# UNIVERSITY OF WYOMING
## Energy Science Graduate Stipends and Fellowships
### NOVEMBER 1, 2013

2011 Session Laws, Chapter 88, Section 346(d)(ii)(D)

To the Joint Appropriations Committee; Joint Minerals, Business and Economic Development Committee; and Governor Mead

During its 2011 session, the legislature appropriated $6,247,930 in Abandoned Mine Lands funds to UW's Office of Academic Affairs for energy science graduate stipends and fellowships. The funds are to be expended over multiple years with no more than $1 million expended per year.

For FY 2014, approximately $731,000 in funding is allocated for graduate stipends to support 27.5 graduate students. The program is designed to support students over a two-year period. There are 15.5 students in their second year of the program. This August, 14 new students started the graduate program at UW, but one of them terminated the assistantship due to personal reasons.

UW did experience some barriers in the program this academic year. Although we do have 13 new students joining the program, seven projects were forfeited due to students committing to other programs or institutions. Poor recruiting efforts are believed to be reason for some of this loss. The plan is to examine the shortfalls and enhance graduate recruiting efforts to achieve the objectives of this program.

The legislation also stipulated that, through Grade Point Averages and Graduate Record Examine (GRE) scores, "only highly qualified candidates are to be awarded energy science graduate stipends or fellowship opportunities." UW addressed this provision by examining the GRE scores for the students under consideration. The GRE scores of the fellowship recipients were *extremely high* with an average score of 317, representing students in the top 17$^{th}$ percentile of scores across the nation. The talent level attracted through this program is truly remarkable.

The energy science GA stipends permit UW to pursue important energy research for the state while raising the stature of graduate education by recruiting outstanding graduate students. Comparable to GA stipends provided in the previous years, the new awards for FY2014 support fundamental research in a wide array of energy topics important to Wyoming. Examples include research in unconventional (shale) natural gas, enhanced oil recovery, $CO_2$ sequestration, coal bed methane production, wind turbine reliability, and solar energy. In addition, studies aimed at improving oil and gas field air quality and treating water produced by hydraulic fracturing were also supported.

Table 1 provides a summary of the departments receiving FY14 energy GA awards along with a brief description of the projects. Table 2 lists the ongoing FY13 awards.

**Table 1.** Energy GA Awards made in AY 2013-14.

| College/Dept. | Topic |
|---|---|
| **Agriculture & Natural Resources** | |
| Ecosystem Sci & Mgmt, MS | Anthropogenic and Environmental Factors Influencing Pronghorn Populations in South-Central, Wyoming |
| Plant Sciences, MS | Potential of forage kochia to reclaim disturbed areas and areas of low reclamation potential used by gas industries in Wyoming |
| Plant Sciences, Agronomy, MS | Utilization of Coal Bed Methane (CBM) Water for Irrigation of Biofuel Crops |
| | |
| **Arts & Sciences** | |
| Chemistry, PhD | Tunable organic light-harvesting nanostructures |
| Chemistry, PhD - **Student terminated assistantship, due to personal reasons.** | New Novel Heteroaromatic Materials that Merge Unusual Electronic and Electrochemical Properties |
| Chemistry, PhD | Solar conversion of water to fuels using photoactive metals |
| Geology & Geophysics, PhD - **Student will start the assistantship in spring 2014**. | In conjunction with: Cretaceous Tight Oil Consortium (K-TOC), 2012-14 |
| Physics & Astronomy, MS - **Student receiving assistantship in fall 2013, only**. | Development of a numerical solution employing orthogonal polynomial properties |
| | |
| **Engineering & Applied Science** | |
| Chemical & Petr Engr, PhD | Enhanced Oil Recovery From The Bakken Shale Formation |
| Chemical & Petr Engr, MS (quick-start) | Unlocking the Dispersion Mechanism of Petroleum Asphaltenes |
| Chemical & Petr Engr, PhD | Proton Exchange Membrane Fuel Cell (PEMFC) Catalyst and Assembly Study for Advanced Energy Conversion |
| Chemical & Petr Engr, PhD | A Microfluidic Model for Visualizing Snap-Off During Spontaneous Imbibition |
| Chemical & Petr Engr, PhD | Inertial Microfluidic Flow Focusing for Enhanced Biofuel Production |
| Mechanical Engr, MS | High-Strength Shape-Memory Composites |

**Table 2.** Energy GA awards made in AY2012-13. Students are provided funding for two years.

| College / Department | Topic |
|---|---|
| **Ag & Natural Resources** | |
| **Molecular Biology, PhD** | Production of hydrocarbon fuels using photosynthetic microorganisms. |
| **Arts & Sciences** | |
| **Chemistry, PhD** | A study of nitrogen heterocycles as they relate to nitrogen oxides (NOx), a compound contributing to air pollution and detrimental effects in refining of hydrocarbons. |
| **Chemistry, PhD** | Basic energy research involving nanoscale separation columns. |
| **Geology and Geophysics, MS** | A study of the mineralogy and the processes that contribute to the formation of roll-front uranium deposits in WY Intermountain basins. |
| **Geology and Geophysics, MS - This student received an opportunity for an internship; therefore will be returning to energy assistantship in spring 2014.** | Characterizing the sedimentologic and stratigraphic properties of active unconventional hydrocarbon wells in the Frontier and Niobrara Formations of the SW Powder River Basin. |
| **Geology and Geophysics, MS** | Unconventional (shale) gas reservoirs require fracture to permit gas flow. The research will employ geochemical experiments and computer simulations to determine fundamental shale-water interactions to evaluate whether $CO_2$ can augment or replace water in shale gas development. |
| **Geology & Geophysics, MS** | Engineered solar microbial fuel cell systems--an avenue to solar energy storage. |
| **Geology & Geophysics, PhD** | A geochemical lab study of the reactivity of important reservoir minerals with water-saturated $CO_2$ and related water-mineral reactions. |
| **Business** | |
| **Economics and Finance, PhD** | Energy economics. |
| **Engineering & Applied Science** | |
| **Atmospheric Sciences, MS** | A study of the chemistry and source of volatile organic compounds (VOC's) emitted during oil and gas extraction. VOC's contribute to elevated ozone levels in the atmosphere. |

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| **Chemical and Petroleum Engr, MS** | Development of sulfur resistant composite membranes for hydrogen purification. |
| **Chemical and Petroleum Engr, MS - this student was not accepted into 2nd year of support, due to poor academic performance.** | Synthesis and characterization of bimetallic catalysts to produce liquid fuels (alkalines) from lactose. |
| **Chemical & Petroleum Engr, PhD** | Synthesis and characterization of bimetallic catalysts to produce liquid fuels (alkanes) from pyrolysis products of biomass. |
| **Civil and Architectural Engr, PhD** | Commercialization of biomass enhanced coal bed natural gas process - a patent-pending technology developed at UW. |
| **Mechanical Engr, MS** | Conversion of beetle killed biomass and solar energy to Diesel grade biofuels investigated experimentally. |
| **Mechanical Engr, MS** | Developing modeling tools to predict fatigue life of composite wind turbine blades. Wind turbine reliability is one of the great challenges facing the wind energy industry. |
| **Mechanical Engineering, MS** | Synthesis and characterization of smart membrane materials for use in treating produced waters hydraulic fracturing. |