A year after it was launched with just a graduate program, the new Bioengineering Department welcomed its first undergraduates during the fall semester. With no real marketing, the department has already attracted 41 undergraduates—both freshmen and sophomores—and another 40 graduate students.

“It’s a similar feeling to the birth of your child,” says Peter Lelkes, PhD, the founding chair of the department who happens to have four children and one grandchild. “It is exciting in such a short time to have created such a thriving department.

“We already have such a well-established and recognized graduate program that students are transferring from other graduate schools, and the undergraduate program is so popular that—after we participated in the introductory engineering class last year—about a dozen students immediately wanted to declare themselves as bioengineering majors.”

Despite its launch just a year ago, the department is already ranked 67th nationally, along with Indiana University-Purdue University Indianapolis, Syracuse University, University of California-Riverside and Worcester Polytechnic Institute.

Like Lelkes, faculty and students alike are relishing the prospect of being pioneers in the launch of the new department. “The ability to come in on the ground floor, where you know you’re going to have the potential to influence how the department and undergraduate program will be shaped, was very attractive,” says first-year PhD student Meaghan MacPherson, a Temple Presidential Fellowship recipient and a 2005 bioengineering graduate from the University of Pennsylvania who also holds a master’s degree in dental materials from Indiana University. “As an older student, the newness of the program was a plus. I was very excited by both the established faculty and the new, younger faculty members who they have recruited. The College of Engineering itself has a fantastic reputation as well.”

Jessica Falcon, a second-year PhD student who earned her B.S. in biomedical engineering at Drexel University—where for 11 years Lelkes was the Calhoun Chair Professor of Cellular Tissue Engineering—agrees. “I worked with Dr. Lelkes a little bit as an undergraduate and I really trust him and his experience. I saw an opportunity to be with a team that was going to be growing rather than go to a school where everything is established.”

Adrianna Urbano, a Northeast Philadelphia resident and Nazareth Academy graduate who transferred into the department this fall as a sophomore following a year at the University of Pittsburgh-Johnstown as a nursing major, also did so without trepidation. “They’re already doing a nice job with the graduate department and I’m extremely excited that Temple is now offering an undergraduate bioengineering degree,” says the third-generation Temple student.
“It is exciting in such a short time to have created such a thriving department.”
— Peter Lelkes, PhD
Founding chair of the department

Bioengineering Welcomes Undergraduates (continued)

“I hope to specialize in tissue engineering, working on stem-cell research and growing tissues and organs to help people.”

Adds Lauren Gray, a sophomore who graduated from Chester County’s Avon Grove High School, “Bioengineering is a developing field and there’s going to be lots of opportunity in the future for it. It’s very interesting, and the fact that you can help somebody by developing new technology or devices to improve their quality of life is pretty cool.”

Dean Keya Sadeghipour, PhD, is bullish on the appeal of the rapidly expanding field of bioengineering to attract more such students. “Bioengineering is not only attractive to industry but it’s a great platform for health care disciplines such as medicine, dentistry and the health sciences. For undergraduates, it means that our program is not only an attractive engineering program designed for industry and higher education, but it’s also an attractive alternative to a pre-med program that would be received well by the medical and dental communities.

“So students currently in such disciplines as biology or chemistry now have an alternative where, should they at any point decide to go into industry, the degree would also enable them to do so. Otherwise, they could easily meet the requirements for a pre-med program.”

Given such broad appeal, within five years the department expects to have at least 150 undergraduate students per year, for a total of 600 undergraduates in the four-year program, and a total of about 150 graduate students (about 50 PhD students and 100 MSc students).

Besides Lelkes, the core faculty currently includes eight professors: five professors on tenure/tenure track as well as three non-tenure track professors. Four other professors within the college’s Mechanical Engineering Department, including Dean Keya Sadeghipour, PhD, and Associate Dean George Baran, PhD—all of whom have been involved in the bioengineering master’s of science degree program that was already being offered through the ME Department—also have joint faculty appointments. So does one associate professor of electrical and computer engineering and Angelika Dimoka, PhD, the director of the Fox School of Business’ Center for Neural Decision Making.

It was only last December that the department was able to move into its renovated 8th floor headquarters. With state-of-the-art open lab spaces and offices totaling about 20,000 sq. ft on both the 8th floor and on 9th floor of the engineering building, which the department shares with the rest of the college, Lelkes—a world renowned authority on tissue engineering and regenerative medicine—touts the department’s growing research portfolio. “We pride ourselves in being the home of a first-rate, nationally and internationally recognized basic and translational bioengineering research program.”

Currently, the department’s faculty is particularly strong in tissue and regenerative engineering and biomaterials. Future planned hires, beginning next year, will broaden and deepen the department’s expertise in biomechanics, neuroengineering and bioimaging.

Indicative of the interdisciplinary nature of the field, the department’s professors and graduate students are collaborating with numerous Temple University researchers at the Health Science campus—including the Schools of Medicine, Dentistry and Pharmacy and Shriner’s Hospital—as well as the Fox Chase Cancer Center, which is now part of the university health system. Lelkes is also forging international collaborations that include Seoul University, the Korean Institute of Brain Science, Tsinghua University in Beijing, several universities in Shanghai, Taiwan International University and the University of Sydney.

A visiting professor this year, Philip Lazarovici, a neuropharmacologist from the Hebrew University of Jerusalem who spent 16 years as a visiting scientist with the National Institutes of Health, will be returning next year for a full year to spend his sabbatical at the bioengineering department as an adjunct professor to work on drug delivery and neuroengineering. David Wolf, the retired NASA astronaut who delivered the keynote address for Engineers’ Week this past February, will also be returning as an adjunct professor to participate in the department’s microgravity-related research, teaching and in the supervision of graduate students.

Under Lelkes’ guidance, the undergraduate curriculum began to be developed a year ago by Assistant Professors Omar Z. Fisher, PhD, and Won Huyuk Suh, PhD. It was finalized this past summer following the arrival of Ruth Ochia, PhD, an associate professor who is also the undergraduate curriculum coordinator.

Ochia, who is also in charge of the year’s-long undergraduate program accreditation process, says the initial goal of the curriculum is to offer undergraduates a solid foundation in the very broad discipline of bioengineering, with a focus on applying engineering science, design and analysis to real life problems—specifically regarding biology and medicine. Hands-on laboratory experiences are key components.

“We don’t just want our students to be reading about hydrogels, for example,” she says. “Can you actually make one?”

Patterned after courses offered by the country’s top bioengineering programs, the foundation of the new curriculum offers students considerable flexibility. “They’ll have the option to either go into industry or further pursue their academic careers, including Temple’s five-year B.S./M.S. program, other master’s or doctoral programs or pursuing a professional degree in medicine, dentistry or intellectual property law,” says Suh.

After taking basic, introductory bioengineering courses, undergraduates will then be able to pursue specific pathways, including:

- **Biomaterials**: A focus on the design, development, and uses of biomaterials in biology and medicine. It also explores the host-biomaterial interface and interactions.
- **Bioinstrumentation**: A focus on the design, development and use of instruments used to record, process, and/or control biological functions.
- **Biomechanics**: A focus on the interaction between forces and motions in tissues, organisms and biomedical materials.
- **Tissue and Regenerative Engineering**: A focus on building functional tissues using cells and scaffolds and repairing diseased tissues and organs from the cellular and molecular level up.
- **Neuroengineering**: A focus on using engineering to understand and interact with neural tissues.
- **Pre-med**: A broad-based bioengineering curriculum which fulfills current pre-med course requirements.

Not surprisingly, Fisher notes that the courses currently being offered are also attracting mechanical engineering majors who are pursuing bioengineering concentrations. “These are also highly interdisciplinary topics that should also be of interest to biochemistry majors and graduate students in the Pharmacy School,” he adds.
As for attracting students interested in medicine, consider Tim Schiselbauer, a freshman bioengineering major from Plumsteadville, Pa. Several of his cousins recently graduated from medical schools after majoring as undergraduates in bioengineering rather than in biology. They recommended that he do the same.

“It sounded appealing to me because my best strength is math, so I figure it’s a major I can do well with and it will work well with my plans to go to medical school,” says the Archbishop Wood High School graduate who tested so well he already is taking the sophomore-level introduction to bioengineering course. “A lot of the courses are interesting and I’m doing well.”

Schiselbauer is also the director of communications for Temple’s new Biomedical Engineering Society student chapter—which, says Lelkes, “strives to provide a vibrant social and academic bridge between both bioengineering students and their professors.”

Already the chapter has sent students to BMES’ annual national conference, in Seattle, and is planning collaborative events with Drexel University’s chapter and other engineering societies within the College of Engineering.

To enhance career development skills and expose students to different bioengineering fields, BMES also sponsors a regular lecture series. In addition, it hosts a well-attended Friday social hour that gives students the chance to interact with both professors and graduate students.

“It really pleases me to see how much our students actually seem to feel at home within our department,” says Lelkes, “and how enthusiastically they participate in a wide variety of activities.”

The collaboration and camaraderie encouraged by the open architecture of the labs, where one door opens onto an entire lab and much of the equipment and instrumentation is shared, is also a plus, according to Pleshko. “I think initially there was some apprehension among the students and some faculty members regarding how it was going to work out—particularly if they were used to having their own equipment—but it’s worked out great,” says Pleshko, whose lab focuses tissue engineering and imaging regarding both bones and cartilage. “My lab is getting a lot of help from Peter’s lab (Lelkes), and his lab is getting a lot of help from us.

“If you have a question, you just walk across the lab to ask somebody.”

Adds second-year PhD student and former Hahnemann University Hospital research assistant Jessica Falcon, who is combining tissue engineering with immunology in Lelkes’ lab: “Everyone here knows how to get things done, and being in a lab that is brand new, rather than working by myself in a hospital lab with no windows, is a nice transition.”

Quam Onigbanjo, a PhD student who has been working with Pleshko in her lab since August 2012, concurs. “My peers and the faculty have been great,” says Onigbanjo, a Trenton native who earned his B.S. in biomedical engineering from the the College of New Jersey and worked as a patent examiner in the Medical Arts Division of the U.S. Patent Office in Alexandria, Va., for a year before coming to Temple.

Onigbanjo was awarded a Temple teaching assistant fellowship last year and received a National Science Foundation award this year. In Pleshko’s lab he is using fiber optics coupled with a spectrometer to analyze the differences between healthy and osteoarthritic or otherwise damaged cartilage. “I’ve learned a lot from Dr. Pleshko and the more senior people in the lab,” he says. “They’re always willing to help you understand something.”

The only current drawback, Pleshko concedes, is the somewhat limited number of courses—a situation that will continue to be alleviated as more courses are developed and more faculty members arrive. Even so, she notes, graduate students have access to many more courses approved by the Bioengineering Department—such as biology, chemistry, medicine and kinesiology classes—that are offered by other Temple University colleges and schools, including the College of Science and Technology, the College of Health Professions and Social Work and the School of Medicine.

For graduate students, the research opportunities are likewise quite broad. Meoghan MacPherson, who worked for six years as a laboratory manager and research assistant in the Dental Biomaterials Lab at the Indiana University School of Dentistry, hopes to focus her research on the craniofacial region. “The fact that the department is collaborating with Temple’s School of Dentistry was definitely one of the factors that contributed to my decision to come here,” she says.