



# SAMUEL GLASSTONE REPORT 2015-2016

American Nuclear Society – Brigham Young University

## ABSTRACT

The ANS BYU student section formation, membership statistics, and activity summaries for the 2015-16 school year

Paul Wilding



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### INTRODUCTION

Almost two years ago, Dr. Matthew Memmott, who received a PhD in Nuclear Engineering from MIT, left Westinghouse to become a professor of Chemical Engineering at Brigham Young University (BYU). There had not been any nuclear research performed at BYU since the 1970's. With his arrival came a remarkable influx of student involvement in nuclear research and enrollment in the elective course, "Introduction to Nuclear Engineering." There may not currently be a nuclear engineering major at BYU, but Dr. Memmott hopes to develop it soon as an emphasis or a minor.

During the summer of 2015, we began our own student section of ANS, appointed leaders, and started recruiting members. We organized and went on two tours, and by the end of the summer, we had reached a size of 35 members! Our section continued to grow as we made our presence known on campus and educated our fellow students on the advantages of nuclear science/energy. We received our official student section charter in October 2015.

### MEMBERSHIP STATISTICS

By the end of the 2015-16 academic year, these were our membership statistics:

Total ANS BYU Student Section Membership	79
Total National ANS Membership	22
Students Enrolled in "Intro. to Nuclear Engineering"	40
Graduates Going into Nuclear Industry	1
Graduates Doing Graduate School in Nuclear Engineering	6

### ACTIVITY SUMMARIES

*Tour of Energy Solutions in Clive, UT* – On July 14, twenty-five student members went to tour the largest privately-owned nuclear waste facility in the United States. We went 75 miles west of Salt Lake City, UT where Energy Solutions maintains their 40-year-old disposal facility for class A waste. The site was chosen during the 1970's because of its proximity to existing railroad tracks for transporting radioactive waste, its vast stores of clay and rocks that can be used in building the disposal mounds, and its groundwater that only flows a few inches per year and cannot spread pollutants anywhere downstream if an accident were to occur. Our tour guide stressed the importance of being involved in the community and helping to inform the general public of the safe practices that those in the nuclear industry enjoy.

*Tour of White Mesa Mill in Blanding, UT* – On August 6, twelve members travelled to the White Mesa Mill, the only uranium mill in the United States. Twenty different mines in the region collect uranium ore, which is processed on-site and turned into uranium oxide ( $U_3O_8$ ), which is the first step in the front-end process for enriching uranium. We got to see the uranium ore, tanks containing residue of yellow cake, grinding machinery, organic solvent tanks, and more. It



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was exciting to see the whole process! Additionally, we learned that they recover vanadium oxide ( $V_2O_5$ ) as a secondary product, which is used in alloys in the aerospace industry.

*Club Opening Social* – During the first week of the Fall semester, we held our first opening social. Throwing aside the boring standard fare of hot dogs and other American food, we made an oriental splash with Panang Thai curry and Hmong egg rolls! Approximately 100 people showed up to enjoy food and socializing and to learn more about ANS and nuclear energy. The most exciting part of the social was our first ever “Meltdown” Competition, in which contestants had to eat a whole bowl of curry with increasing amounts of spicy Sriracha sauce. By the end, contestants were eating almost pure Sriracha sauce!

*Westinghouse Info Session* – Westinghouse, an industry leader in nuclear design, came to recruit engineers at the BYU STEM career fair. They highlighted their unique work in the new nuclear power plants being built both in the United States and in China, and also spoke about their extensive nuclear design experience that started with the pioneering work of George Westinghouse. It was a great networking experience that earned summer internship opportunities for several of our members.

*STEM Career Fair Volunteering* – Approximately 10% of our ANS membership volunteered at BYU’s STEM career fair both Fall and Winter semesters. We engaged in a variety of tasks including support to recruiters, recruiter check-in, student check-in, and logistical management of the event. Overall, our members contributed about 35 man-hours to the STEM career fairs for the school year.

*Finis Southworth (CTO of AREVA) Lecture* – On September 17, Dr. Finis Southworth, the former Chief Technology Officer of AREVA, visited BYU and spoke to an audience of about 100 students. He spoke about the struggles and future of nuclear power in the world, specifically regarding AREVA’s High Temperature Reactor design. A few students were also able to accompany Dr. Southworth to a meeting with the Utah Governor’s Energy Development Office to discuss the importance of nuclear technology and potential opportunities for nuclear energy technology to come to Utah.

*Tour of Western Zirconium (Westinghouse) in Ogden, UT* – On October 22, seventeen student members and Dr. Memmott visited the Western Zirconium plant in Ogden, UT owned by Westinghouse. We spent about 4 hours touring the site and learning about the different processes in manufacturing nuclear fuel cladding and components. We witnessed the batch processes of cold and hot work used to refine the zircaloy to precise measurements. We learned that this is critical in the nuclear industry because each piece used in nuclear power plants needs to be durable and suitable to neutron propagation. We had the opportunity to interface with many process engineers who encouraged us to consider the nuclear industry.



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*Gene Grecheck (Pres. of ANS) Visit* – On October 27, National ANS President Gene Grecheck visited BYU to present us with our official student section charter. He gave a presentation about the future of the nuclear industry and the unique role that ANS plays within it. Before the presentation of our charter and dinner, he encouraged all of us to become lifetime national ANS members.

*BSA Pow Wow (Nuclear Science)* – Our members taught the Nuclear Science merit badge to young boy scouts at the BYU BSA Pow Wow both Fall and Winter semesters. In an area where this merit badge had not previously been taught, we thought it important to help the younger generation develop a familiarity with nuclear science and engineering. At both Pow Wow events, we taught 360 boy scouts the basics of nuclear science, helped them tour a linear particle accelerator on BYU campus, and emphasized to them the importance that nuclear science/energy plays in the world today. Approximately 90% of all the boy scouts enrolled completed all the requirements to receive the Nuclear Science merit badge.

*STEM Club Rush* – In October, the Ira A. Fulton School of Engineering and Technology at BYU held a club rush event where all of the science, technology, engineering, and math clubs set up a booth and talked to students about their field. Our ANS section participated by setting up a booth and explaining to other students the importance of the nuclear sciences today. The club rush was also an opportunity to educate the students who visited our booth, so we demonstrated the use of a Geiger counter and explained different sources of radiation we encounter on a normal basis.

*Student Internship Panel* – In November, we wanted to educate our undergraduate members about the internship opportunities that exist in the nuclear industry and help them to take advantage of those opportunities. For our monthly ANS membership meeting, we set up a panel of students who recently completed internships with nuclear companies. Four students were on the panel and talked about their diverse experiences in neutronics, waste disposal processes, manufacturing, and design. Our members were engaged and the Q&A was a large success.

*ANS Winter 2015 Meeting* – In November, we were able to send five undergraduate students and one graduate student to the ANS Winter Meeting in Washington D.C., where they each participated in the special student sessions the Saturday before. During the student sessions, they felt the call within the nuclear industry to stand up for nuclear energy, especially during COP21 that was taking place in Paris. During the rest of the conference, our undergraduates presented three different posters, and our PhD student gave a technical presentation on his work for the I<sup>2</sup>S-LWR project being funded by the NEUP-DOE. All in all, it was a great opportunity to network with fellow nuclear professionals and talk with students from different schools. They returned with a greater commitment to engage political leaders in encouraging



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the adoption and growth of nuclear technology and to participate in the national student organization of the American Nuclear Society.

*Robert Penn Seminar* – In December, Robert Penn, a former engineer at AREVA and currently a contracted employee at the Diablo Canyon Power Plant, visited BYU to give a presentation on nuclear engineering. The fifty members present asked him questions about the nuclear industry ranging from regulatory challenges to his personal experiences as a nuclear engineer. At the end of his seminar, he and his wife, Lori Penn, presented twenty fully-funded national ANS memberships to active members of our student section. We are grateful to them for their generous gift as well as for our friendship with such an experienced veteran in the nuclear industry.

*INL / Univ. of Idaho Education Seminar* – Our December monthly ANS membership meeting involved the visit of Dr. Rich Christensen from the University of Idaho (in Idaho Falls) and Dr. Marc Skinner from the Idaho National Laboratory. Over fifty-five students came to hear about the amazing opportunities to work at INL either for an internship or full-time while obtaining a graduate degree in Nuclear Engineering from the University of Idaho. We took the opportunity to open the doors for research collaboration between professors at Idaho and Dr. Memmott's lab here at BYU.

*Chuck Goodnight Lecture* – On January 8, Chuck Goodnight of Goodnight Consulting, Inc. gave a presentation titled "An Overview of the International Nuclear Power Industry." Chuck Goodnight has worked with the nuclear industry in thirty-four different countries along with many of the main players in the nuclear energy sector. His company also developed the New Nuclear International Conference. His presentation focused on the variety of opportunities available and the importance of safety culture in nuclear engineering. Afterwards, he answered many questions and met with several students one-on-one to discuss career opportunities in nuclear.

*Jeopardy Recruiting Activity* – As a student section, we wanted to increase our membership as well as educate as many students as possible on the basics of nuclear energy. To accomplish this, we held a nuclear Jeopardy activity, inviting undergraduates of several different majors to come and participate, learn basic nuclear facts, and eat pizza! The students enjoyed the experience, and a number of them joined our section afterward.

*Middle School Science Fair Judging* – On January 22, we had the opportunity to volunteer as judges at the Provo Centennial Middle School science fair. This was a great way for us to give back to the community and support science education. The students and volunteers had a fantastic experience learning about the different projects. This activity has also helped us to make connections and plan for future activities with local schools to promote nuclear science education.



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*Tour of Idaho National Laboratory* – On February 23, our section drove up to the Idaho National Laboratory in Idaho Falls, ID with twenty-one students and three faculty ANS members. We toured the Materials and Fuels Complex, the Hot Fuel Examination Facility, and the Advanced Test Reactor. At the ATR, we learned about the unique experiments conducted there, observed the Cherenkov Effect from the Cobalt-90 that was resting in the canal, and learned about the importance of nuclear reactors in providing medical isotopes to hospitals around the world. Afterward, the University of Idaho had us tour their Center for Advanced Energy Studies. The trip was very enlightening and broadened our professional network.

*Engineering and Technology Week (BYU)* – On February 26, BYU hosted an event to encourage thousands of middle school children in the area to consider the sciences for their higher education. Our ANS section set up a booth, and our members enjoyed explaining different nuclear concepts and the importance and benefits of nuclear energy. We explained the energy density of nuclear fuels compared to fossil fuels, used Geiger counters to show them the naturally-occurring radiation all around them, showed the effects of ionizing radiation using home-made electroscopes, helped them build edible atomic models, and set up an interactive demonstration to explain the Rutherford experiment. Of the thousands of young students at the event, our ANS booth most certainly served several hundreds of them!

*Discover STEM (BYU)* – The Discover STEM activity was organized by the mathematics education department at BYU. A Saturday morning in February, hundreds of middle school children and their parents attended to experience a large range of STEM-related hands-on booths. Seven ANS members attended to man a booth, where they provided all of the interactive experiences mentioned above in our previous booth.

*Utah Nuclear Engineering Student Delegation (UNESD)* – On February 29 and March 1, a handful of our ANS members went to the Utah state capitol, in the companionship of several students from Utah State University and the University of Utah. In groups of 2-3, we met personally with a few dozen state senators and representatives and talked with them about their knowledge, aspirations, and/or concerns about the future of nuclear energy/research in Utah. Although there was no current nuclear-related legislation up for a vote, we made sure they were aware of the current and future nuclear-related projects within Utah that would benefit the State as a whole. Furthermore, our presence was a clear indicator that we, the rising generation, are seeking careers in the nuclear industry, and we want our representative government to reflect our goals. We were surprised to see how many of the legislators were already in favor of nuclear energy and wanted to see it expand within the state.

*1<sup>st</sup> Annual BYU Nuclear Symposium* – On March 25, ANS BYU assisted the BYU Kennedy Center for European Studies in the planning and execution of a day-long symposium in commemoration of the 30<sup>th</sup> anniversary of the Chernobyl accident. The symposium was titled “Nuclear Energy and Proliferation in the 21<sup>st</sup> Century” and was composed of various speakers



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and panels, including insights into the science, culture, and politics of nuclear energy and the Chernobyl accident presented by professors of Chemical Engineering, Russian, Scandinavian Studies, Political Science, Law, and Nuclear Engineering at BYU and the University of Utah. Students were encouraged to participate in a poster competition in the categories of nuclear non-proliferation and nuclear science. Notable speakers included Judd Gregg, former governor and senator of New Hampshire and current co-chair of Nuclear Matters, Adam Scheinman, the Special Representative of President Barack Obama for Nuclear Non-proliferation, and Richard Rhodes, the Pulitzer Prize-winning historian and playwright. Rhodes' play *Reykjavik*, depicting the discussions held between Ronald Reagan and Mikhail Gorbachev at the Reykjavik Summit, was performed by two BYU students. The symposium was well-attended and its content received well by those in attendance, including BYU students and faculty, members of the Utah Governor's office, and representatives from the NEI. We plan to work with the Political Science department in making the BYU Nuclear Symposium an annual event!

*ANS 2016 Student Conference* – On May 31, we sent one of our mechanical engineering students to the ANS 2016 Student Conference to present a pitch for his irradiator and participate in the Student Innovation Competition. His irradiator idea is designed for irradiating food and water, sterilizing medical equipment, etc. He enjoyed networking with other students and technology professionals while in attendance.

*Blue Castle Holdings CEO, Aaron Tilton, Seminar* – In April, we invited Aaron Tilton, the CEO and co-founder of Blue Castle Holdings, to come speak to our student section. He spoke to us on the current economic and logistical state of the Blue Castle Project, which is focused on enabling the construction and operation of a two-unit nuclear power plant near Green River, Utah.