1. Executive Summary

Dartmouth, with its strength in the liberal-arts tradition and its commitment to the scholar-teacher faculty model in undergraduate education, has many areas in which it is currently making an internationally recognized scientific impact. By better integrating the strengths of A&S, Geisel, and Thayer in combination with strategic investments in scientific research and education we can further advance our leadership to levels on par with universities often ranked in the top twenty and within the IvyPlus Peer Institution category. Dartmouth also faces distinct challenges. Dartmouth is small relative to its peers; despite its size, Dartmouth must enhance its level of scientific accomplishment to seriously “move the needle” of Dartmouth’s research reputation, a critical factor in Dartmouth’s overall national and international reputation. Indeed, our peers are outstripping us – most dramatically evidenced by Dartmouth’s recent demotion from R1 to R2 status in the Carnegie classification – and many are stepping up their investment in STEM even as we write this report.1

In this document, the Science Strategy Working Group proposes a strategy for science at Dartmouth. We intentionally use the term “science” broadly, encompassing all the so-called STEM fields – science, technology, engineering, and mathematics – spanning all of Dartmouth’s schools, and their component departments and programs, wherever such inquiry occurs.

The Working Group determined that Dartmouth’s aim is to achieve several interlocking goals:

- to increase Dartmouth’s national and international reputation and prestige,
- to expand the quantity and impact of our scientific scholarship,
- to recruit and retain a diverse and world-class STEM faculty,
- to develop critical mass in a range of scientific disciplines,
- to strengthen ties across departments and schools,
- to maintain the highly collegial environment that fosters collaboration and quality of life,
- to innovate and improve science education for STEM majors and all undergraduates, and
- to strengthen our graduate programs to attract the best students and produce great scientists.

After speaking with a broad range of campus stakeholders and studying data about science at Dartmouth today, including data that compares Dartmouth with other institutions, we came to the following findings:

- Dartmouth has 311 STEM faculty (tenure-track and research-track) across three schools,
- Dartmouth has 206 postdoctoral scholars across all three schools,
- Dartmouth has 782 graduate students across all STEM-related programs,
- Dartmouth has 809 undergraduate STEM majors (38% of those who have declared a major), and
- Dartmouth has many strong departments and graduate programs, when viewed through metrics that adjust for our relatively small size.

On the other hand,

- Dartmouth’s STEM ecosystem is much smaller than its primary competitors,
- Dartmouth provides less institutional support for research than do many of its peers,
- Dartmouth’s scholar-teacher model, as currently implemented, presents tremendous challenges to individual faculty,
- Dartmouth can expand its scientific impact and improve its scientific reputation while remaining committed to an outstanding undergraduate program – but we cannot achieve both goals without increased investment.

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Ultimately, Dartmouth must decide whether it is committed to becoming a destination that fosters STEM research and education of the highest impact. To be competitive on a national and international scale, this commitment must include significant investments aimed at strategically expanding and supporting its faculty, graduate programs, and facilities to recruit and retain the best possible faculty and students and achieving its dual mission of “teaching and the creation of knowledge”.

Given the above goals and findings, this Working Group provides many detailed recommendations. At a high level, we recommend that Dartmouth:

- invest broadly in the science infrastructure (including technical staff) that supports the existing faculty and current STEM programs, and maintain and expand that infrastructure as the STEM ecosystem grows and evolves;
- invest in the development of centers of scientific inquiry that bring a critical mass of faculty, postdocs, graduate students, and staff around promising areas of scientific inquiry;
- establish regular mechanisms to measure and monitor its scientific productivity and quality, interpreted in context, with mechanisms to share those metrics with departments and programs so they may strive to improve;
- invest in graduate programs, asking each to articulate a strategy for improving the quality for recruiting a stronger and more diverse range of students, and for training students for the best professional outcomes;
- increase efforts to recruit and retain a diverse and world-class faculty, by building the scientific ecosystem where they can thrive;
- recognize the faculty’s daily challenge of balancing a highly competitive research program with their commitment to undergraduate and graduate education, by increasing support for faculty who strive to achieve excellence in both, through explicit recognition of faculty effort in graduate education, and by mechanisms that allow differential teaching loads for faculty with and without significant research programs;
- immediately begin to construct and upgrade laboratory buildings to provide room for growth in the scientific community – faculty, postdocs, and graduate students – that is anticipated by existing plans (such as cluster hires) and by our other recommendations;
- develop policy and fiscal infrastructure to expand support for facilities and instrumentation, ensuring the ongoing maintenance and periodic replacement of laboratories and instruments essential to both our research and educational mission;
- recognize the essential role of technical support staff, who support the scientific infrastructure and, more broadly, support our entire scientific enterprise, and their role as “productivity enhancers” for our faculty and students;
- increase administrative support to faculty, enabling them to focus their time and energy on research and teaching rather than on administrative tasks;

and, in short, to:

- enable our faculty to compete in the increasingly global scientific community — while maintaining their dedication to the highest quality undergraduate and graduate education.

Furthermore, we recommend that Dartmouth proactively export its science to the world, by:

- expanding efforts at media relations, ensuring scientific achievements are well publicized;
- supporting the Office of Science & Technology Outreach to connect Dartmouth scientists with local schools and with the public;
- supporting the Office of Entrepreneurship and Technology Transfer to assist Dartmouth scientists with the transfer of our science to the commercial world;
- expanding STEM-related fundraising efforts within the Development office.
Dartmouth needs to make an immediate investment to boost its scientific enterprise – on the order of $500-800m over the next decade – to construct and upgrade lab and computing facilities, expand faculty in selected areas, strengthen shared infrastructure and technical support staff, and provide faculty the time and resources to innovate in both research and education.

Furthermore, as articulated in Chapters 4-9, we anticipate the need to continue an increased level of institutional support for STEM ($50-75 million annually) to support these infrastructure, services, and activities in the decades to come.

These investments to ensure the future success of STEM at Dartmouth may be simply categorized as **People, Places, and Things:**

- **People:** hire and retain the best faculty, students, and staff;
- **Places:** provide and maintain functional work spaces that inspire and enable the best science;
- **Things:** provide and maintain the necessary instruments and core infrastructure required for cutting-edge research and education in STEM fields.

This report makes recommendations in all three categories, and wraps up with a focused list of action items for immediate consideration.

Finally, because the improvement of STEM at Dartmouth will necessarily be a long-term, ongoing process, we recommend the creation of a standing committee to advise the Deans, Provost, and President regarding future STEM investments. With representation from across the broad range of Dartmouth’s STEM faculty, this committee can advise the Provost and Deans about requests for major new facilities, renovations, or programs, and can periodically monitor the outcomes of prior investments. As needed, this committee may recommend that the Provost convene an external panel of experts to consult on projects that are especially large, complex, or transformational.

**Structure of the report.** In the nine chapters that follow, we explore these goals, findings, and recommendations in more depth. After an introduction and summary of our Working Group’s process (Chapters 2–3), we dig into the state of science at Dartmouth today (Chapter 4). We outline a strategy for supporting science at Dartmouth in the future (Chapter 5), and the support needed for the ongoing support of the Dartmouth scientific ecosystem (Chapter 6). We explore graduate STEM education (Chapter 7) and undergraduate STEM education (Chapter 8), and recommend changes to Dartmouth’s structure, policy, and culture (Chapter 9); finally, we end with a summary and conclusion (Chapter 10). The conclusion provides a list of **follow-up actions** we recommend Dartmouth’s leadership pursue upon receipt of this report.