Kansas State University
College of Arts & Sciences, Department of Geology
Priority 2 – Geosciences Enhancement Request

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 10 years are projected to grow faster than the average for nearly all other occupations.[2] K-State Geology can help to fill this skill gap to benefit Kansas. Furthermore, with its strengths in science, technology, engineering, and mathematics (STEM) disciplines, K-State 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, K-State 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. The Kansas oil and gas sector alone is currently a $2.8 billion industry that supports an average annual estimated 118,000 jobs, more than $3 billion in family income, and more than $1.4 billion in state and local taxes. In areas where oil and gas are found, the industry represents a quarter of the jobs in some counties and 60 percent to 70 percent of the property tax.[4] It ranks just below agriculture as the most significant Kansas industry in terms of gross state product.[5]

Similarly, geoscience expertise is required for creative solutions to our looming water shortage, the urgency of which is widely recognized. Gov. Sam Brownback has been quoted as saying, "Water and the Kansas economy are directly linked."[6] Indeed, the well-being of society depends on access to clean water. However, solving these problems is difficult because they cross multiple boundaries: agricultural,

[1] http://www.theguardian.com/environment/2012/feb/20/climate-change-overconsumption
[2] http://www.bls.gov/ooh/life-physical-and-social-science/geoscientists.htm
[3] Thompson Hall was built in 1922 for instruction in institutional management and once served as the campus cafeteria.
[4] https://www.kioga.org/communications/reports/2015-kansas-oil-gas-industry-strategic-analysis/view
[5] https://www.kioga.org/career-center/oil-gas-career-tool-kit/frequently-asked-questions
[6] http://cjonline.com/news/2013-10-24/brownback-presses-50-year-water-policy-strategy

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.

Jobs in the geosciences are predicted to grow! In spite of the recent downturn in the energy sector, jobs in the geosciences are expected to grow faster than average (10 percent) over the next 10 years, with median annual pay of nearly $90,000 (U.S. Bureau of Labor Statistics, 2016).[7] In Kansas, jobs in the unconventional oil and gas industry, for example, are projected to double to over 25,000 in the next five years, and the value-added contribution to the Kansas economy is estimated to grow to nearly $6 billion by 2035.[8] Job growth in areas of environmental geoscience are predicted to be even greater than in the energy sector (11-12 percent).[7] With the exception of mathematics/statistics, *the predicted job growth in the geosciences exceeds that of nearly all other STEM fields*. Other STEM fields are, at best, expected to grow at a rate similar to average job growth rate (7 percent), and some disciplines are well below, particularly areas of engineering (e.g. ca. -2 percent for electrical and aerospace engineering; ca. 1-2 percent for chemical and industrial engineering; and ca. 4 percent for chemistry, biology and agricultural engineering). So now is the time to invest in geoscience education!

Through the introductory level geology courses taught each year, the Department of Geology provides roughly 3,000 nonmajor 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.*[9] 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 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, aiming to double the number of undergraduate majors and graduate students over the next five years.[10] 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 Hall 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 increasingly challenged by limitations in natural resources. 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.

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[7] *U.S. Bureau of labor statistics http://www.bls.gov/ooh/life-physical-and-social-science/geoscientists.htm*

[8] http://www.energyxxi.org/sites/default/files/Americas_New_Energy_Future_State_Highlights_Dec2012.pdf

[9] 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.

[10] We currently have 65-75 undergraduate majors annually working toward a bachelor's and 20-25 master's students.

The cost to the state for supporting this increase in the geosciences is $3.1 million in recurring base funding to the College of Arts & 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 by $10 million in private donations used for equipment, endowed faculty positions and sustainability of the new building.

Investing in New Facilities. Up to $2.1 million per year of this base funding request will be used to bond the construction of a new $30 million building that has cutting-edge research and teaching lab spaces. One million dollars per year will be invested in provision of new state-of-the-art teaching and research equipment.

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 $3.1 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.