The Challenge

Society is facing the “perfect storm”\(^1\). Population growth, and the associated demands for food, fuel, and clean water—combined with climate and environmental change—are placing increasing pressures on Earth and its precious natural resources. Addressing these challenges requires an unprecedented intensity and scale of interdisciplinary scientific observation and new knowledge to guide intervention. The geosciences are essential to that endeavor. Yet, the U.S. is experiencing a demonstrable shortage of geoscience talent, and job vacancies over the next ten years are projected to grow faster than the average for nearly all other occupations\(^2\). KSU Geology can help to fill this skills gap to benefit Kansas. Furthermore, with its strengths in Science, Technology, Engineering, and Mathematics (STEM) disciplines, KSU is uniquely positioned with its talent base to undertake the interdisciplinary teaching and learning required to provide the trained workforce that is poised to address these global challenges head on.

However, KSU Geology lags behind peer institutions in terms of access to modern facilities and equipment for teaching and research. Our current facility, Thompson Hall, was not designed to support modern teaching, research, and development activities\(^3\). Its location on the southern margin of campus, physically distant from the other STEM disciplines, is a significant barrier to collaborative teaching and research and diminishes the educational experiences of our students. The consequences are significant. With insufficient state-of-the-art classrooms, offices, laboratories, and equipment for research and training, we have become increasingly uncompetitive in our ability to recruit the brightest and best students and faculty, our students become less competitive in the job market, and our faculty are hindered in their ability to obtain external funding through extramural grants and awards. A state-of-the-art, multidisciplinary facility located at the heart of campus, with flexible space for instruction of interrelated STEM fields, is needed urgently.

Why it matters to Kansas

Geoscience knowledge, expertise, and jobs underpin major sectors of the Kansas economy. For example, the natural resources and mining industry make up ca. 5% of the nominal GDP of Kansas. The Kansas oil and gas sector alone is a $4.3 billion industry employing over 9,100 Kansans and over 17,000 in “downstream” sectors. It is comparable to the aviation industry in its significance to the Kansas economy ($7.1 billion\(^4\)) and ranks just below agriculture as the most significant Kansas industry in terms of gross state product\(^5\). Over the next five years, jobs in the Kansas unconventional oil and gas industry are projected to double to over 25,000, and the value-added contribution to the Kansas economy is estimated to grow to nearly $6 billion by 2035\(^6\). There are also a host of complementary benefits that accrue for the citizens of Kansas in the form of lower energy bills and lower costs for the more than 6000 other goods and services\(^7\) produced from or dependent upon petroleum\(^8\).

Similarly, geoscience expertise is required for creative solutions to our looming water shortage, the urgency of which is already widely recognized. Governor Sam Brownback has been quoted as saying, “Water and the Kansas economy are directly linked”\(^9\). Indeed, the well being of society depends on access to clean water. However, solving these problems is difficult because they cross multiple boundaries: agricultural, natural, and social sciences as well as boundaries in governance structures. The geosciences are critical to developing sustainable solutions through better understanding and prediction of the movement of water on the surface and in the aquifers and generation of knowledge of the processes that affect water quality, quantity, and condition.

\(^{1}\) [http://www.theguardian.com/environment/2012/feb/20/climate-change-overconsumption](http://www.theguardian.com/environment/2012/feb/20/climate-change-overconsumption)


\(^{3}\) Thompson Hall was built in 1922 for instruction in institutional management and once served as the campus cafeteria.


\(^{5}\) [https://www.kioga.org/career-center/oil-gas-career-tool-kit/Frequently-asked-questions](https://www.kioga.org/career-center/oil-gas-career-tool-kit/Frequently-asked-questions)


\(^{7}\) Examples include petrochemicals, fertilizers, cosmetics, plastics, pharmaceuticals, cement and the entire food production and distribution industry


Finally, through the introductory level geology courses we teach each year, the Department of Geology also provides roughly 3000 non-major undergraduate students with a basic understanding of our local and global natural resources and their limitations through highly popular survey courses. The importance of improved public understanding of the geosciences has been recognized in the new Framework for K-12 Science Education\textsuperscript{10}. The Department of Geology contributes substantially to this new educational agenda, through our service teaching role, which would benefit from a new teaching facility in the heart of the K-State campus.

**Investing in the Future**

To keep pace with these growing demands, and to better serve the needs of the state of Kansas, K-State proposes to expand its Department of Geology, more than doubling the number of undergraduate majors and graduate students over the next five years\textsuperscript{11}. To achieve this ambitious target, new investment is needed to accommodate the expansion, including building facilities and equipment and annual operating budget increases for new faculty and staff.

Investment in a new teaching and research facility, adjacent to the new Engineering building and most of our STEM programs, will complement the state’s earlier investments in producing scientists and engineers who are prepared to work in a global environment with considerable resource limitations. With its focus on the instruction of STEM and collaborative research addressing global resource challenges, this new investment will continue to propel K-State toward its goal of being a top 50 public research university by 2025.

**The cost to the state for supporting this increase in the geosciences is $5 million in recurring base funding to the College of Arts and Sciences at Kansas State University (Department of Geology).**

This critical investment includes the cost of building and bonding a new facility, provision of state-of-the-art training and research equipment, and infusion of much-needed resources for faculty, staff, and students to accommodate added recruitment, teaching, advising, research, and retention activities.

These funds will be matched on an annual basis by $2.5 million in private donations, $1 million from increased tuition revenues to the university, and $1.5 million in research expenditure growth.

**Investing in New Facilities.** Up to $2 million per year of this base funding request will be used to help bond the construction of a new $45 million building that has cutting-edge research and teaching lab spaces. $1 million per year for five years will be invested in provision of new state-of-the-art teaching and research equipment.

**Investing in People.** An outstanding program is built on outstanding faculty and students. Yet, KSU Geology faculty salaries are 38\% behind those of peer institutions\textsuperscript{12}; graduate student stipends lag similarly behind those of peer universities. Demand for geoscientists in non-academic positions is high and reflected in current salary offers, with annual starting salaries often exceeding $100,000\textsuperscript{13}. Without adequate financial incentives, we will struggle to recruit and retain the brightest and best faculty and students. We will therefore direct $4 million toward at least two endowed chairs, as well as provide additional support for existing faculty. We will also direct funding to increased financial support for students in the form of scholarships and fellowships.

As the Land Grant university for our state, Kansas State University seeks to provide access to excellent education for the citizens of Kansas, including new developments in agricultural research and natural resource development and protection. Geology is critical to this mission by providing education and training about our most precious commodity—our planet. Indeed, the Kansas economy depends on the geologic resources of oil and gas, coal, building stone, sand, salt, gypsum, and water. With this critical $5 million base funding investment, the department will be poised for new growth and expanded productivity in teaching and research that will underpin the economy of Kansas into the future.

\textsuperscript{10} [http://www.nextgenscience.org/framework-k%E2%80%9312-science-education](http://www.nextgenscience.org/framework-k%E2%80%9312-science-education). Even the mean annual wage for all geoscientists (ca. $82,500) is well above typical starting salaries for early career faculty.

\textsuperscript{11} We currently have 65 – 75 undergraduate majors annually working toward a BS and 20 – 25 Master’s students.

\textsuperscript{12} data provided by the College and University Professional Association (CUPA),

\textsuperscript{13} [http://www.americangeosciences.org/workforce/reports](http://www.americangeosciences.org/workforce/reports)