



Janelia Farm

HHMI plans to transform a Virginia farm into a unique laboratory complex where interdisciplinary teams will create advanced tools for biomedical research. The inside story of how a “what if?” idea became a \$500 million project || *By M. Mitchell Waldrop*

PHOTOGRAPHY BY WILLIAM K. GEIGER



A Normandy-style farmhouse is the focal point of the bucolic 281-acre site.

Not too many years from now and not too far from Washington, D.C., HHMI plans to open what some are calling “the Bell Labs of biology.”

Officially announced on February 1, 2001, the initiative is intended to create a free-ranging environment in which chemists, physicists, computer scientists and other specialists can collaborate with biologists. In a state-of-the-art facility equipped with ultra-advanced research tools, they will be able—even encouraged—to attack much more than one class of diseases or set of research problems. “We’re trying to do something that will benefit the scientific enterprise as a whole,” says Institute President Thomas R. Cech.

The new laboratory complex will occupy a 281-acre site in Virginia, called Janelia Farm, located some eight miles north of Dulles

Thomas R. Cech



KAY CHERNUSH

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International Airport. HHMI expects to spend at least \$500 million over the next decade to construct and operate the facility.

Clearly a major, perhaps defining, project for his administration, Cech reasons that HHMI’s uniqueness in the biomedical research world enables it, with financial resources second only to NIH itself and the flexibility that comes from being a private organization, to undertake projects that can transform the biomedical sciences, not just move them along a little faster.

David A. Clayton, a developmental biologist, began thinking along these lines shortly after he joined HHMI as a senior scientific officer in 1996, coming from Stanford University. “I had begun to realize how challenging a task it is to deploy state-of-the-art technologies to researchers in the field,” recalls Clayton, who is now HHMI’s vice president for science development. The initial cost is actually the least of it, he explains—although electron

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microscopes, tandem mass spectrometers and the like certainly aren’t cheap. “First, you have to find the space to put the machine—and there isn’t any academic institution I know of where space is not at a premium. Then, you have to provide a protected environment for it, with air conditioning, seismic isolation and so forth—which is very hard if you have an old building, as most university buildings are. You soon find that the environment is costing you several times the cost of the instrument itself.

“Finally,” says Clayton, “you have to find the technicians and engineers who know how to operate the machine and keep it in repair. That’s the real challenge because it’s expensive and time-consuming to train these people—and then if they’re good, the pharmaceutical or biotechnology companies come knocking at their doors, offering them commercial-sector salaries that the academics can’t hope to match.”

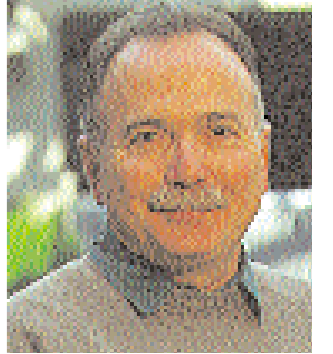
Given that reality, he says, one obvious solution was consolidation: Use HHMI’s considerable resources to establish a central campus equipped

with an excellent staff and the best instrumentation—and then bring the scientists to the machines instead of the machines to the scientists.

Cech was taken with Clayton’s idea as soon as he heard it; establishing an HHMI research campus seemed to offer exactly the new direction he was looking for. “So David and I talked about it before I started as president,” says Cech, “and then the idea matured as we continued to discuss it with lots of people.”

An active participant in those discussions was geneticist Gerald M. Rubin, an HHMI investigator at the University of California, Berkeley whom Cech was in the process of recruiting as the Institute’s vice president for biomedical research. “I liked the concept of doing something outside the usual process,” says Rubin. “It made the job seem more intellectually challenging.”

Rubin was especially intrigued by the evolving strategy for staffing the new campus. In addition to a resident staff of about 240 scientists, there would be an active program for visiting scientists. Some



David A. Clayton

PAUL FETTERS

To Dream the Plausible Dream

To understand why HHMI is building its own research campus for the first time, says Institute President Thomas R. Cech, you just have to look at where the biomedical sciences are headed in the next decade or so: To turn these dreams into reality, you have to deploy the most advanced tools in the right kind of environment.

Take imaging tools, for example. “That’s a broad term that means trying to locate the molecular components of living cells in as much detail as possible,” says Cech, and “then seeing how those molecules move within the cell, how they change partners within the cell and how they change position within the cell—say, from the cytoplasm to the nucleus.”

Present-day examples include the use of rapid freezing to lock cellular structures in place so that they can be mapped by a

high-voltage electron microscope. “But there’s no reason to restrict it to the cellular level,” Cech adds. “People are also interested in imaging how whole tissues and organs respond to various stimuli,” for instance, by using nuclear magnetic resonance techniques to map the changes taking place in the brain as experience becomes fixed into memory.

Then there are the computational tools. “Computers have finally come into biology in a big way,” says Cech. “Many of our investigators and their students are spending considerable amounts of time mining the databases of genomic sequence information that are becoming available at such a rapid rate.”

Today, thanks to the Human Genome Project, virtually the entire three billion-letter sequence of *Homo sapiens’* DNA is available to anyone with access to the Internet. But soon, Cech says, “you can

imagine a Web site where you could scoot around inside a cell as if you were in a video game, and look at any molecule you want.” In effect, he adds, such a site would function as an electronic atlas that mapped the location of every type of molecule in every type of human cell at every stage of the cell cycle—or at every stage of turning cancerous. “It will take very large computers to store that kind of information. But our techniques are getting to the point where this is a plausible dream, rather than a wild flight of imagination.”

Researchers are also “modeling macromolecular structures or, in the neurosciences, using computational approaches to map out neural connections and then model them with neural networks,” says Cech.

The new HHMI campus, he notes, will push hard to advance these tools and many more, with heavy emphasis on cutting across traditional disciplines.

Location, Location, Location

HHMI's new research campus doesn't yet have an official name, says Institute President Thomas R. Cech. For internal planning purposes, it is being referred to simply as HCAT, the Hughes Collaboration in Advanced Technologies. In the end, however, the site may very well keep the name it already has—Janelia Farm—following in the tradition of Cold Spring Harbor and Woods Hole. "That has the advantage that it doesn't mean anything scientifically," Cech says. "As new generations of programs evolve there, the name of the place doesn't go out of date."

Besides, it still looks like a farm. Located along the south bank of the Potomac River about 30 miles upstream from Washington, D.C., the 281-acre site is mostly given over to woods, pasture and two ponds. Its centerpiece is a Normandy-style farmhouse that was built in 1936; both it and the adjoining carriage house are listed on the National Historic Register. Janelia Farm is not entirely rustic, however; it contains three nearly completed office buildings—the remnants of a technology park planned by the farm's previous owner, the Vanderburg Group, a subsidiary of the Dutch software firm Baan Companies.

In terms of location, at least, the site appeared to have virtually everything HHMI was looking for. Janelia Farm lies on a major highway—Virginia Route 7—just eight miles north of Dulles International Airport, which will mean easy access for out-of-town visitors. It is likewise very close to the Internet com-



The property, along Virginia Route 7, is eight miles north of Dulles International Airport.

panies that have lately been springing up around Dulles, which will mean easy access to fiber-optic lines and other cutting-edge information technologies—not to mention top-flight computer talent. Being located in fast-growing Loudoun County, Virginia, provides access to housing and good schools. Most important, Cech says, the farm offers a pleasant setting in which to work. So, when it turned out to be available, HHMI snapped it up.

The details of the site plan remain to be determined, though it is already clear that the existing office buildings are not suitable for biomedical laboratories; one of them will likely be used for campus administration and bioinformatics, while the other two will be rented out. The farmhouse will probably be renovated, perhaps as a reception center. The main campus, which will include laboratory space for 24 investigators and some 300 staff members, along with conference facilities, visitor housing, recreation facilities and the like, will be constructed from scratch on the 183 acres of the site that remain open for development.

The designs will be as environmentally sensitive as possible, says HHMI's vice president for science development, David A. Clayton, who is in charge of the planning. For example, HHMI will remove only as many trees as it has to for the actual construction of the buildings. The landscaping will do everything possible to enhance the feeling of peace and quiet—and the portion of the site lying in the Potomac River floodplain, which is protected by state law, will not be disturbed. "For something so close to the city," Clayton says, "Janelia Farm is an amazingly bucolic site." —MMW



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visitors would come for just a week or so to attend a workshop or to brush up on a new software technique. Other visitors would come for about a month and bring specimens and other materials for testing. Still others might come for a whole sabbatical year or longer. No one on the campus, however, would have anything like tenure; the expectation is that most would eventually move on.

Perpetual turnover would, presumably, help ensure the intellectual vitality of the campus, since new visitors would constantly bring fresh ideas with them. It would likewise ensure the rapid dissemination of any technologies developed there, since visitors would be taking ideas home with them.

Rubin saw another opportunity. "It's an experience we've all had," he explains. "You're at a meeting, maybe sitting around with some colleagues in a bar, and you get an idea for a great research project you could do together—but you can't just go out and do the project. First you've got to scrape up funding from government agencies—and then you've got to struggle to coordinate the efforts of team members who are scattered among home institutions all over the country, if not the world.

"So what's needed is a place for people to come together—not just to have a meeting but to work together collaboratively over an extended period of time," says Rubin. The new HHMI campus can offer exactly that opportunity. By building enough capacity in the beginning, Rubin points out, HHMI can operate the new campus partially as a "research hotel," providing space and resources for scientists to come for several years and tackle a hot new idea as a group. With people rotating through instead of spending their entire careers there, the place would always have lab spaces opening up.

Cech took office as HHMI's president on January 1, 2000, the same day that Clayton and Rubin assumed their current posts. In the months that followed, says Cech, the HHMI Trustees also proved to be enthusiastic about the new program and a formal proposal was developed, followed by the site selection. Then, in December 2000, HHMI purchased Janelia Farm from the Dutch software maker Baan Companies for \$53.7 million.

Much of the property lies in the Potomac River floodplain, and will be left undisturbed.

Plans for the new campus are continuing to evolve. Take the obvious issue of commercialization, for example: Will visitors who want to commercialize technologies they've developed at the campus be allowed or even encouraged by HHMI to form start-up companies? "We haven't gotten far enough along to answer that," says Clayton, "although obviously we'll have to work it through to make sure we're staying true to HHMI's mission and to the rules for not-for-profit organizations."

Some principles are settled, however. One is that the new campus will not be restricted to the existing cadre of HHMI investigators; instead, it will be open to researchers from all over the world. Another is that cooperative research and cross-disciplinary thinking really will be given the highest priority. "We'll be making every effort to mix engineers, biologists and so on," says Cech. "We'll even be working with the architects to make sure the physical layouts of the buildings are such that people can't pull away into isolated groups. . . . But we will also have to find people who genuinely buy into the cooperative model. It may not be for everyone; some researchers work best as loners. But if everyone on the campus is a loner, then this experiment will fail.

"At a typical university," Cech adds, "if someone's publications are all collaborations, he or she will often have trouble getting promoted. But at Janelia Farm, if we see that someone's papers are all collaborations, we can say, 'This is wonderful!'" ■



Gerald M. Rubin

