University of Maryland
Fischell Department of Bioengineering

2019-2023
Strategic Plan

May 2019

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EXECUTIVE SUMMARY

About this strategic plan

The Fischell Department of Bioengineering at the University of Maryland has been operating for 12 years and is ranked in the mid-30s nationally for bioengineering programs. This document outlines a department strategy for the next five years to help expand the department's scope, impact, and visibility; recruit top faculty and students; and climb in the national rankings.

Strategy overview

Mission: *to educate and empower the next generation of bioengineers while developing and translating biological-based knowledge to address societal grand challenges.*

Figure 1. Vision and Strategic Goals

REPUTATION FOR INNOVATION AND IMPACT
Be widely recognized locally, nationally, and internationally

COLLEGIALITY
Establish and maintain an inclusive and collaborative ecosystem of diverse backgrounds and perspectives

RESEARCH EXCELLENCE
Apply engineering principles to expand knowledge of and solve problems associated with biological systems

EDUCATION
Provide curriculum, programs, and mentoring that equip the next generation of bioengineers for success in their careers

SCIENTIFIC/ TECHNOLOGY TRANSLATION
Lead translation of new knowledge into practice and products

Lead in education and research excellence that improves quality of life for the citizens of Maryland and the world.

Process to develop strategy

The department held two meetings and distributed two online surveys to develop this plan, gathering targeted input from department members, students, and advisory board representatives in defining their mission, vision, goals, initiatives, challenges, values, and differentiators. Nexight Group—a management consulting firm partnering with the department—used the results of these meetings and surveys to develop this strategic plan.

DEPARTMENT DIFFERENTIATORS AND VALUES

DIFFERENTIATORS

Department differentiators equip the department to advance their mission and distinguish themselves from competitors, helping to attract top students, faculty, and staff.

Location Near Washington, D.C.

The department is located in one of the top five biotech regions in the country, close to both federal agencies and national laboratories. This competitive access to new research opportunities and high-impact partnerships can help attract top students and researchers from around the nation.

Breadth and Impact of Research

The department has research strengths in biomedicine, biological sciences, and biomedical devices. This diversity of strengths drives innovation through new collaborations across fields and empowers faculty to tackle new topics.

Cutting-Edge Resources and Outstanding Personnel

State-of-the art infrastructure and tools, as well as faculty with a breadth of academic and industry experience, equip the department to tackle problems at the forefront of bioengineering.

Supportive and Collegial Community

The department fosters a collaborative, collegial environment that empowers and values diverse backgrounds and perspectives.

Investment in Student Success

The department invests in students' experience at the University and their success in future careers, equipping them for work in both academia and industry. Faculty are committed to self- and peer-assessment, continually improving their teaching techniques and student outcomes.

Opportunities for Translation and Societal Impact

The department is innovative and forward-thinking, with demonstrated successes in translating research to achieve tangible societal impact. Students engage in this work to address critical bioengineering challenges.

High-Impact Collaborations

The department has strong relationships within and outside the University of Maryland—including with the Robert E. Fischell Institute for Biomedical Devices and UMD Medical School—which expands research capabilities and training opportunities for students.

Rising Leader

The department is young and rapidly growing, remaining nimble and responsive to critical needs in the field while building a research core that will launch it into preeminence and leadership.

VALUES

Values core to the department's identity and how each member conducts his or her work—organized around each department strategic goal—include:

Research Excellence	**Innovation**: forward-thinking, high-quality, and creative research and educational approaches **Integrity**: upholding scientific and academic ethics
Scientific/ Technology Translation	**Utility**: conducting research with real-world application **Impact**: respect for and commitment to advancing human health
Reputation for Innovation and Impact	**Leadership**: working on the frontier of bioengineering research to pave the way for new breakthroughs **Outreach:** sustained connection and engagement with local and broad community needs
Education	**Student experience**: commitment to enhancing student learning, welfare, and community while at the University of Maryland **Student success**: setting students up for career success beyond their time at the University of Maryland
Collegiality	**Cohesion and inclusivity**: building an inclusive community driven by collaborative partnerships **Diversity:** building a community that respects and actively engages diverse backgrounds and perspectives **Transparency**: maintaining open communication across all department stakeholders

DEPARTMENT STRATEGIC GOALS

The department's five strategic goals to advance their mission and vision, and core initiatives and targets within each goal, are outlined in more detail below.

1 RESEARCH EXCELLENCE: Apply engineering principles to expand knowledge of and solve problems associated with biological systems

The department employs innovative research approaches, working across disciplines to solve complex problems. This research informs their translation and entrepreneurism work, enhances the education they provide students, and can yield breakthroughs that will then be broadly communicated locally, nationally, and globally. The department's research excellence is supported by a collegial and collaborative working environment.

Core Initiatives
- Incentivize and support bold research proposals
- Improve research support resources
- Finance high-impact research
- Cultivate collaborations to expand research impact
- Hire highly skilled and rising-star faculty

Targets	Date
• 27 tenure-track department faculty members	2023
• 1 active National Institutes of Health Research Project Grant or equivalent project per active tenure-track faculty member, where members serve as Principal Investigator or one of multiple Principle Investigators	2023

2 SCIENTIFIC/TECHNOLOGY TRANSLATION: Lead translation of new knowledge into practice and products

By translating research findings into new practices and products, the department can meet key societal needs within human and environmental health. The department's translation work provides experiential learning opportunities for students and strengthens the department's reputation with industry and funders.

Core Initiatives
- Cultivate relationships with industry
- Work with campus initiatives to encourage translation projects
- Target department work toward high-impact needs
- Lead university growth in translational research

Example Metrics

Metrics that the department will use to monitor progress toward this strategic goal include:
- Number of internships held by students
- Number of industry interactions with the department
- Number of proposal submissions

3 REPUTATION FOR INNOVATION AND IMPACT: Be widely recognized locally, nationally, and internationally

Shining light on the department's work maximizes the impact of their research findings and translation successes. Communicating these successes to stakeholders maintains support for the department and can bolster the department's funding. As such, initiatives to disseminate the department's work and broadcast its collective accomplishments are central to the department's strategic plan and future operations.

Core Initiatives
- Increase department presence in the bioengineering community
- Celebrate bioengineering successes
- Incentivize high-visibility work
- Launch new communications initiatives
- Improve department ranking and ranking perceptions

Targets	Date
10 high-impact papers (i.e., impact factor greater than 10) published by department members as senior authors, per year	2023
2 ultra-high-impact papers (i.e., impact factor greater than 25) published by department members as senior authors, per year	2023
4 trainees placed in faculty positions per year	2023

4 EDUCATION: Provide curriculum, programs, and mentoring that equip the next generation of bioengineers for success in their careers

The department is invested in helping students succeed both during and beyond their time at the University, equipping students for diverse careers in both academia and industry. The department also strongly emphasizes experiential learning, drawing students into research and translational work.

Core Initiatives
- Promote teaching excellence
- Expand experiential learning opportunities
- Strengthen holistic student support services
- Align curricula with desired student outcomes
- Expand student access to courses
- Launch new graduate student recruitment initiatives

Targets	Date
200 PhD applicants with 25 PhD students enrolled, per year	2023
Six-year PhD graduation rate of 80%	2023
90% or higher bachelor's student placement by graduation day	2023
20 graduate fellowships awarded per year	2023

5 COLLEGIALITY: Establish and maintain an inclusive and collaborative ecosystem of diverse backgrounds and perspectives

Collaboration can help uncover innovative approaches to addressing complex problems. Additionally, the success of each member of the department is driven by the support of colleagues. As a result, the department is committed to welcoming, engaging, and empowering individuals with diverse backgrounds in a collegial and supportive environment.

Core Initiatives

- Increase faculty and staff career advancement support
- Host more social and networking opportunities
- Broaden input into department decision making
- Improve student access to department resources
- Empower department members and strengthen diversity

Targets	Date
• 1 family-inclusive social day established per semester	2020
• Increased student and faculty participation in student groups	--

CHALLENGES TO ADVANCING STRATEGIC GOALS

Challenges that the department faces in pursuing their vision cut across all of their strategic goals. Some present obstacles to overcome while others are concerns to be aware of in assessing the feasibility and priority of new department initiatives. Core department challenges are summarized in the table below.

Core Challenges	Examples
Resource and personnel limits	- Growing student body makes it difficult for staff and faculty to maintain a healthy work/life balance and provide needed support - Lack of dedicated technology transfer support - Finite space to accommodate research, classes, and student initiatives - Lack of financing to support or reward high working standards, and lack of accountability measures
Curricular and student support gaps	- Difficulty developing an in-depth graduate curriculum and programming within a broad discipline - Limited support for social and mental health factors that can impact student success
Barriers to interacting and exchanging ideas	- Rapid department growth makes it difficult to innovate while building out standard operations - Lack of easy transport between the Baltimore and College Park campuses, and limited parking at the Baltimore campus
University system burdens	- Administration structures—such as manual systems for invoicing and slow response rates—sometimes hamper research, innovation, and collaboration - New campus policies are often enacted without regard for the workload requirements of implementing them
Limited outreach efforts	- Need for more demonstrated impacts on real-life, individual cases - Lack of external communication about faculty research - Insufficient bandwidth to communicate successes - Lack of a strong local and international presence - Limited publications in high-impact journals
Perception and ranking disparities	- Misperceptions about department capacities, such as local perceptions of department as leader in only 1–2 fields - National rankings do not accurately reflect department strengths

INITIATIVES AND ACTIVITIES TO ADVANCE STRATEGIC GOALS

Detailed activities for achieving department strategic goals and addressing current challenges are outlined in the tables that follow. Core activities across all department strategic goals include:

- **Recruiting** top faculty and students
- **Equipping** staff, faculty, and students to excel within their work, research, and training
- **Connecting** people and research across disciplines and backgrounds
- **Leading** the UMD and bioengineering community by working at the forefront of the field
- **Applying** research to societal needs
- **Learning** from successes and failures to teach others
- **Communicating** successes to shine light on important work

RESEARCH EXCELLENCE

	URGENCY LEVEL
Incentivize and Support Bold Research Proposals	
Identify and incentivize large research grant submissions	
Foster interdepartmental, cross-disciplinary research activities to encourage research proposals that combine different faculty members' expertise	
Provide proposal mentoring and feedback	
Conceptualize broader-impact proposals	
Improve Research Support Resources	
Hire a technical writer and/or graphic illustrator to support grant proposal and paper submissions	
Improve tools and processes for purchasing research and conference materials	
Finance High-Impact Research	
Secure training grants and fellowships for graduate students and post-docs	
Offer seed grants for submitted proposals that received high reviews	
Incentivize accelerated research: the more accomplished, the more funding support provided	
Cultivate Collaborations to Expand Research Impact	
Develop critical mass around research themes within and beyond the department	
Create opportunities to collaborate on high-risk/high-reward projects	
Develop relationships with non-governmental sources (e.g., foundations)	
Hire Highly Skilled and Rising-Star Faculty	
Develop Center of Excellence through targeted hiring of senior National Academy of Engineering (NAE) members	
Recruit young/mid-career rising stars	

SCIENTIFIC/TECHNOLOGY TRANSLATION

	URGENCY LEVEL
Cultivate Relationships with Industry	
Facilitate business/entrepreneurship collaborations and competitions	████████ (high)
Connect principal investigators with knowledgeable entrepreneurs and investor networks	█████ (medium)
Offer incentives for industry-based sabbaticals	█████ (medium)
Offer industry student fellowships	██ (low)
Partner with the business school and publicize opportunities	██ (low)
Work with Campus Initiatives to Encourage Translation Projects	
Offer administrative support for faculty/researchers who are trying to navigate the red tape involved with translational research (e.g., conflicts of interest)	█████████ (high)
Hire experts to evaluate the potential of translating technology/research	█████ (medium)
Establish and grow internship and co-op programs in bioengineering	█████ (medium)
Create space for principal investigators to launch and do company start-up research on campus	███ (low)
Build a bioengineering-focused entrepreneurship and patenting office	██ (low)
Incentivize student-led translational projects	██ (low)
Leverage resources for translation available to medical school students	██ (low)
Hold a workshop about aligning research with translation	██ (low)
Establish and grow student-focused technology events, such as workshops, hackathons, and tech-slams	███ (low)
Target Department Work toward High-Impact Needs	
Identify areas/projects to focus on based on high-impact needs (FDA Manufacturer and User Facility Device Experience [MAUDE], ECRI Institute, etc.)	██ (low)
Identify key stakeholders that technology translation will directly impact	██ (low)
Collaborate with clinicians or technology end-users to discuss current medical challenges and encourage need-to-tech matching	██ (low)
Connect engineering technologies/curriculum to service-driven endeavors	██ (low)
Lead University Growth in Translational Research	
Establish a structure and community between the department and the Fischell Institute	█████████ (high)
Broadly communicate department success stories in translation	██ (low)
Track the impacts of previously translated research to encourage the state/university to do more translational work	██ (low)
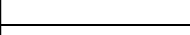
REPUTATION FOR INNOVATION AND IMPACT

	URGENCY LEVEL
Increase Department Presence in the Bioengineering Community	
Increase faculty presence in study sections, keynote/plenary talks, fellows, awards, and professional society leadership	
Host a distinguished lecture series with external bioengineering and biomedical engineering department chairs and high-profile investigators	
Encourage faculty to highlight the department's work in presentations	
Participate in and publicize outcomes of national student competitions	
Continue to increase the number of faculty and students presenting at the Biomedical Engineering Society (BMES) meeting, and expand the department's role in organizing BMES	
Increase the number of external department chairs invited to the UMD department (e.g., to visit seminars) and strategically plan their experiences	
Celebrate Bioengineering Successes	
Highlight student successes, such as through recognition and fellowships	
Create an "Innovator of the Year" award in the department (or in the Big 10)	
Incentivize High-Visibility Work	
Incentivize high-impact papers and presentations (e.g., salary raise, Clark Fellowship/Award, better parking, reduced teaching/buyout cost, foundation funding, staff access to BioWorkshop)	
Improve training of PhD graduates and post-docs to better position them for lead academic or industry programs, where they could further build the department's reputation	
Increase placement of graduate students and post-docs in faculty positions	
Launch New Communications Initiatives	
Expand the department's social media presence, particularly of faculty, such as by engaging an expert to train faculty on leveraging social media	
Hire additional communications staff	
Create two-minute videos of individual faculty research areas to post on website	
Send e-mails/newsletters to universities about department research	
Host activities to better engage the local community (e.g., Nerd Nite, Prof Pints)	
Improve Department Ranking and Ranking Perceptions	
Increase understanding of the ranking process and improve communication to stakeholders about the department's ranking	
Improve transparency around efforts to improve department rankings	
Leverage Big10 initiatives focused on improving ranking	

EDUCATION

	URGENCY LEVEL
Promote Teaching Excellence	
Consider new approaches to assess teaching excellence (e.g., peer and department evaluations)	
Reward/incentivize evidence-based teaching	
Encourage faculty to attend teaching workshops	
Research/assess new pedagogies for undergraduate bioengineering education	
Expand Experiential Learning Opportunities	
Offer more hands-on education experiences	
Offer master's projects similar to Capstone to improve industry job opportunities	
Bring clinicians and industry representatives into the classroom	
Expand research opportunities for students, particularly undergraduate and early graduate students	
Offer an expanded, research-based master's degree	
Expand student internship opportunities	
Strengthen Holistic Student Support Services	
Better connect students and faculty with resources (e.g., mental health support) to support students in out-of-class factors related to student success	
Improve access to student scholarships	
Strengthen support for students pursuing non-academic careers	
Find better ways to communicate to students—beyond e-mail—about resources and opportunities	
Re-think future faculty program to gear more career support toward post-docs	
Align Curricula with Desired Student Outcomes	
Restructure the bioengineering graduate curriculum to achieve desired outcomes	
Conduct ongoing curriculum assessments and improvements, engaging students in re-thinking curriculum designs	
Increase synergy between bioengineering courses	
Expand Student Access to Courses	
Improve student access to required courses (increase number of seats, or host more classes)	
Expand online courses	
Create opportunities for students to take courses at the UMB Medical School	
Launch New Graduate Student Recruitment Initiatives	
Create specialized track in graduate program curriculums to promote interest in bioengineering and the University of Maryland	
Encourage faculty to recruit directly from universities to attract top graduate students	
Engage department-wide activities to promote graduate student recruitment	

COLLEGIALITY

	URGENCY LEVEL
Increase Faculty and Staff Career Advancement Support	
Build career advancement skills for both faculty and staff	
Organize a mentoring workshop for new hires	
Create a junior faculty/post-doc mentoring program	
Increase cross-training within the department	
Host More Social and Networking Opportunities	
Organize a bring your child and/or dog to work day	
Organize department welcomes (e.g., coffee hour or lunch) for new faculty, staff, and researchers	
Host more department-wide, family-oriented events such as picnics, community service events, charitable initiatives, and potlucks	
Host research lunch-and-learns	
Organize weekly coffee hours	
Diversify timing for department social events to avoid repeated conflicts with staff/faculty obligations	
Broaden Input into Department Decision Making	
Consider impact on staff when new programs are developed	
Survey faculty, staff, and students to gather feedback on new initiatives	
Improve transparency about department decision-making	
Improve Student Access to Department Resources	
Develop a "smart" access system in Clark Hall for undergraduate student access	
Install phones in the department laboratories so students can call for access	
Improve transparency around faculty and staff roles, to help students identify the right point-of-contact for their needs	
Empower Department Members and Strengthen Diversity	
Recognize everyone's contributions to the department (e.g., through public acknowledgement, stickers on doors)	
Set up a diversity advocate or task force	
Assess balance between faculty workload and salary	

APPENDICES

APPENDIX A. CONTRIBUTORS

Department Faculty

- Leigh R. Abts, *Research Associate Professor*
- Helim Aranda-Espinoza, *Associate Professor and Associate Chair for Graduate Studies*
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- Alisa Clyne, *Associate Professor*
- Gregg A. Duncan, *Assistant Professor*
- Edward Eisenstein, *Associate Professor*
- John P. Fisher, *Distinguished Professor and Department Chair*
- Xiaoming He, *Professor*
- Keith Herold, *Associate Professor*
- Huang Chiao Huang, *Assistant Professor*
- Steven M. Jay, *Assistant Professor*
- Christopher M. Jewell, *Associate Professor and Associate Chair for Research*
- Arthur T. Johnson, *Professor Emeritus*
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Department Staff

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Department Board Members

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