ChE department

# BRIGHAM YOUNG

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BRIGHAM YOUNG ACADEMY was founded in 1875 in Provo, Utah, a small Mormon community. At that time, it was a small academy—one of many founded by the Mormons in the newly settled areas of the Great Basin. Its purpose was to give the students from the small farm communities in the area an equivalent of today's high school education. Over the past one hundred years, this small, local academy has grown to be the largest church-affiliated university in the nation, with an enrollment of about twenty-five thousand, and with students from every state in the United States and from about fifty foreign countries.

The growth has come in quality of education and diversity of programs as well as in size. It has grown from an academy to a teachers college to a liberal arts college to a liberal arts university, to a full-scale university. About twenty-five years ago, engineering was added to the curriculum with chemical engineering being one of these engineering programs. This program has grown from a small division under the Chemistry Department twenty-five years ago, to a vital high-quality department today.

## DEPARTMENTAL HISTORY

CHEMICAL ENGINEERING Science was first announced in the school catalog in the fall of 1952 as a part of the Chemistry Department. Professor Joseph K. Nicholes was the Chairman of the Department of Chemistry and Chemical Engineering. That fall, the first ChE students enrolled at Brigham Young University. The first courses in ChE were taught to these students in their third year by Dr. Angus Blackham of the Chemistry Department and other chemistry professors in 1954. In 1955, Dr. Billings Brown joined the faculty. He was the first ChE professor to join the Brigham Young University faculty. He was joined in 1956 by Dr. Wendell Wiser, who was also a chemical engineer. The Bachelor of Engineering Science degree was first awarded to six students in 1956. This degree required five years to complete as it included more mathematics and science courses than the typical engineering degree. Dr. Brown served as coordinator for the ChE program from 1955 to 1958 under the

Chemistry Department and then as department chairman of the Chemical Engineering Department when it was formed as an independent department from 1958 until 1960, when Dr. James J. Christensen, who joined the faculty in 1957, became the department chairman. Since that time, three men have served as department chairmen: Dr. Dee H. Barker, Dr. Bill J. Pope, and Dr. L. Douglas Smoot. The department has improved and grown under each chairman. Today, there are twelve faculty members in the department.

The number of students enrolled and graduates has increased with thirty-four students receiving their bachelor's degree this year. In 1970, the undergraduate degree was changed from a five year Bachelor of Engineering Science (BES) degree to a four-year Bachelor of Science (BS) degree.

## UNDERGRADUATE PROGRAM

THE UNDERGRADUATE program includes core courses in the areas of unit operations, chemical kinetics, thermodynamics and plant design, and options that may be chosen by the students. These options are the plant design and operation option, management option, research and development option, energy and environmental option, applied mathematics and statistics option, nuclear option, bioengineering and premedicine option, and industrial option. Each of these options include some required classes and a list of classes from which the student may choose, or, the student may choose other classes subject to faculty approval to fill his own option. This gives the student a wide choice, but also insures that he gets a quality education.

During the freshman year, all the students are required to take a class in the use of computers and calculators. The department has two desk model programmable calculators as well as access to the university's three computers. The students can then use these tools throughout the rest of their education.

Since, in the past, many students had no feel for engineering until their sophomore year, another freshman class was added. This class is in process synthesis and gives the students an idea of what engineering is about in their freshman year. During all four years, the student is required to take a seminar course each semester. Here, the students are exposed to many of the facets of ChE from visiting experts, faculty, and other

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students. It also gives the student an opportunity to give an oral presentation to the other students.

The department is particularly proud of the unit operations laboratory. During the students' senior year, they are required to take four semester hours of lab. The laboratory contains many experiments in transport, separations, thermodynamics and kinetics. Many of the experiments are carried out in glass equipment, so the student can see what is going on. The laboratory is used to help students gain skills in expressing themselves orally and in writing as well as giving them experience with pieces of equipment. The students write a formal report, a short report, a letter report and give an oral report on their laboratory work each semester. The number and quality of the experiments is increasing each year as fast as finances allow. Many of the students,

**Ralph Coates with early model coal gasifyer.**

both before graduation and after working several years, express the feeling that the senior lab was one of their most valuable educational experiences.

The undergraduate program has changed and improved over the years, and hopefully, will continue to do so in order to improve the quality of education and to meet the changing needs of the students and industry. As the program has improved, so has the quality of students. Since this quality of students has improved over the years, it is hoped this trend will continue. The graduates have done remarkably well in graduate schools and in industry.

## GRADUATE PROGRAM

IN THE EARLY YEARS, no graduate degree was offered and the amount of research done was small. However, one of the requirements for a BES degree was to write an undergraduate thesis and a modest level of research was sustained at that time. A Master of Science degree program was initiated in 1962 and a Ph.D. program was started in 1968. Since that time, fifty-eight Masters degrees and four Ph.D. degrees have been conferred. The number of Ph.D. degrees has been small in the past, but at present, there are fourteen Ph.D. candidates and one post-doctoral student studying and conducting research in the department. Hence, the number of doctoral degrees conferred by the department should increase substantially in the future.

At the master's level, a student may choose to work toward a Master of Engineering (non-thesis) or a Master of Science degree. This allows the student some choice in the type of education he wishes to pursue at the master's level. The department has also offered a master's program for students with an undergraduate degree in chemistry. This was originally a two-year program. However, a year ago, a new program was initiated to accelerate the program. A special course is now being taught during the summer for those with a background in chemistry. It is a six-hour course covering fluid mechanics, heat transfer and separations together with the unit operations laboratory. This enables these students to complete a master's program in fifteen months instead of the two years previously required. Although only one year-old, the program has proven to be successful in terms of attracting graduate students and in educating the students.

As the graduate program has grown, so has the amount of research conducted in the department. Several years ago, the department faculty members decided that a greater effort should be made to increase the research productivity of the department. This effort has paid off well. The amount of funded research is approaching one million dollars per year. About forty percent of this amount has come from private industry with the remainder coming from government agencies. This funded research has allowed the department to hire twelve faculty members which is considerably more than the university would be willing to support for 100% of their time. This gives a wider spectrum of expertise within the department than would be possible with a smaller faculty.

## FACULTY AND RESEARCH

THE DEPARTMENT has always had a strong thermodynamic research program. Dr. James J. Christensen has been a real pioneer in the field of solution calorimetry. He has developed and refined a titration calorimeter and a heat of mixing calorimeter. Due largely to his and his colleagues' efforts, the Institute of Thermochemical Studies was founded at the university. Dr. Christensen and Richard W. Hanks are presently investigating the relationship between the heat of mixing and vapor liquid equilibria.

Dr. Grant Wilson has a worldwide reputation for his expertise in collecting and correlating thermodynamic data. His laboratory know-how and knowledge of thermodynamics has led companies to request him to do work for them

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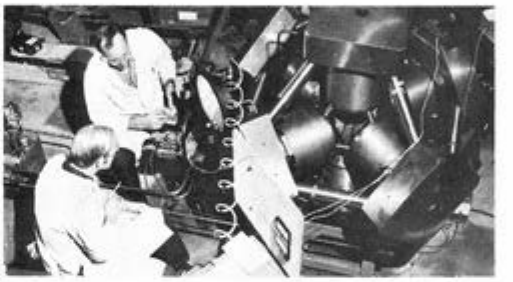
Above: two students with batch distillation column. Right: Duane Horton and student by high pressure press. Below: (l to r) student, Duane Horton and Douglas Smoot with combustion apparatus.



in collecting and understanding thermodynamic data that are needed in industry. His areas of special expertise are vapor liquid equilibria, equations of state and the use of the computer to predict the behavior of real fluids.

A large part of the research effort is directed toward the utilization of coal. Dr. Ralph Coates has developed an entrained flow coal gasification system that promises to have many advantages over the present generation of gasifyers. It has a very high throughput per unit volume and has a very simple ash removal system. His work has attracted considerable interest and he is taking a leave of absence to become the research director of Mountain States Fuel.

Dr. L. Douglas Smoot together with Drs. M. Duane Horton and Richard W. Hanks, is one of the leaders in the combustion field. They have been modeling the combustion of methane and coal. Their research includes collecting data in atmospheric and high pressure combustors and the modeling of the complex processes that occur. This work has direct application on coal combustion and gasification and in better understanding coal mine fires.

Dr. Calvin H. Bartholomew has been utilizing his knowledge in the area of catalysis to study the methanation of gas produced from coal. He has been studying the effects of altering compositions of the catalysts on such things as sulfur poisoning, selectivity and reactivity of the catalyst.

Drs. Bill J. Pope and Duane Horton have conducted research in the area of high pressure technology. They have worked with Dr. Tracy Hall, who holds a joint appointment in chemistry and chemical engineering. Dr. Hall is well-known as the first man to make synthetic diamonds.

The other areas of research include fluid mechanics directed by Dr. Richard Hanks; mineral recovery from the Great Salt Lake and oil and tar sand exploitation directed by Joseph Glassett; trace metal analysis in humans directed by Dr. Dee H. Barker and biomedical engineering studies by Dr. Kenneth Solen.

The departmental research efforts are a vital part of the program and are an aid in the education of the student. Many of the undergraduate students as well as all the graduate students, are involved in this large effort. This helps the undergraduates see what research is and since much of it is related to industrial work, it helps them see some of the needs of industry. It also helps support them financially. □