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Andrea Rinaldi

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Room of its own

The new Janelia Farm Research Campus for multidisciplinary research is a major change in strategy for the Howard Hughes Medical Institute

This autumn, the Howard Hughes Medical Institute (HHMI; Chevy Chase, MD, USA) will begin an initial recruiting round for scientists to conduct research at its new campus, Janelia Farm, which it is now building in rural Loudoun County, Virginia, about a 45-minute drive from Washington, DC. The US\$500 million project broke ground in May 2003 and will house 200–300 permanent scientific staff on 281 acres when operational in the summer of 2006. It represents a radical change from HHMI's current model of funding researchers at home institutions, towards creating a multidisciplinary and collaborative research environment that incorporates various aspects of other independent research institutions around the world.

"In our vision of building a new model of research community, we have created nothing original, but rather have made use of many aspects of various models worldwide, including the Medical Research Council [MRC] Laboratory of Molecular Biology [LMB] in Cambridge, UK, the European Molecular Biology Laboratory [EMBL; Heidelberg, Germany], and Bell Labs in Murray Hill [NJ, USA]," said geneticist Gerald Rubin, Vice President of HHMI and Director of the Janelia Farm Research Campus (Fig 1). While they all differ radically from each other, these successful research environments share certain characteristics: they have small, individual research groups with leaders who are active bench scientists; internal, dependable and generous funding; excellent support facilities and infrastructure; high staff turnover with limited or no tenure, and an emphasis on originality, creativity and collegiality. Other institutions that served as a model for the Janelia Farm plan were Cold Spring Harbor Laboratories (Cold Spring Harbor, NY, USA) and the Carnegie Institution of Washington's Department of Embryology (Baltimore, MD, USA).

"The plan for Janelia Farm corresponds to a European model of research, but goes beyond what European institutions fund," commented Daniela Rhodes, a structural biologist who works on chromatin and

The goal of HHMI funding has been, and remains, to support scientists with innovative ideas who may not receive support from government or industry because their research is basic or 'blue sky' research

telomere structure at the LMB. "It's not a new idea—the LMB is [over] 50 years old—but I think it's a great step," she said. "There is a great need to integrate disciplines to tackle scientific problems. ... I believe it is much more efficient to have a few hundred scientists under one roof, centrally funded, taking risks, not having to apply for grants." In fact, the LMB's success has come largely from funding long-term work with risky outcomes, observed Nobel laureate John Sulston in his book *The Common Thread* (Bantam Press, London, 2002). In 1947, the MRC established a lab for 'research on the molecular structure of biological systems' to enable Max Perutz, the laboratory's first director, and John Kendrew to develop their research using X-ray diffraction to study proteins. "It took Max Perutz 23 years...to solve the structure of haemoglobin, and many chemists and biologists thought he was wasting his time," Sulston wrote. "You didn't—and still don't—have to justify everything in advance; you were just given the time, and a limited amount of space and resources, to get on with it." A similar spirit is found in other internationally successful research institutions, such as the EMBL or the German Max Planck Institutes. It is therefore an intriguing experiment: how will HHMI, with its considerable funds, add to these successes with its own research institute?

According to Rubin, HHMI does not seek to change its original mandate of supporting individual scientists, but rather to complement its model of funding about 320 researchers each year at their 70 home institutions. The goal of

Fig 1 | Gerald M. Rubin, HHMI Vice President and Director of the Janelia Farm Research Campus. © HHMI.

HHMI funding has been, and remains, to support scientists with innovative ideas who may not receive support from government or industry because their research is basic or 'blue sky' research. "HHMI funds people, not projects," said Avice Meehan, HHMI Vice President for Communications and Public Affairs. Typically, each HHMI investigator receives about US\$1 million per year for an initial term of five years, after which he or she is evaluated and either funded for an additional five years, or granted two more years of 'terminal', or final, funding. HHMI investigators are technically HHMI employees, but spend up to 20% of their time on other tasks, such as teaching or administrative work. A defining feature of HHMI support, however, is that it is geared to freeing up grantees from most non-research-oriented responsibilities, which typify careers in academic science. Importantly, it also aims to relieve the scientists that it funds from the ever-pressing and onerous need to write grants and progress reports.

Janelia Farm will take this one step further. It will free researchers even more from serving two masters—HHMI and their home institution—and the need to balance their HHMI work and other tasks to remain in good standing at their home base, such as publishing and worrying about tenure, said Rubin. But more importantly, it will provide a meeting place for scientists from many fields to work together in mixed teams of chemists, physicists, computer scientists and

engineers with biomedical researchers to solve problems that require interdisciplinary effort and expensive infrastructure.

The idea of building a research campus started with a surplus from the technology boom in the mid-to-late 1990s, which increased HHMI's endowment and the need to reinvest into the organization. The plan was hatched in 1999 over a series of conversations between Nobel laureate, and now HHMI President, Thomas Cech, David Clayton—Vice President and Chief Scientific Officer—and Rubin. "While we had the funding to add researchers, we felt that growing past about 330 would require putting in a middle-level bureaucracy, which we wanted to avoid to preserve the unique character of HHMI," said Rubin. "Keeping the current number of scientists funded means that they all have access to each of us, but growing past that would mean the quality [of interactions] would suffer."

Another major goal is to promote collegial interchange that is simply not possible in university research environments

The real key to Janelia Farm is that it is complementary to HHMI's existing programmes. "We would not have built Janelia Farms to house existing research simply for pride of ownership," explained Cech. "In

analysing the direction in which biomedical research is moving, we saw that progress is linked to tools: imaging, proteomics, structure determination and computational biology. We want to be not just users, but creators of the next generation of tools for the scientific community." Ultimately, HHMI found that it could not accomplish this by funding researchers at their respective institutions because of the interdisciplinary nature of the work required to develop those tools and the expensive infrastructure required. "We thought it would be best to have physicists and engineers in the same building, working side-by-side with biomedical researchers," Cech said. "The acid test for building Janelia Farm was, 'could we just as well support this research at our existing institutions?' If the answer was yes, building it was not what we should be doing."

Another major goal is to promote collegial interchange that is simply not possible in university research environments. "Academia is a system in which individuals must, of necessity, distinguish themselves from their colleagues, and which does not reward scientists for collaborating," said Nobel laureate Eric Kandel, University Professor at Columbia University (New York, NY, USA) and HHMI senior investigator. Also, academia does not easily foster interdisciplinary research, he added. While Janelia Farm does not seek to serve as a model to change either academia or industry, it does aim to provide an alternative environment in which science that is not well served by either can be done. "We don't seek to compete with what's being done in research now, but rather to do what can't now be done in academia or industry," Rubin added. "Janelia Farm seeks to create a unique research environment where gifted investigators interact with each other and are rewarded for working together to achieve a higher goal," Kandel said. "The research done at Janelia Farm should ideally be more than the sum of its parts."

HHMI believes that, because of their independence and their strong funding basis, they are in an excellent position to create a research environment that frees researchers from the constraints that limit collaboration and creativity, thus maximizing their creativity, flexibility and collaborative possibilities. In fact, this push for multidisciplinary research can be seen in many other institutions: the 'Roadmap' framework of the US National Institutes of

Health (NIH; Bethesda, MA, USA), the University of California, Berkeley's US\$500 million Health Sciences Initiative, Stanford University's Bio-X programme and the Broad Institute (Cambridge, MA, USA)—an interdisciplinary genomics institute announced last year by the Whitehead Institute, the Massachusetts Institute of Technology and other partners—are just a few new projects that aim to promote interdisciplinary biomedical research.

The ultimate success of the Janelia Farm endeavour will depend on the balance of researchers and which areas of study are selected...

Nevertheless, HHMI will not pursue areas such as genomics because a good deal of government and private funding is already being devoted to it. "It will happen whether we fund it or not. We want to pick an area that would not be done—or done well—otherwise," Rubin said. Janelia Farms will do what cannot or is not being done elsewhere because of financial or structural constraints. One likely area of focus will be neurobiology. "In neurobiology, a good deal of translational research is being conducted in Alzheimer's disease and stroke at the NIH, but much less is being done in basic research of neuronal models of the brain," Kandel said. "This is an area that requires experts in optics, electronics, chemical dyes—we don't have access to those technical capabilities at this or any other university. For the past 50 years, we've made incredible progress on understanding how the brain works, but we've studied one cell or molecule at a time." Thus, cellular interaction imaging—specifically, neural circuitry imaging—is likely to become one of the first projects.

The ultimate success of the Janelia Farm endeavour will depend on the balance of researchers and which areas of study are selected, said Gerald Fischbach, Executive Vice President for Health and Biomedical Sciences, and Dean of the School of Medicine at Columbia University. The plan now envisions two types of resident investigators at the campus—24 group leaders and 20 fellows—as well as visiting scientists. With

Fig 2 | A model of the Janelia Farm Research Campus as seen from across the lake. © Rafael Viñoly Architects, with permission from HHMI.

research groups of 2–6 lab members, there will be about 180 researchers, plus another 80 to provide core scientific support. All group leaders will be involved in hands-on research and will participate in structured and unstructured collegial interchange to encourage collaboration between groups. HHMI plans to have half of the 24 group leaders already identified when the campus becomes operational, and the rest within 3–4 years after that. The initial appointment for group leaders will be for six years, with annual performance reviews. Fellows will join Janelia Farm soon after earning their doctorate degree, or will come to change research direction, or as mature scientists wishing to return to research without administrative duties. The campus will also enable up to 100 scientists to visit on-site; these may be current HHMI investigators or short-term visitors who are collaborating with staff, or using research facilities.

Interdisciplinarity and collaboration are also reflected in the architecture. The scientific programme and physical facilities have been planned together, with the objectives of collaboration and flexibility remaining foremost. Lead architect Rafael Viñoly and HHMI architect and senior facilities officer

Robert McGhee have planned a low-rise, terraced, rambling site that blends in with the rolling hills and preserves views of the nearby countryside (Fig 2). "We have designed labs that will be open and accessible to both the outdoors and communal spaces, and offices located in pods around meeting space," said McGhee. Workspace will be adaptable and convertible into other functions—to support physics and engineering needs, for example.

The creation of Janelia Farm Research Campus can be seen as an experiment in the anthropology of scientific research, with its emphasis on collaboration over a wide range of scientific disciplines. It follows other successful models in the USA and Europe that have become incubators for scientific research that are not primarily funded by government or industry, and which consequently do not suffer from the strict departmental borders found at most universities. Whether it will establish itself on a par with other independent research institutions, such as the LMB, the EMBL or Bell Labs, will be seen over time, as every institution needs time to hit its stride.

Vicki Brower

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