**Research Development Fund – Fall FY16 Cover Page**

**Proposal Title:** Stable Isotope Partnership for Ecology, Environment, and Energy Research (SIPEEER)

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**Key Participating units:**

*College of Agriculture and Life Sciences* – Ecosystem Science and Management

*College of Geosciences –* Departments of Geography, Geology and Geophysics, and Oceanography

**Key Team members:** Ethan Grossman (Geology and Geophysics)

Thomas Boutton (Ecosystem Science and Management)

Brendan Roark (Geography)

Jason West (Ecosystem Science and Management)

Niall Slowey (Oceanography)

Ayumi Hyodo (Ecosystem Science and Management)

**Anticipated Request Amount ($): $1.3 million**

**Executive summary:**

We request funds to purchase a gas chromatograph-combustion-isotope ratio mass spectrometer system (GC-C-MS-IRMS) and a clumped isotope mass spectrometer (CIMS), delivering to TAMU a stable isotope capability unmatched in Texas and the region. This premier capability is possible through the partnership of the *Stable Isotopes for Biosphere Science* *Laboratory* in the College of Agriculture and Life Sciences, and the *Stable Isotope Geosciences Facility* in the College of Geosciences, providing techniques at the forefront of ecology, environment, and energy research.

The GC-C-MS-IRMS separates and identifies compounds with gas chromatography and quadrupole mass spectrometry, then quantifies isotopic composition through a combustion or pyrolysis interface to an IRMS. This system would provide cutting-edge capabilities to track sources and fates of specific biochemical compounds through the biosphere, geosphere, hydrosphere, and atmosphere, expanding the interpretation of bulk isotopic measurement and would be utilized by several Departments in four Colleges (COALS, CLA, COE, CLGE) as well as the Health Science Center. The instrument would be housed in the Stable Isotopes for Biosphere Science (SIBS)Laboratory. The Principle Investigators of the SIBS Lab hold membership in several TAMU multidisciplinary faculties, and have developed collaborative relationships with a diverse cross-section of faculty and graduate students who would benefit from the new analytical capabilities.

The second instrument, a clumped isotope mass spectrometer (CIMS), measures molecules incorporating two rare isotopes (e.g., 13C18O16O/12C16O2). The most promising new technique in geothermometry, clumped isotope geothermometry offers a new approach for predicting petroleum maturation, leading to more cost effective exploration. This technique combined with TAMU’s excellence in fossil fuel research (GEPL, OCNG, PETE, Berg-Hughes Center for Petroleum and Sedimentary Systems) have the potential to transform petroleum exploration and lead to industry partnerships and federal funding. Clumped isotopes are also an emerging technique in paleoclimate studies in soil science, geology, and oceanography. The CIMS would be housed at the Stable Isotope Geosciences Facility (SIGF), which performs 1000s of analyses for faculty and students in five Colleges.

To our knowledge, neither of the instruments requested are available in Texas. An informal SIBS-SIGF partnership has been in place since both facilities’ inception, with provision of joint seminars and facilities for shared use. To further cement this relationship, we propose joint seminars focused on the new applications, training through a methods course, and a University-wide symposia expanding the application and funding opportunities of stable isotope science at TAMU. This will produce a powerful cadre of highly competitive graduates directed toward industry and academia.