

PHOTOGRAPHY BY BILL BURKHART

A Brighter Stage For Science

BY WILLIAM HOLDER '75

Members of biologist Jan Naegele's research team (Dan Austin '08, Eniola Yeates '10, Jacob Mirsky '08, and Jenna Gopilan, a 5th-year BA/MA student) gather round her to examine photomicrographs that show patterns of neuronal cell death in a mouse after a seizure.

JANICE NAEGELE

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Biology/Neuroscience
and Behavior

Ask any scientist on campus how the sciences at Wesleyan stack up against other liberal arts institutions, and you will hear an exclamation that our peers aren't even in the same league.

A lot of data exists to support that contention, or at least a more restrained articulation of it. Wesleyan has a huge lead in federal funding of science; faculty publish substantially more articles than their counterparts; their articles are cited more and appear in the best journals; Wesleyan's equipment is unmatched by peers; undergraduates can join teams of grad students and post-docs working with faculty; Wesleyan is a top producer of students who go on to obtain PhDs from the nation's leading graduate schools.

For science, Wesleyan should be recognized as the liberal arts school of choice among applicants. It isn't. Not even close. Twenty percent of first-year students arrive with an intention to major in science, which puts Wesleyan last among a group of 12 liberal arts peers.

For the past eight years, the science and math departments have accounted for between only 12 and 16 percent of majors, and if psychology is included, that figure rises to 20–22 percent.

These statistics say nothing about the quality of science students who do enroll, many of whom go on to distinguish themselves in scientific careers. The science departments are significantly underutilized, however, which places a strain on other departments that are oversubscribed. More than this imbalance, though, the disparity between quality in science and results in the admission market is a source of puzzlement and frustration. It also has been the prod for much discussion and analysis as Wesleyan moves forward with its most expensive building project ever: a life sciences building anticipated to cost about \$160 million.

The desire to raise the profile of the sciences at Wesleyan led to the formation in 2005 of the Science Advisory Council. This small group of scientists who have achieved wide recognition in their careers has met regularly to help Wesleyan develop a strategy, called A Plan For Wesleyan Science, which can be implemented during the Roth administration. The Council's chair is Joshua Boger '73, a Wesleyan trustee and the founder and chief executive officer of Vertex Pharmaceuticals.

"Our enrollments in science are out of whack with

what society needs,” he says. In his view, low enrollments suggest that Wesleyan can do much more not just for potential scientists, but for everyone else on campus as well. “One of the keys to Wesleyan’s future—and to society’s future—is to enhance the impact of science on *all* students, not just science students, and on *all* faculty, not just science faculty.”

The Plan advocates that Wesleyan press for the development of a more vigorous culture of science on campus. This shorthand covers a range of initiatives including offering more collaborative courses taught by science faculty and their non-science peers, focusing more attention on science-related events, promoting science in admission tours, touting the benefits of the graduate programs to undergraduate education, and more. Boger asserts that an English major should encounter and talk with science students in the normal course of daily life.

The Plan also calls for one specific and easily measured target: an increase by 50 percent in the number of students majoring in the sciences and mathematics. The date for achieving this is 2014, which may coincide with the opening of the last phase of the new life sciences building, should construction be approved. Faculty members believe their programs could accommodate that increase without major changes in the program or in faculty resources. For several years an average of 124 students have graduated each year from Division III. Last year that figure jumped to an all-time high of 156. One year’s datum does not make a trend, but the increase is regarded as a hopeful sign.

To increase the number of science majors, Wesleyan will need to recruit more students interested in science. Retention of students who take introductory courses could be better, particularly among minority and first-generation college students, and a Science Retention Committee is currently working on this problem. Yet 74 percent of students who say they wish to complete a science major do so, and this figure compares well with peer institutions. As the Plan points out, some loss is to be expected as students discover other majors more appropriate to their intellectual interests.

Joe Bruno, vice president for academic affairs and a long-time member of the chemistry faculty, voices a widely held sentiment when he says that Wesleyan needs to do a better job of getting the word out about the strength of its science programs. In the admission market, that desire is more easily stated than achieved. Bruno also is quick to point out

that the responsibility for raising Wesleyan’s profile rests not just with the Admission Office; the support and help of the science faculty is crucial. Prospective applicants hear claims about personal attention and research opportunities in science from most, if not all of Wesleyan’s peer institutions. Many applicants are probably not sophisticated enough to discern differences in the quality of the research programs. That is the crux of Wesleyan’s advantage, along with the opportunity for undergraduates to participate fully in a vibrant research community with graduate students, post-docs, technicians, and faculty members.

Wesleyan can make a compelling argument for the distinction of its science programs. Among the talking points:

- In the NSF Survey of Earned Doctorates, Wesleyan ranks in the top 10 of baccalaureate colleges for the number of students who go on to obtain a PhD in the sciences (in spite of the low percentage of majors). The exposure of undergraduates to graduate-level research and course work is undoubtedly a factor.
- Wesleyan receives more than twice as much federal funding for scientific research than any of its liberal arts peers.
- Recent data from the Institute for Scientific Information shows that Wesleyan ranks first among liberal arts colleges (with a wide lead) in science and math publications in the period 1994–2004, including more than 100 with undergraduate co-authors since 2000.
- Wesleyan is the only undergraduate liberal arts institution to receive NIH grants in support of predoctoral research training in molecular biophysics. Other institutions receiving similar grants include Stanford, Berkeley, Johns Hopkins, and Harvard Medical School.
- Among 17 peer and competitor institutions, Wesleyan ranks first in the proportion of science graduates in 2003 and 2004 who are women.
- For the classes entering between 1999 and 2003, among graduates with grade point averages of 3.5 or better, acceptance rates to medical school range from 83 percent to 100 percent.



MICHAEL CALTER

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Chemistry

Chemist Michael Calter and graduate student Na Li are engaged in synthetic organic chemistry with the aim of using easily available molecules to make new materials or pharmaceuticals.

MICHAEL MCALEAR

Molecular Biology
and Biochemistry

Master's student Brian Heiss '06 (left) confers with molecular biologist Michael McAlear over research using a gene chip micro-array reader.

Nonetheless, marketing science to potential applicants remains a challenge. "It's the liberal arts conundrum," says Terri Overton, associate dean of admission. "The term itself, 'liberal arts,' confuses people."

The market is highly competitive. "Every college and university in the country is looking for top science students," she notes. In spite of this competition, faculty members report that the quality of science students who matriculate has been improving in recent years.

The Admission Office has undertaken a number of initiatives to focus attention on science, according to Overton, who has led a collaboration between Admission staff and science faculty. They include an annual open house in which applicants may mingle with dozens of science students presenting their work in poster sessions; much more engagement among faculty with recruiting; more use of science majors as paid admission tour guides; encouraging applicants who have done research to submit their work for review; and more visits to science-oriented magnet schools.

At the urging of the Admission Office, Wesleyan also is placing more emphasis on the value of the graduate program for undergraduates. Undergraduates gain a richer, more sophisticated view of science by participating in research teams that include graduate students.

Some applicants are well aware of Wesleyan's distinction, says Justin Mello '08, who is majoring in neuroscience and behavior with the intention of attending medical school. From his vantage point as a senior interviewer in the Admission Office, he says that applicants are attracted by the opportunity to work with faculty and graduate students on meaningful, publishable research. They also want science in a liberal arts context—just as Mello did when he was a freshman taking art history, film, and economics to broaden his education and test his inclination toward premed against other options.

Equally important to educating the next generation of scientists—and to developing a culture of science on campus—is teaching nonscientists to function comfortably and knowledgeably in a world where scientific issues loom large.

David Bodznick, dean of the natural sciences and mathematics, says, "Every Wesleyan graduate needs to under-

stand scientific information and how to evaluate it. In the coming decades scientists and nonscientists alike will face decisions that could result in cataclysm for the planet or, more hopefully, revolutionary new ways of protecting the Earth's future."

In the past decade, the science departments have made a concerted effort to increase the number and quality of courses targeted to nonmajors, so-called general education courses. Wesleyan currently offers 32 of these, the largest number of any peer institution both on an absolute basis and relative to the number of undergraduate students. Students rate the quality of these courses highly. There is strong demand for curricular offerings such as Forensic Geology or Reproduction in the 21st Century.

"Interdisciplinary courses," says Boger, "are not just a way to trick kids into liking science. If you look at some of the most exciting new faculty, you see that they bring an interdisciplinary perspective. They push boundaries and advance their disciplines."

Wesleyan's story about science is a good one, but the state of the life science facilities complicates the telling of it. The university has not built a new science building in nearly 40 years. The Hall-Atwater building, in particular, needs to be replaced in the near future. While Wesleyan once led its peer institutions in facilities, it now lags the competition.

Construction of a life sciences building to house biology, chemistry, and molecular biology and biochemistry is emerging as a top priority of the new Roth administration. The urgency of the project rests not just on Wesleyan's competitive position. The practice of science has changed substantially in ways large and small that could be better accommodated by a new building.

Boger provides a mundane but crucially important example that only a practicing scientist would recognize. When he was a senior in 1973, students and faculty carried out many experiments on lab benches in the open air. Today, much more work is done in protected fume hoods that house chemicals and the apparatus for working with them, as well as sophisticated instrumentation that may be used with toxic materials. It is a better way to conduct science, but comes at a price. Hall-Atwater cannot be retrofitted to accommodate more fume hoods. The hoods require a network of ducts that are difficult to access, and more clearance would be required between floors for additional ducts. Wesleyan's scientists are stuck

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with the hood space they now have.

The practice of science is also far more collaborative than it was when Hall-Atwater was built. Says Boger, "You can't do research now without being collaborative. You will be in a backwater if you aren't. The funded science is in interdisciplinary research. The space to interact is critical."

Boger should know. From a modest beginning in 1989, Boger has overseen the growth of the Cambridge-based Vertex Pharmaceuticals to a company that has almost 1,200 employees. Drug discovery is a multidisciplinary enterprise that requires expertise in fields such as basic sciences, protein X-ray crystallography, computational chemistry, clinical pharmacology, and clinical medicine. Boger has overseen the construction of several new buildings designed to facilitate interactions among scientists, with common areas, white boards, and coffee.

Boger and Wesleyan science faculty members are determined that the proposed new building—which will consist

of three connected wings—provide space for unplanned interactions, that it be a campus hub with foot traffic through open areas. They want visible teaching labs that provide a sense of activity. Site plans call for a brownstone building in proximity to Exley Science Center. Shanklin Hall will be torn down. Once part of a small science quad with Hall Chemistry building (no longer standing), Shanklin would be left isolated in the new arrangement, and preserving it would not save any money, according to architects.

"We're 10 years late with this building," says Boger. "But we have the opportunity now to create a great facility, one that is not luxurious—the proposal does not add much space—but one which reconfigures space to modern standards and which reflects the needs of life sciences today."

Sensitive to the large scope of the project, President Roth has laid down a guideline that whatever the cost, Wesleyan will commit to adding an equivalent amount to the endowment before construction is scheduled to end in 2014 (over and above what Wesleyan already forecasts will be added to the endowment through gifts in that period). His intent is to ensure that the financing of the science facility does not detract from other high-priority items such as financial aid and curricular innovation.

Wesleyan scientists are well aware that a building by itself won't accomplish the goal of establishing the university's reputation as the premier liberal arts institution for science. The Plan contains 28 recommendations in areas as diverse as graduate education, patents and industrial collaborations, service-learning courses, off-campus internships, funding for instrumentation, and more. Some could be achieved through dint of effort, some require new funding sources, and some—such as increasing majors by 50 percent—require success in competitive markets that are hard to predict.

Both the proposed building and the Plan affirm the position of the sciences at Wesleyan as integral to the liberal arts curriculum and culture. Science takes place within a cultural context, not in isolation. The most effective scientists, according to Boger, are those who grasp the place of their discipline within the larger context.

"Scientists who change the field are those who can explain their insights to expert peers," he says. "Telling a story, understanding narrative structure, logical argument, philosophical bias—all this is part of being a good scientist. It's why a liberal arts education is the best education for a scientist."

Do you have an opinion about this topic? Please write us at letters@wesleyan.edu.