



Department of Geoscience

Strategic Plan 2020 to 2024

January 2020

EXECUTIVE SUMMARY

The Department of Geoscience is among the world's leaders in Earth science research and education. Our research programs span sedimentary geology, glaciology, hydrogeology, geophysics, geochemistry, geomicrobiology, biogeochemistry, paleoclimatology, structural geology, surface processes, and the new subdiscipline of geoinformatics. Beyond its traditional applications for energy and mineral exploration and extraction, the importance of the geosciences has been amplified in recent years by accelerating, anthropogenically induced changes in Earth's climate and critical life-support systems and the urgent need to understand how our planet has responded to similar changes in the geological past. Given the inherently multidisciplinary nature of the geosciences, our departmental faculty, staff, and students collaborate with personnel in numerous other campus units, including Anthropology, Astronomy, Atmospheric and Ocean Sciences, Bacteriology, Botany, Chemistry, Civil and Environmental Engineering, Computer Sciences, Geography, Integrated Biology, Materials Science and Engineering, Physics, and Soil Science departments, the Nelson Institute for Environmental Studies, and Wisconsin Institute for Discovery. At the graduate level, we have trained generations of leaders in academia and industry. At the undergraduate level, we train numerous geoscience majors and non-science students. At the broadest level, embodying the Wisconsin Idea that university research should broadly benefit all citizens of the state and beyond, we collaborate closely with the Wisconsin Geological and Natural History Survey and scientists in Wisconsin offices of the U.S. Geological Survey, and engage the public broadly through the departmental Geology Museum, via media coverage of our faculty/staff research, and through other focused outreach efforts.

Mission. Our departmental mission is to investigate and disseminate information on the structure, chemistry, physics, and evolution of the Earth, life on Earth, and the interactions between the physical, chemical, and biological processes that shape the Earth now, in the past, and in the future. To serve this mission, we strive for breadth and excellence in our coverage of geoscientific sub-disciplines and endeavor to create, integrate, apply, and transfer knowledge within and between fields. We aim to be a leader in research and to communicate our work broadly to the public, students, and specialists. In so doing, we strive to provide essential knowledge and training for advancing the resilience, sustainability, and stewardship of our planet, its ecosystems, and human society.

Plan summary. Our five-year plan for the department's research enterprise is centered primarily on our recent and projected new faculty hires, new technical staffing, and an initiative to sustain and grow a robust geoinformatics research and training program. Our educational initiatives are focused on broadening student course access via new summer and academic-year courses and sustaining and supporting a new visiting international student program for undergraduate geoscience students from China's top universities. Other noteworthy objectives include improving our departmental diversity, climate, and inclusiveness, working with our Board of Visitors on a new gift-fund development campaign, and using our space in Weeks Hall more efficiently.

1. INTRODUCTION

Background and present. The Department of Geoscience, which has an illustrious history that extends back to its formation in 1878, currently comprises 20 faculty members, ~20 technical and administrative support staff, and an aggregate of ~200 post-doctoral associates, graduate students, and undergraduate majors. The department's national rankings in the 2018 U.S. News and World Report were 7th in geology, 8th in geochemistry, and 15th overall. Our faculty count is 30% smaller than any of the more highly ranked Earth science departments in the U.S. - we are thus the most highly ranked small Earth Science department in the top 20. The broad research portfolio of our faculty reflects our historical emphasis on meeting the broad educational needs of a major public university.

Previous strategic plan. During the past six years, the department has accomplished most of the primary goals that are stated in its 2013-2018 five-year plan (which for brevity are not enumerated herein) and most of the goals from its informal interim plan from 2016, which outlined the department's strategy for replacing five faculty who planned to retire between 2019 and 2021. The key outcomes include the successful hiring of four junior faculty within the strategically important areas that are outlined in our 2016 plan, the creation of several new graduate fellowships via generous alumni gifts, and the implementation of a streamlined pathway to a Ph.D.

Process for the present plan. Most elements of the present plan, which covers the period from 2020 through 2024, were discussed at departmental strategic retreats in January 2016 and February 2019 and at numerous other meetings of the Departmental Executive Council and Faculty. Whereas the 2016 retreat focused mostly on forthcoming faculty retirements and our strategy for hiring their replacements, the discussions during the 2019 retreat ranged more widely and included the following: (1) Concerns about overworked staff and a desire for a more balanced allocation of staff between the faculty. (2) Improvements in the diversity of our faculty, staff, and student body. (3) More equitable faculty teaching loads. (4) Possible responses to the campus call for larger undergraduate enrollments. (5) How to balance the college's call to expand our high-impact teaching practices, which are easiest to implement in smaller classes, against its incentives to expand our student course enrollments. (6) The diminishing impact of our gift-fund/endowment dollars, the declining condition of our Weeks Hall infrastructure, and our inefficient use of space. Several objectives in this plan respond to these concerns.

2. SUSTAINING AND ADVANCING RESEARCH EXCELLENCE: FACULTY

From early 2019 through mid-2023, the Department of Geoscience will experience a ~40% turnover in its faculty, including a likely addition of 8-9 new faculty and retirements or departures of 7 faculty. Much of our strategic planning since 2016 has focused on how to best use this turnover to improve our departmental research standing. The timeline on the following page summarizes our projected faculty retirements and new faculty hires and searches for the five years beginning in Fall 2019, which are concentrated in the subdisciplines of geophysics, geochemistry, and hydrogeology. During this period, five already-hired faculty will join the department, three others will retire, and searches will be run for four or more faculty. For financial planning purposes, the timeline also shows when three new faculty salaries will shift

mostly onto the department's 101 salary line, representing step increases in our projected salary expenses that will require forward planning to accommodate them within our base budget. Unrelated to the timeline, our plan also outlines our motivations for sustaining and nurturing our leading geoinformatics research program.

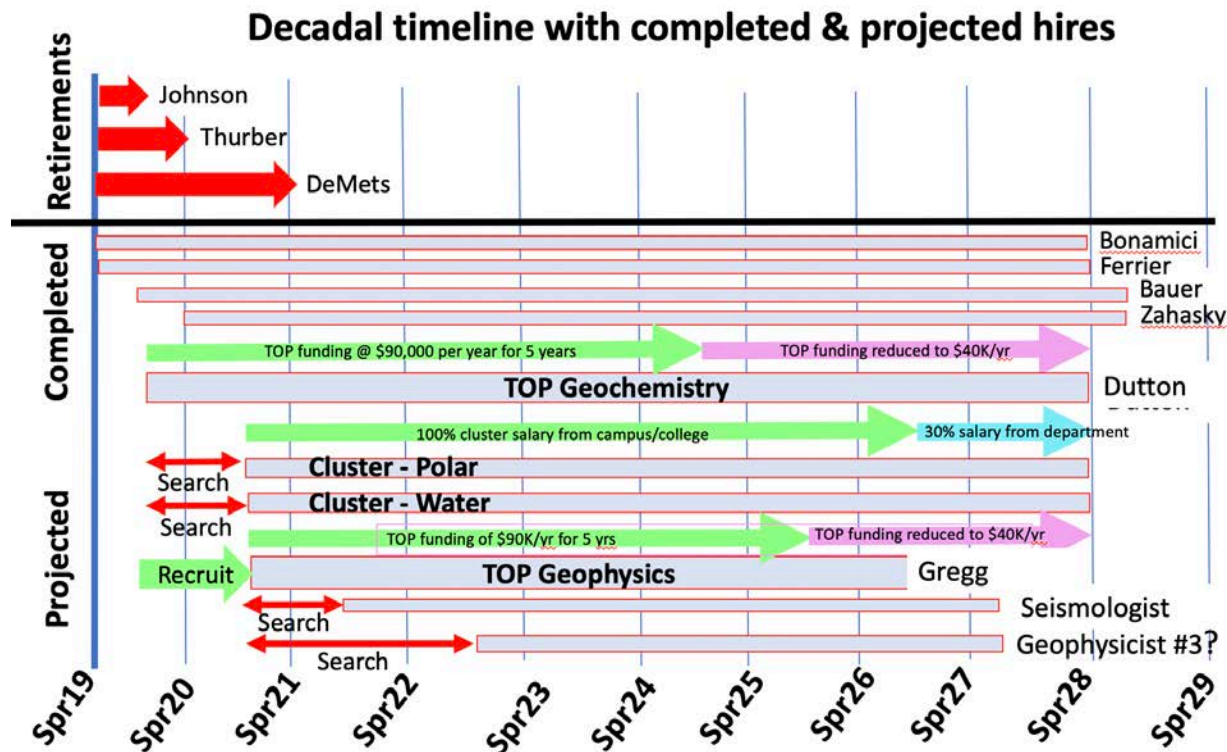


Figure 1. Faculty retirements and recent and projected hires for the decade beginning Spring 2019. The green and blue arrows are timelines for the funding sources for several of the newly hired faculty members.

Geophysics: Our top research priority during the next 3-4 years is to sustain and strengthen our geophysics program via three and possibly four new hires. The soonest likely hires in geophysics will occur in 2020, one via our ongoing search for a glacial modeler as part of the campus-approved Polar Regions cluster proposal and the other via our ongoing recruitment of Dr. Patricia Gregg via the campus Target of Opportunity (TOP) initiative. In 2021, the department will search for a crustal seismology to replace retiring Professor Cliff Thurber. A decision whether to fill the position that will be vacated in 2021 by retiring Professor Chuck DeMets awaits the outcome of the department's recruitment of Dr. Gregg and a broader faculty discussion of the appropriate size of the faculty within the framework of the department's five-year budget forecast. Caution in expanding the faculty to 23 is warranted given the significant budgetary challenges that the department will face in 2024-2025 when it will have to assume a much larger fraction of the 101 costs for any faculty hires it makes under the campus TOP and cluster hiring initiatives (see Fig. 1 for details).

The new hires described above and our existing geophysics faculty Feigl, Ferrier, and Zoet will form the nucleus of a large, mostly young cohort of geophysicists whom we anticipate will elevate the department's capabilities in this important subdiscipline.

Geochemistry: With the 2018 hires of Professor Annie Bauer and Professor Chloe Bonamici, both specialists in isotope geochemistry, and the mid-2019 hire of Professor Andrea Dutton via the campus-level Target of Opportunity Program, the department and campus have invested strongly in the future of the department's highly ranked geochemistry program. A critical objective in 2019/2020 is to complete a new clean laboratory and uranium-series radioisotopic dating lab for Prof. Dutton on time, and at or below the allotted 2.3-million-dollar budget. Significant time and effort by one or more research staff and two or more faculty will be devoted to completing these labs, which will expand the department's already-considerable capability in geochronology and significantly expand opportunities for cross-collaboration between our faculty.

Hydrogeology: In a state known for its abundant fresh waters, a vibrant hydrogeology program is an essential component of any geoscience program. Upon the 2018/2019 retirements of hydrogeology professor Jean Bahr and hydro-geophysicist Professor Herb Wang, our well-regarded hydrogeology program diminished to a single faculty member. Our May 2019 hire of Professor Chris Zahasky, a hydrogeologist who is engaged in a blend of field, experimental, and theoretical research, will help restore our program to critical mass. In addition, the approved water@UW cluster proposal includes a to-be-hired contaminant hydrogeologist whose tenure home will be the Geoscience department or Civil Engineering. Another factor important for the continued health of our hydrogeology program is our close affiliation with the Wisconsin Geological and Natural History Survey, which deserves strong departmental support as it navigates the transition from a quasi-independent agency within UW-Extension to a quasi-independent entity within UW-Madison.

3. SUSTAINING AND ADVANCING RESEARCH EXCELLENCE: STAFF

Although the research and educational accomplishments of the department's faculty constitute the foundations of the Department's national ranking and standing in the College, the department's talented, dedicated staff members are critical to the health and success of our mission. Given that the faculty renewal and expansion that is described in Section 2 will impose high demands on the department's talented technical and administrative staff members, possible ways to meet our staffing demands for the next five years are an important element of this strategic plan.

Academic staff: As of early 2020, the department's research programs were supported by eleven academic staff whose salaries are paid by a mixture of college, grant, and gift funds (Figure 2 on the following page). Six of our present research staff members operate and support our vibrant geochemistry labs and microprobe/SEM facility (Fig. 2). Two staff engineers (Lord and Sobol) facilitate our geophysical and geological field efforts and design, build, operate, maintain, and repair the department's diverse collection of laboratory and field equipment. Two information technologists support our broad-based and ever-increasing computational hardware and software needs. Finally, one staff member (Rogers) prepares thin sections and grain mounts that are vital for our departmental structural and geochemical research.

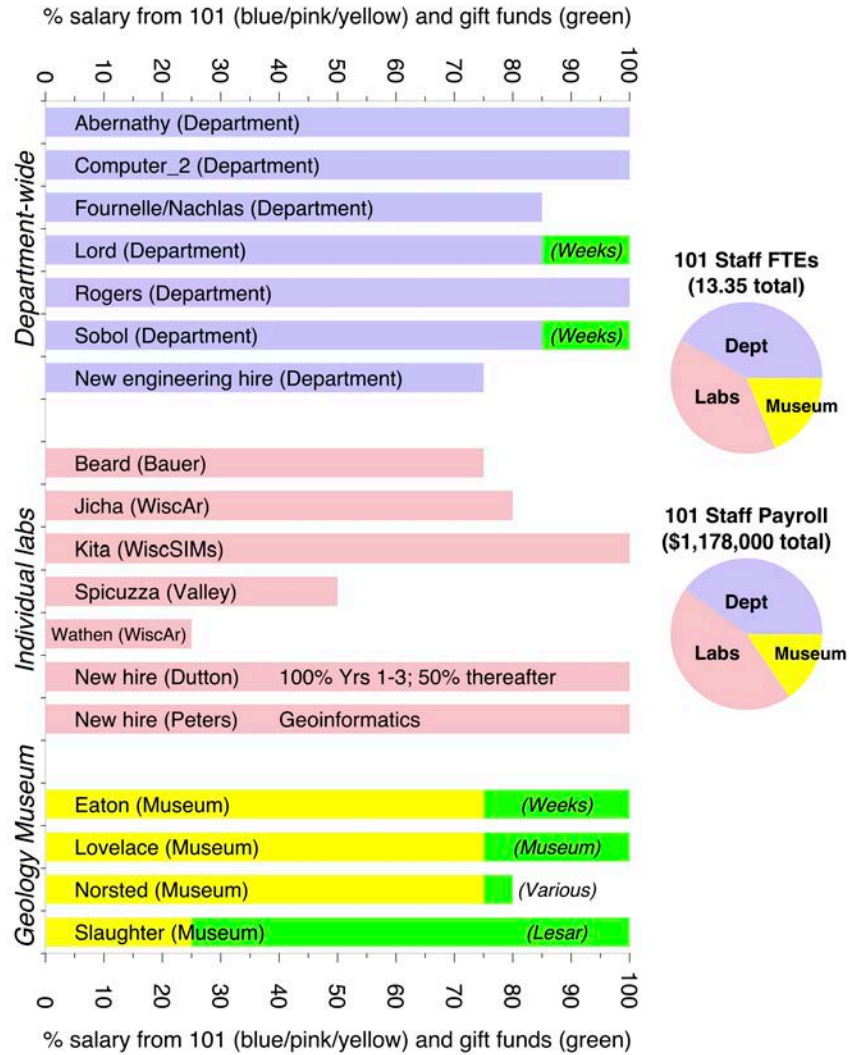


Figure 2. Academic staff positions supported by 101 and gift funds in early 2020.

In 2019, college 101 funding was secured for two new academic staff positions, one to manage Professor Andrea Dutton’s new clean lab and mass spectrometry facility and the other for our burgeoning geoinformatics program. Specifically, the College committed 101 funds for a new 1.0 full-time-equivalent (FTE) position in geoinformatics from July 2020 forward and a 0.5 FTE clean lab/mass spectrometry technician position during mid-2020 to 2023 and 0.25 FTE after mid-2023. In addition to these new positions, the faculty broadly support hiring a third staff engineer given the substantial, present unmet demand for the services of our two existing engineers. Straightforward calculations indicate that we can hire a new engineer for ~\$5,000 in 101 funds under a funding model in which 75% of our staff engineers’ salaries are paid from college 101 funds and the other 25% from research grants. Further discussion and adoption of this “pay-to-play” funding model for our engineering staff is a high near-term priority.

Other less immediate, but nonetheless important changes in the composition and responsibilities of our research staff may occur via retirements, re-allocation of our existing staff responsibilities, or strategic use of surplus 101 and other funds for new fractional or whole staff positions. Useful strategies for enlarging or altering the pool of funds that pay for our technical staff salaries might include charges to external grants for partial salary support of our information

technology (IT) staff, use of laboratory revenue-recovery fees to cover some staff salary costs, and investments of some of the new revenues from our summer courses and VISP program into staff salaries. Recommendations for modifications to our present IT staffing support are found in Section 4.

Finally, promotions of suitably qualified staff members to the newly defined “research professor” title, which will be available in March 2020, also offers broad possible benefits to the department and our Ph.D.-level technical staff. Such promotions would boost the research profiles of our most productive Ph.D. staff members and the department’s research profile at no cost to the department or College.

University staffing: Six staff members are responsible for the department’s daily operations: our department manager, our graduate secretary (who handles most tasks related to the academic needs of undergraduate and graduate students), two financial specialists, a payroll and benefits specialist, and a part-time undergraduate advisor. The department also employs a part-time director of development from the Wisconsin Foundation and Alumni Association, who is responsible for alumni fund raising focused on donors with large giving potential.

One important addition to our university staff would be a half-time communications director, who would oversee the department web site, social media, and other matters related to outreach and communications, including the Department’s annual alumni magazine, *The Outcrop*. The new position would be funded by 101 funds, some possibly recovered from our latent departmental secretary position.

4. THE GEOINFORMATICS INITIATIVE

Our primary research goal for the next five years is to sustain and grow our leading global program in the burgeoning field of geoinformatics, which involves data-driven discovery and machine learning approaches to scientific problem solving in Earth science, including solid-Earth geoscience and the atmospheric and oceanic sciences. Below, we describe the background for a geoinformatics initiative and outline a path for creating a new emphasis area in this promising field.

Background: During the past 8 years, Department of Geoscience Professors Shanan Peters and Basil Tikoff and Department of Geography Professor Jack Williams, a Geoscience Affiliate Faculty, have become the acknowledged world leaders in the area of sample-based geoinformatics. Our leadership position rests on three pillars. First, the answers to important, basic research questions – such as how much carbon is present in the Earth’s crust – requires the construction and analysis of geoscientific databases. Professor Peters and his collaborators have constructed such databases and published the derivative results widely and in the highest-impact journals. To date, his group has produced 6 *Science* and *Nature* papers (including a *Nature* cover article in 2012), 5 *PNAS* papers and many others in more specialized journals. This high-profile research and their foundational databases are one reason for our leadership in geoinformatics.

Second, Professor Peters and his research group have established several key on-campus database and cyberinfrastructure resources, most notably Macrostrat and the Paleobiology Database. These databases and supporting cyberinfrastructure now power a rapidly growing ecosystem of data-driven applications. For example, in 2016 Peters and his grant-supported Programmer Analyst developed and released the mobile app Rockd, which is available on iTunes

and play.google. The usage of Rockd has grown exponentially since its release and now exceeds more than 100,000 individuals and companies. Over 16,100 *accounts* by globally distributed users have been created on Rockd, of which nearly 10% were created in a single recent month (4/2019). These internationally regarded research databases and their associated, cutting-edge cyberinfrastructure make our department the *de facto* geoinformatics resource for analytical paleobiology and geology and drive further scientific and technological advances. The databases are also avenues for addressing the National Science Foundation's requirements for data sharing.

GeoDeepDive, the world's single largest repository of published scientific content that can be used for data science methods development and informatics initiatives, is another pillar of our geoinformatics leadership. Conceived and created by Professor Peters and Professor Miron Livny in Computer Sciences, GeoDeepDive (now xDD) is backed by new, campus-level contracts forged by Professor Peters and his UW Library collaborators with commercial and open-access publishers. This unique resource for building and deploying machine reading and learning methods to automate the construction of scientific databases is an active research area in the UW Computer Science Department, where Peters' collaborators are progressing rapidly in order to take full advantage of this resource.

Finally, StraboSpot is a digital data system for field- and laboratory-based structural geology, sedimentology, experimental deformation, and microstructural analysis. Spearheaded by Professor Basil, StraboSpot uses a community-based approach for developing standards (controlled vocabulary, etc.) and interface design. It not only stores field and other geologic data, but also provides the contextualization needed for making the data useful to other geologists. The data system is accessible both in the laboratory (through a web browser interface) and field (through iOS and Android mobile applications). This recently launched applications is quickly becoming the standard for digital storage and sharing of geoscientific data.

Actions to date and recommendations: Significant departmental and college investments in a geoinformatics program over the next five years are warranted given our present leadership position in the field, the high potential for fundamental new geoscience research, and the growing market for students who are trained in geoinformatics. In Spring 2019 and mid-2019, the Department and College respectively granted Professor Peters 0.5 FTE and 1.0 FTE academic staff positions and three-year rolling horizons for two technical staff positions in response to difficulties experienced by Professor Peters in his efforts to recruit new, well-qualified geoinformatics staff members and retain his present staff. Other proactive departmental-level actions/investments in geoinformatics over the next 1-3 years might include the following:

(1) A modest redirection of our computing staff resources toward broad support of the geoinformatics and other software-intensive research initiatives in the department. Most of our scarce academic staff positions have historically been allocated to our well-funded geochemistry and geophysics faculty to support their laboratory and field research, excluding only our two information technology specialists. Given the recent departure of one of those IT specialists and the likely retirement of the other in the next few years, we recommend using this rare opportunity to redefine both positions to include research-level support for geoinformatics and other software-intensive departmental research, possibly paid partly through external grants. Although this will likely mean that some of our present IT support will have to be out sourced, it is critical that our scarce staffing resources be used to maximum effect and avoid duplication of services such as those offered by DoIT.

(2) Development of a formal geoinformatics “track” for our geoscience majors based on newly-designed exercises in some of our existing classes, the possible creation of new academic-semester or summer-semester courses, and linkages to the College’s new School of Computer, Data, and Information Sciences.

(3) Development of a professional master’s degree program in geoinformatics. Assuming annual enrollment of at least 10 students, each of whom would contribute at least \$10,000 per year to the department in 131 revenues, the program would be self-sustaining and generate enough revenue to pay for a Ph.D.-level geoinformatics specialist. The specialist would not only teach key courses in the program but would add critical mass to the geoinformatics research initiative. Given high market demand for students with skills in big data and computer programming, we recommend careful consideration of the feasibility of such a program.

5. Sustaining and Advancing Educational Excellence

One important, achievable goal during the next few years is to encourage and possibly expand the department’s nascent summer course program due to its potentially transformational effect on the department’s revenue base. Experience to date at the college level suggests that students prefer online to lecture-centric summer courses because the former courses fit better into their summer schedules. Accordingly, efforts to develop, staff, and refine our online *Environmental Geology* (Geoscience 106), *Geohazards* (G140), and *Energy Resources* (G411) courses should be supported and encouraged. Developing a system in which some or all of our summer courses could be taught by qualified, non-faculty, Ph.D.-level instructors would avoid any negative effects on our faculty summer research effort, which remains paramount to the department’s health and ranking.

A second achievable goal is to support and possibly grow the department’s new “Visiting International Student Program” (VISP) for one- or two-semester-long visits by qualified Chinese undergraduate geoscience majors. Spearheaded by Professor Huifang Xu, the new program not only offers a significant possible source of new revenue but should also build goodwill between our faculty and leading Chinese geoscience departments and possibly create a pipeline of talented Chinese graduate students.

A third goal that warrants continued attention is our departmental effort to increase our undergraduate student credit hours in response to the campuses planned 15% increase in undergraduate enrollment over a five-year period that began with the Fall 2018 semester. New revenues from this plan, possibly equal to \$300 per added student credit hour, are being awarded preferentially to departments that expand their course access and student credit hours. Increasing our departmental credit-hour load without negatively impacting faculty research time will require careful planning by the Chair and Undergraduate Studies Committee.

Finally, two items that warrant consideration over the next few years include (1) Creating a common graduate-level course for our students, which was raised but not discussed at the February 2019 departmental strategic retreat, and (2) Whether GRE scores should remain a requirement for our graduate student applications. The Graduate Studies Committee will recommend action on the latter item during the 2020 academic year.

6. DEPARTMENTAL CLIMATE

Our department is committed to creating and promoting a community where diversity is welcomed and encouraged. Diversity of age, race, ethnicity, gender and expression, sexuality, physical ability, immigration status, marital status, class, religion/spirituality, political ideology, and the complex intersection of these and other dimensions is vital to an intellectual community at the forefront of scientific progress. Research, collaboration, and the ability to communicate science more broadly are all directly enhanced by interactions between a diverse student, staff, and faculty body through the confluence of unique perspectives.

In 2018, the Department formed a Committee on Diversity and Inclusion (D&I), which includes members of the faculty, staff, and student body. The committee will: 1) Continue to collect information regarding trends in diversity and departmental climate; 2) Provide a forum for identifying and addressing any systemic issues related to diversity and inclusion within the department; and 3) Connect resources to individuals with concerns about diversity and inclusion within the department. Our goal is to create and promote an atmosphere that protects members of the Department against discrimination and bias and encourages respect and value for varying perspectives and backgrounds. Possible actions to achieve this goal may include seeking and retaining students, staff, and faculty of underrepresented populations, nontraditional patterns of academic preparation, economically disadvantaged backgrounds, and first generation status; providing resources to staff, faculty, and students to enhance awareness and address issues regarding diversity and inclusion; and demonstrating respect for differences in the context of intellectual exchange through open dialogue.

Finally, during late 2019 and early 2020, the Geology Graduate Student Association (GGSA) is conducting the first-ever department climate survey of graduate students. The survey will establish a baseline for student attitudes toward a wide variety of topics related to their intradepartmental work climate and the department in general. Careful attention and follow-up actions by the Faculty related to this survey's primary findings are warranted.

7. INFRASTRUCTURE AND PARTNERS

The departmental “facility”, including the C. K. Leith Geology Library, are also critical to the health of our mission. The Geology Museum, Wisconsin Geological and Natural History Survey, and our alumni also strongly support the Department's academic mission and broaden that mission into the public realm, representing the embodiment of the Wisconsin Idea. Each is thus discussed briefly below.

Research infrastructure and Weeks Hall: Maintaining the department's research infrastructure is an increasing challenge as Weeks I and II approach 50 years since their construction. Given the unlikelihood of procuring private or public funding to build a new geoscience building, the Department must continue efforts to renovate and more efficiently use our existing space. Opportunities for renovations paid for with college or campus funds are mostly limited to the annual instructional laboratory modernization (ILM) exercise and remodeling associated with faculty start-ups. The Department's past success in procuring ILM funds strongly suggests a continued effort to submit annual requests would be fruitful. Campus and college contributions to remodeling and equipment for new faculty start-ups has equaled two-thirds of the cost in recent

years. It is thus essential that the Department anticipate and include facility remodeling costs in new faculty start-up requests. Soliciting alumni gifts to renovate specific critical rooms in Weeks Hall should also be considered.

Efficient use of our space is also critical. We recommend charging a special committee composed of members of the faculty and staff to prioritize, plan, and schedule the clearing of unused or underutilized rooms. This could include assigning one faculty or staff member the responsibility for overseeing the effort, and possibly specifying some limited gift funds to pay for assistance in cleaning spaces.

Geology Library: The C. K. Leith Library, which is one of the most comprehensive domestic collections of geoscientific reference materials, provides vital resources and support to the Department and many other researchers. The Library's physical and electronic collections, reference and research services, assistance with Departmental projects, and spaces for communal interaction, group collaboration, and curricular support are also important for our teaching and outreach efforts. Maintaining the library is thus central to the effective functioning of the department and in its best interests.

Geology Museum: With an annual attendance of roughly 50,000 people, the Geology Museum is one of the top ten destinations for visitors to campus and is easily the most popular attraction for K-12 classes. Founded in 1848, the same year that Wisconsin became a state, the Museum maintains a vast collection of geological specimens that are utilized for teaching, outreach, and research in the Department. Before 2004, the museum only had a single staff position. Between 2005 and 2012, it added three staff members whose salaries were funded mostly by temporary grants and gifts. In 2014, a substantial endowment and increased support from the university began supporting all the museum staff.

During the past 5-10 years, the educational roles of the Museum staff have evolved from group-based instruction in introductory and distance-based departmental courses to individualized instruction of numerous undergraduate and graduate students in projects of mutual interest to the students and Museum. The Museum outreach programs have also expanded to better serve a wide variety of under-represented populations and assist/advise the Department faculty members with outreach and public education efforts in their federal and other grants. As a highly successful and largely self-funded entity, the Geology Museum now functions mostly independently from the Department with its own long-range plan.

The Museum's strategic goals in its core areas are as follows:

1. *Collections*

- Furnish Room AB55 with mobile shelving for specimen storage
- Launch a new collections management system
- Spectacularly bolster the Wisconsin minerals collection, partly to set the stage for an eventual renovation of the mineral displays
- Free space in Weeks repository to better accommodate faculty specimen storage needs

2. *Exhibits and Visitor Services*

- Replace the exhibit area carpeting and overhead lighting
- Assemble and exhibit the largest ever collection of Wisconsin Ice Age fossils
- Expand weekend hours and/or have extended summer hours
- Make the exhibit area more enjoyable for visitors with developmental disabilities

3. *Education and Public Outreach*

- Overhaul the self-guided tour book and translate it into Spanish
- Work with the faculty on creative, impactful ways to share their research with the public
- Develop and implement an outreach project worthy of national attention
- Forge partnerships with more community groups to broaden the diversity of the audiences

4. *Research and Field Work*

- Develop the computational capacity for modern, data-driven paleontological research
- Strengthen the Department's graduate program via our vertebrate paleontology expertise
- Discover a signature fossil locality to anchor our summer field program in Wyoming for years to come
- Establish more research collaborations within the department and across campus

5. *Museum-Wide Goals*

- Strengthen the Museum's financial base
- Expand the Museum's undergraduate training programs in all core areas
- Make the Museum and its programs more welcoming and inclusive
- Devise a plan for a fifth museum staff position such as a museum manager, exhibit curator, or community engagement coordinator

Wisconsin Geological and Natural History Survey (WGNHS): The Department has long had a close connection with the WGNHS, a quasi-independent state unit whose basic and applied studies of Wisconsin's geological and water resources clearly overlap our Departmental mission. Formerly part of UW-Extension, but merged into UW-Madison in 2019, WGNHS is responsible for communicating their study results to the public via publications, technical talks, and responses to public inquiries, ultimately toward fostering more informed decision making by Wisconsin government, industry, business, and citizens.

Our long-term and present connections with WGNHS staff and faculty are numerous and include the following:

- WGNHS faculty with affiliate faculty status in the Department.
- WGNHS faculty and staff co-advise some of our graduate students, including service on their M.S. and Ph.D. committees.
- WGNHS faculty serve on our faculty search committees.
- WGNHS faculty and staff are co-principal investigators on grants led by our faculty.
- WGNHS faculty teach departmental courses during our faculty sabbaticals.
- WGNHS supports geoscience graduate student stipends.
- WGNHS offers logistical support for department in-state research, including shared laboratory and field equipment.

A 2019 poll for specifics of our faculty interactions with WGNHS faculty and staff revealed active or recent collaborations on research projects, proposals, and student supervision for 5 of our then-19 active faculty members and 2 of our emeritus faculty members. The Department thus has an obvious vested interest in the continued wellbeing of former WGNHS faculty as they are assimilated into the much larger faculty that comprises the newly created Division of Extension within the UW-Madison.

Alumni, Board of Visitors, and Development: The Department has long cultivated strong connections with its alumni and Board of Visitors via personal connections, via our annual newsletter *The Outcrop*, and via a development officer from the Wisconsin Foundation and Alumni Association (WFAA). The Department and WFAA have hired Mae Saul as our new development officer. She will work primarily with donors capable of making major gifts. Ms. Saul will have an office in Weeks Hall and will be embedded in the Department so as to enhance her knowledge of who we are and what we do, and hence her credibility with our alumni and Board of Visitors.

One objective for the next five years will be to work with our Board of Visitors and alumni on a major new development campaign, the first by the department since the early 2000s when it raised funds for the construction of the Weeks III building addition. The need for a new development campaign is driven mostly by a roughly factor-of-two decline in the purchasing power of our Weeks Funds during the past two decades, as follows: In July of 1998, the value of the Department's primary endowments, the Lewis Weeks and Albert and Alice Weeks funds, was 12.7 million dollars. In July of 2018, 21 years later, the value of the same funds was still 12.7 million dollars even though market equity returns for that 21-year-long period were 338%. Our annual spending thus averaged 7.6% of principal, roughly twice that recommended by WFAA. If our departmental spending had instead averaged a more sustainable 4%, our 2018 endowment balance would have been roughly 26 million dollars. Given net U.S. inflation of 54% from 1998 to 2018, the purchasing power of our endowment has declined by slightly more than a factor-of-two during the past 20 years. Heavy spending during the next 3-4 years on new faculty start-up packages will continue this trend, resulting in a further decline in the annual endowment income.

Based on the above, the Department and Board of Visitors began strategizing in 2018/19 on a new development campaign. To date, this effort has encountered difficulty in reconciling the Department's desire for a flexible large fund similar to the Lewis Weeks Fund with potential donor interests, which are often focused on funding discrete items with more tangible outcomes. More work is called for, including the cultivation of good relationships between Mae Saul and major potential donors.