



How four smart Mac students evaluated the potential of a Mayo Clinic invention.

BY | **JAN SHAW-FLAMM '76** → PHOTOS BY | **KELLY MACWILLIAMS**

The 2010 Mayo Scholars team at the Mayo Clinic (left to right) Chen Gu '11, David Lopez '10, Varini Sharma '11, and Philip Titcombe '11.



The four-student team met whenever their schedules meshed, sometimes from midnight to 2 a.m., powered by gallons of Red Bull and coffee. Days and nights the science students read journals and patents and combed databases, while the economics majors pored over market research. They lived with and grew to love the reality of cross-disciplinary collaboration.

It may sound like finals week, but this wasn't about grades or course credit. Instead, at stake was the next step in developing a new technology that could impact the lives of millions suffering from neurological diseases. Millions now, and with the rising numbers of aging baby boomers, millions more to come.

The inventors are physicians and scientists at the world-renowned Mayo Clinic. The evaluators are students: **Chen Gu '11** (Shanghai), **David Lopez '10** (Kuala Lumpur), **Varini Sharma '11** (New Delhi), and **Philip Titcombe '11** (Eagan, Minnesota). The process is part of the Mayo Innovation Scholars Program (MISP).

MISP, soon to enter its fifth year, brings teams of outstanding students from Minnesota private colleges together with the Mayo Clinic Office of Intellectual Property to evaluate discoveries arising from the work of Mayo researchers, and to make recommendations about taking those ideas to the marketplace.



Even at their most exhausted, the **Macalester team members** were grateful for the chance to partner on an important medical project with the famed Mayo Clinic.



Clockwise from upper left: A brain scan; Mayo Scholars team (from left) David Lopez, Vaini Sharma, Chen Gu, and Philip Titcombe; the team joined by chemistry professor Chris Calderone (second from left) and biology professor and program director Liz Jansen (far right).





Students are given a description of a new invention being developed at Mayo Clinic and then they have six months to research it. At the end of the program they give a 45-minute presentation of their team's work to an audience of peers, faculty members from other colleges, intellectual property experts, and physicians and scientists from Mayo Clinic. They analyze the science behind the inventor's idea, present the potential novel medical and scientific applications of the technology, and make recommendations to Mayo Clinic as to whether and how to proceed with their idea, including identifying potential licensing partners.

And they do all of this on top of their regular class load and other obligations.

The Mayo Innovation Scholars Program is the brainchild of John Meslow, who early on approached biology professor Elizabeth Jansen and Joan Toohey, director of Macalester's Science and Research Office, to discuss the idea. Now retired, Meslow is a former president of Neurological Business and a former senior vice president at Medtronic. He had also served on the board of the Minnesota Private College Council, so he was in a unique position to envision the win-win possibilities that became MISP. "Macalester was one of the first colleges

I talked with about the concept," says Meslow. "I found Liz Jansen and Joan Toohey to be very positive and receptive to the idea." Both women remain integral to the program, with Jansen serving as the academic program director.

Macalester's 2010 project dealt with novel chemical methodologies to enable drugs to traverse the blood-brain barrier, a physiological structure that prevents certain substances in the bloodstream from entering the central nervous system. While often protective, this barrier presents challenges in delivering medication to brain tissue. This hampers both the diagnosis and the treatment of neurological diseases, among them Alzheimer's disease and brain tumors.

David Lopez, an economics and math major who graduated in May, called the whole experience "a fantastic opportunity. It was wonderful to work with a group of both economics and science majors." Varini Sharma is an economics major. Chen Gu is a chemistry major and Phil Titcombe is pre-med, an economics major with a chemistry minor. "Phil and Chen gave us presentations on the blood-brain barrier, which helped us understand the science of it," says Lopez. "The experience really broadens your horizons, one of the benefits of the liberal arts."

Back home in Malaysia, Lopez had been educated in the British system based on lectures and exams, and at first found Macalester a challenging environment. “Here we have to form opinions that others critique and comment on. The system values asking why and being open to questions.” He credits this approach with helping their MISP team succeed, as well as positioning him for his new job as a research analyst with the Federal Reserve Bank of St. Louis.

Each student brought different strengths and skills to the team. Last fall both Lopez and Sharma took a class on business presentations from economics professor Joyce Minor ’88, and they brought that knowledge to their Mayo work. Among other things, “the science students learned to present; we learned due diligence,” summarizes Sharma.

“The most difficult part of the program,” says Sharma, “is that it’s not an actual class. While we were working on our Mayo project, we were also dealing with classes, job applications, and interviews, but we were committed to upholding the reputation of Macalester and to not letting down Mayo.”

Why do students take on this extra challenge? Titcombe, the econ and chemistry student, has always been interested in biomedical research and called it “a perfect synthesis of what I’m doing at Mac.” Lopez and Varini were attracted by the chance to get a real-world perspective. And as for Chen, he “wanted to understand how an idea becomes a product and to understand the relationship between the science and the market.”

Gu, the chemistry major from Shanghai, immersed himself in the literature related to the blood-brain barrier, reading many of the approximately 100 sources cited in the appendix of their final paper, plus others they didn’t cite. Two key sources were the U.S. Patent and Trademark Office’s database and the NIH digital archive of biomedical and life sciences journal literature.

“There are programs like this in business or engineering schools, but this is highly unusual at the undergraduate level,” says Jansen. “The process looks at all aspects—science, business, ethics. It’s a perfect mix for the liberal arts student. I started out thinking, ‘Isn’t this nice of Mayo?’ but I have come to realize that we are really helping them with analysis of their innovations and to identify new applications or potential licensees.” (Mayo often enters into licensing agreements with commercial industry to further develop and market a given Mayo technology, rather than doing so themselves.)

After meeting with the inventor and a licensing manager from the Mayo Office of Intellectual Property, it’s easy for students to get caught up in the excitement, but Mayo isn’t just looking for a rubber stamp. If a product isn’t likely to succeed, they want to know that. And there are endless considerations—*What’s the competition? Who*

else might use it? If it’s designed for a hospital, does it have applications for first responders? What about the ethics of a diagnostic test for which there is no treatment?

And sometimes you hit a wall. Because of the years of research involved and the proprietary nature of the inventions, everyone involved must sign a non-disclosure agreement, and this article must necessarily be a bit vague, beyond saying it has to do with the blood-brain barrier. Therefore, Titcombe’s quote has been altered to be a bit cryptic: “After further research, we realized that the great thing was not so much the originally proposed application, but that you have this novel invention that’s applicable to so many fields. Our biggest role as the science students was to branch out and tell the econ kids what markets they should look at.”

From there, the economics students studied the incidence of the relevant diseases, costs of treatment, and competition in the marketplace, and they did a SWOT marketing analysis. SWOT stands for strengths, weaknesses, opportunities, and threats, and is a method used to analyze a business opportunity.

For all their academic brilliance, the team members are still students, and one of the benefits of MISP is its real-world aspect. “Science students may not be used to thinking about their audience,” says Toohey, who works closely with the program. “They’re all expected to present at a professional level and to present a report with a business plan.” Nothing is taken for granted. “The students sometimes bring in their shoes and ask if they’re okay. Our office keeps a supply of neckties to loan.”

The months of study culminated in a 21,000-word report and an oral presentation at Mayo Clinic on March 12, the last of three days of presentations. Dressed in dark suits and dress shoes, the teammates gathered before dawn for a foggy drive to Rochester for four hours of presentations.

The wood-paneled room was set up for PowerPoint presentations and there were muffins and juice for those not too nervous to eat. With founder Meslow’s final advice—“I want you to move ahead with confidence”—the presentations began. Each was followed by a question and answer session with the audience. The questions were probing but friendly, and the audience members’ depth of knowledge was apparent.

There are no “winners,” medals, or team rankings, but Mayo licensing manager Susan Stoddard told Jansen she thought Macalester had the most difficult project of the year and had done a great job with it. Following the presentations, the presenters and audience members enjoyed a celebratory luncheon at the English manor-style Mayo Foundation House, the former home of Dr. and Mrs. William J. Mayo.



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Finally, the Mac Mayo four could return to campus to begin their spring break and the possibility of sleeping for more than five hours a night.

Even at their most exhausted, though, the Macalester team members were grateful for the chance to partner on an important medical project with the famed Mayo Clinic. Sharma had instant validation of the respect this experience accords: During her interviews for a summer job in investment banking, her experience with MISIP was the only thing the interviewers wanted to talk about. (P.S. She got the job and is currently interning with UBS in New York.)

Lopez, the only graduating senior in the group, is now a research analyst at the Federal Reserve Bank of St. Louis. Titcombe is spending the summer at the University of Minnesota doing research on a fellowship from the Lupus Foundation of Minnesota and also interning with Jennifer Gobel '81, a doctor at Mendakota Pediatrics in West St. Paul. He has his eye on medical school. Gu had a summer grant from the American Society of Plant Biologists to continue his research on plant growth hormones, plus a research opportunity at Princeton, where he'll study slime mold. He's contemplating a PhD program in biomedical engineering.

If the previous team's experiences are any indication, this year's Mac four will find their MISIP project well worth the midnight oil they burned. For Meredith Percy '09, a senior specialist at global clinical diagnostics company Beckman Coulter, the program reconfirmed her interest in the biomedical industry as well as her preference for the business side of it.

Colin Hottman '09 has just finished his first year in a graduate economics program at Columbia University. MISIP helped him discover he preferred academia to industry. Hannah Carlson-Donohoe '09 says that the Mayo program gave her confidence in her ability to independently research and understand new scientific concepts. She now works in a genetics lab in the Undiagnosed Diseases Program at the National Institutes of Health as part of the Intramural Research Training Award program.

Although it's hard to predict where this year's team will end up after Mac, it's safe to say at least this: Their careers will be forever colored by the chance to be Mayo scholars. **M**

JAN SHAW-FLAMM '76 is a member of the communications staff at Macalester and a regular science writer for the college.



Images from Mayo (clockwise from upper left): Dennis P. Hanson, coordinator for Imaging Technology Development; David R. Holmes, director of the Biomedical Imaging Resource Core Facility; Hanson demonstrating with model spine; the whole Mac group, including (from left) MBA student team member Chad Leonard, Lopez, Sharma, Gu, Jansen, Titcombe, and Calderone, posing with a statue of the Mayo Brothers (from left), Charlie and Will.



MAYO SCHOLARS KEY PLAYERS

mnprivatecolleges.org/misp

- Mac faculty advisors—Biology: Elizabeth Jansen (MISIP academic program director), Chris Calderone, and Paul Overvoorde; Chemistry: Becky Hoyer; Economics: Jeff Evans and Joyce Minor
- Mac's Science and Research Office director—Joan Toohy
- MISIP founder and program director—John Meslow
- Financial support—Medtronic Foundation, Mayo Clinic Office of Intellectual Property
- Administrative support—Minnesota Private College Council