA "should immediately" funnel more funds to two topics: the relationship between what a fixed outdoor air-pollutant monitor measures and what people who may spend most of the day indoors actually breathe; and pinning down which PM component—such as metals or organic compounds—accounts for their apparent toxicity. The agency's strategy is "crucially inadequate" in these areas, the report says.

Without such basic knowledge, EPA may be casting too wide a net. The agency's plan for an ambitious network of devices to trap fine particles might not measure "the most biologically important aspects" of particles, the report states, and therefore "is moving forward rapidly with too narrow a focus on $PM_{2.5}$." The panel has no qualms over the first step: to install several hundred trapping devices to find out which regions fail to meet the new standard. But it questions, for instance, a $15 million set of "supersites" to measure gases and particle size and chemistry, when it's unclear how useful such data will be for health studies. "It's a cart-before-the-horse kind of thing," Hopke says.

EPA officials say they will address the panel's concerns. "The point is well taken that there has to be an emphasis about what in PM is causing these effects," says John Vandenberg, who manages ORD's PM research program in Research Triangle Park, North Carolina. And EPA will hold a workshop this summer to get outside scientists' input into monitoring. "We will absolutely listen and ... make sure we're optimizing the network for the things they've recommended," says EPA policy official John Bachmann.

Hopke, however, says such a step should have been taken last fall, and now EPA will have no choice but to spend the $66 million it's requested for monitoring in 1999—more than ORD's $44.5 million PM research budget, the report notes. However, he says, "Congress could change the allocation" by, for example, shifting some of the monitoring funds to basic research.

–Jocelyn Kaiser

SCIENCE EDUCATION

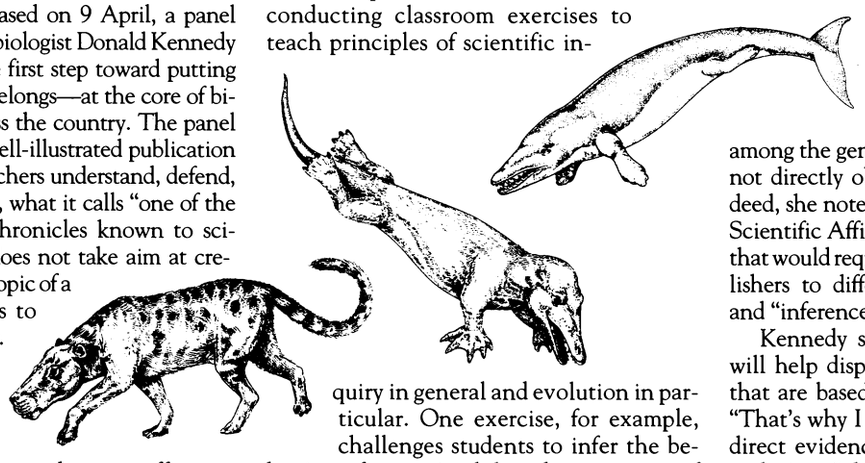
Academy Rallies Teachers on Evolution

Whether it's a symptom of rotten science literacy or a triumph of conservative religious groups, evolution is ignored or downplayed in many classrooms these days. Yet, says a panel of the National Academy of Sciences (NAS), "teaching biology without evolution would be like teaching civics and never mentioning the United States Constitution."

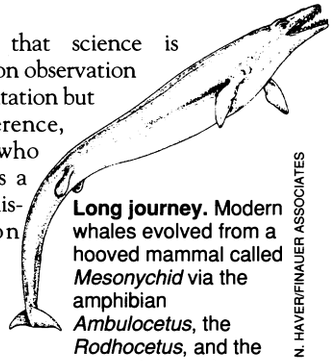
In a report* released on 9 April, a panel headed by Stanford biologist Donald Kennedy attempts to take the first step toward putting evolution where it belongs—at the core of biology curricula across the country. The panel has put together a well-illustrated publication designed to help teachers understand, defend, and teach evolution, what it calls "one of the most magnificent chronicles known to science." This report does not take aim at creationism; that's the topic of a booklet NAS plans to release next summer.

To start with, Kennedy's panel takes pains to correct a major misunderstanding that can hamper efforts to teach evolution: Calling it a theory does not mean it's just a hunch. In science, the report explains, a "theory" is an explanation for a set of known facts and observations—in the case of evolution, facts and observations about the "similarities among organisms" and the "extraordinary variety of life." They include observations that led Charles Darwin to first devise the theory of evolution more than 140 years ago, as well as modern findings such as similarities in the proteins and genes of different species pointing to a common ancestor.

The report also offers instructions for conducting classroom exercises to teach principles of scientific inquiry in general and evolution in particular. One exercise, for example, challenges students to infer the behaviors of two animals based on a pattern of fossil footprints. Another teaches the role of predators in selective survival by having students hunt for "prey" (colored dots of paper) on a busy background.



"In my dealings with K–12 teachers, I find that there's a great hunger for the kind of information in this publication," says panel member Eugenie Scott, who runs the National Center for Science Education Inc. in El Cerrito, California. Teachers must be able to communicate that science is based not just on observation and experimentation but also on inference, says Scott, who claims there is a widespread misapprehension among the general public that if something is not directly observable, it's not science. Indeed, she notes, a group called the American Scientific Affiliation has drafted a model law that would require teachers and textbook publishers to differentiate between "evidence" and "inference" in teaching evolution.



N. HAVER/FINAUER ASSOCIATES

Long journey. Modern whales evolved from a hooved mammal called *Mesonychid* via the amphibian *Ambulocetus*, the *Rodhocetus*, and the completely marine *Basilosaurus*.

Kennedy says he hopes the new report will help dispel suspicions about evolution that are based on this artificial distinction. "That's why I wanted to talk about the very direct evidence for evolutionary change in real time," he says, such as modern-day changes observed in 13 finch species first studied by Darwin on the Galápagos islands.

The academy panelists now hope teachers will heed their message. Says Yale biologist Timothy Goldsmith: "To fail to recognize [evolution] as one of the most important triumphs of human understanding in the history of science is to ignore something just terribly important, exciting, and inspiring."

–Constance Holden

* "Teaching About Evolution and the Nature of Science," NAS, www.nap.edu/readingroom/books/evolution98.