ChE department

WEST VIRGINIA

... and its "Pride Program"

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IN THE COAL-RICH mountains of West Virginia, the '70's will undoubtedly be remembered as the decade of the energy crisis. The state's abundant supply of coal brought it new prominence as an energy supplier; but with that prominence came questions. How could the coal be mined cheaply without destroying the rugged beauty of the state? How could its high sulfur content be treated so that it could be burned without polluting the air?

The young men and women who are today's chemical engineering students are eager to take a hand in answering these and other questions; yet when the time comes, that step out of the classroom into a job is a big one. Recognizing the uncertainty students are likely to experience making that transition, West Virginia University's Department of Chemical Engineering has developed a program aimed at enabling students to apply ChE concepts to complex real world problems.

Called PRIDE, the program combines individualized instruction, increased emphasis on design courses, and programmed instruction to provide **P**rofessional **R**easoning **I**ntegrated with **De**sign **E**xperience.

The PRIDE concept was developed at WVU over a number of years. Dr. H. P. Simons, former department chairman, took the first step in the early '60's when he introduced the Senior Block, a 10 credit course taken both semesters of the senior year. The content of traditional fourth year studies were incorporated into the block's year-long comprehensive design project.

Later, a unique course called "Guided Design" was introduced for all freshmen engineering students. Planned, controlled projects are emphasized in this course aimed at developing the student's ability in analysis, synthesis and evalution.

The PRIDE program has four basic objectives:

- **To present a coordinated, professional ChE curriculum oriented more toward the education of practicing engineers than research engineers.**
- **To involve the student in the team-effort approach to solving engineering problems.**
- **To take advantage of faculty specialties in each area by the use of team-teaching.**
- **To utilize programmed instruction and other innovative educational techniques to achieve maximum efficiency in the teaching of content subject matter.**

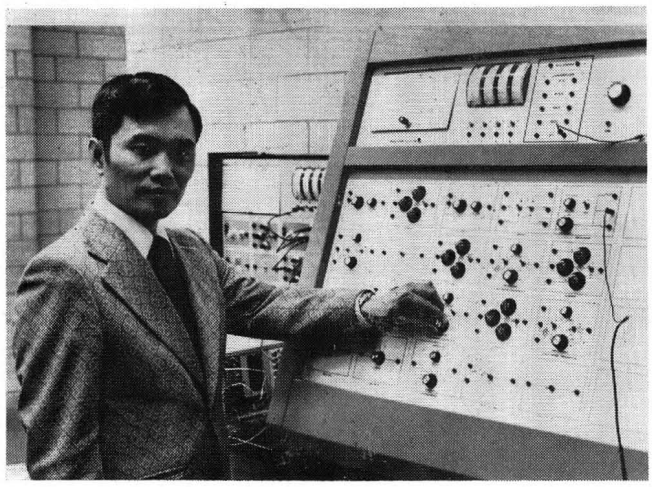
Recognizing the importance of design proficency for the professional engineer, WVU's ChE faculty resolved to introduce this complex activity early and to give students frequent opportunity to practice it.

In 1972 a grant was awarded by the Exxon Education Foundation to fund the development of this program in the sophomore and junior years. Now, over three years later, most of the "bugs" seem to have been worked out and the program is operating smoothly.

Al Pappano directs the sophomore segment of PRIDE, a two semester (two/credit/semester) course. The Junior Block, supervised by Duane Nichols and Dick Bailie, consists of two three-credit courses taught back-to-back each semester, allowing several uninterrupted hours of class time.

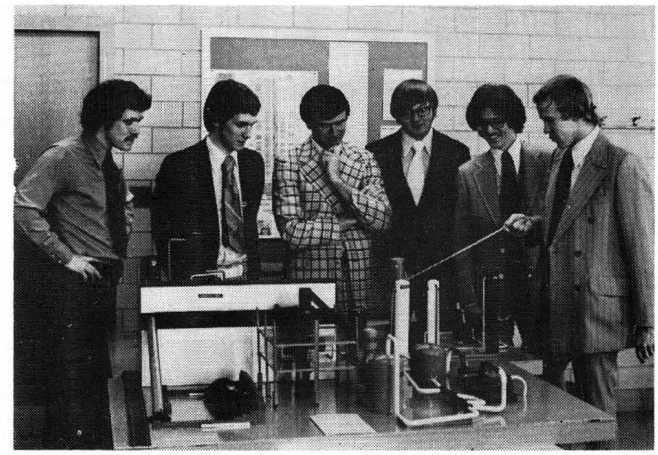
Faculty members guide the students to complete the projects themselves. In these classes, the student plays the role of a professional engineer on a four-man team trying to solve a design project problem.

Each design problem presented is carefully chosen to require knowledge of the concepts which make up the course content. Students learn subject material based on a "need to know" in order to complete the design project.



Dr. C. Y. Wen, Department Chairman, heads research activities in coal/energy research.

The role of the instructor changes as the students progress through the program. Moving away from the traditional role of transmitter of knowledge, the instructor becomes a consultant who guides the student's decision-making activities.



Senior Block group leaders look over plant model.

SENIOR DESIGN PROJECT

THE SENIOR BLOCK, DIRECTED by Fred Galli and John Sears, is the culmination of this practice in decision-making and design work. Planned to simulate as nearly as possible the working environment of the practicing engineer, the focus of the senior curriculum is a comprehensive design project. Students meet every week in uninterrupted class periods to work on this project.

Each fall the student chief engineer, who is recommended for the job by the previous year's graduating class, receives from the faculty a brief description of the project to be undertaken. For example, the recently graduated chief engineer, David Daugherty, guided his class in an exploration of the use of alcohol as a gasoline extender, a topic particularly relevent in these days of high fuel prices.

The project description specified the volume of alcohol to be produced each day and identified the particular processes to be used to produce ethanol or methanol from wood or coal. The class divided into five groups to investigate these processes and to study the economics of each one. As their planning became more exact, the group considered environmental and safety concerns. They found that some processes presented special problems. For instance, all of the wood in Pennsylvania was needed as a raw material for one of the processes.

When the class reached agreement on the most feasible process, a detailed design and economic analysis was conducted to determine what effects factors such as fluctuation in material costs or changes in the nation's financial outlook would have on the cost of production. Construction of a plant model was the last step in completing the project.

WVU ChE department is perhaps the only place on campus where students are enthusiastic about examinations, recognizing the learning opportunity they present.

At the final presentation, each group leader summarized the group's contribution to the project and answered questions posed by faculty and students. This occasion gives students a chance to demonstrate their creativity and it becomes apparent that the program isn't called PRIDE by accident.

Students also have a chance to display their expertise during another feature of the Senior Block, the major examination. When a "major" is scheduled, all senior ChE classes are cancelled and students work individually for one or two weeks on a process analysis project proposed by the faculty. The project is designed to develop student maturity—and judgment counts as heavily as the student's performance on the "major." Creativity and judgment count as heavily as design proficiency. Students present a written report of their work and defend it orally before a faculty panel. The oral presentation is particularly valuable because students get experience in presenting and defending their ideas before a technically trained group. The WVU ChE department is perhaps the only place on campus where students are enthusiastic about examinations, recognizing the learning opportunity they present.

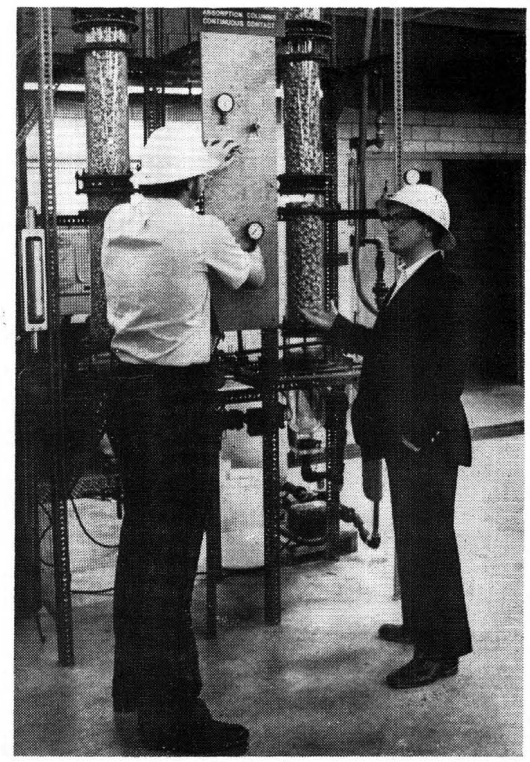
COMMUNICATIONS SKILLS

IN ADDITION TO DESIGN experience, good communications skills will be important to these students in their engineering careers. With this need in mind, the grant from the Exxon Education Foundation helped to develop another program called "Communications Integrated Into Engineering Curriculum". Marian Jones, a journalist with a background in ChE, conducts the program to help each student develop oral and written communications skills.

Beginning in the sophomore year, Mrs. Jones schedules individual conferences with the students as they are needed, and gives each one advice for improving writing and speaking abilities. A video tape system is available to allow students to evaluate themselves in oral presentations. Students gain experience in writing laboratory reports, progress reports, memos, and the major design examinations. In addition, they are given advice in preparing resumes and job applications.

West Virginia's PRIDE program has not gone unnoticed. Representatives from industry conducting job interviews on campus have commented on the poise and self-confidence the students exhibit.

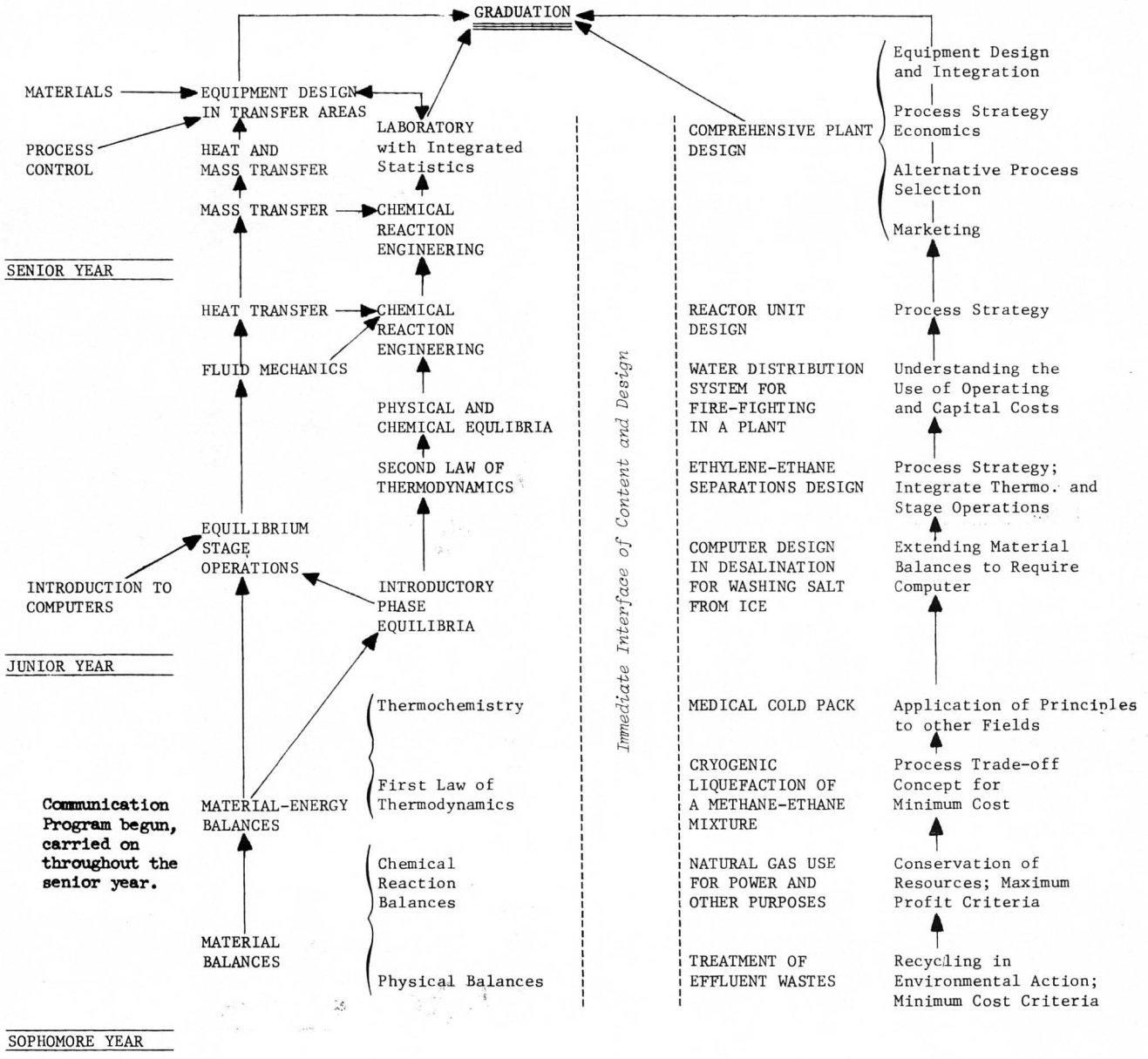
Although research is not emphasized in the undergraduate curriculum, that is not to say it has no place at WVU. When Dr. C. Y. Wen became department chairman in 1969, he brought to the job an expertise in coal/energy research. Under his direction, the department has become internationally known for its work in energy and environmental problems.



John Sears, faculty member, discusses performance characteristics of an adsorption column.

Continuing research programs in the area of coal conversion technology have gone on for several decades. Currently, one of these projects will assess the potential of coal-based energy complexes which produce either liquids, gases, power, or combinations from coal. Research is presently being conducted on processes for reducing air and water pollution. These projects range from small scale laboratory studies determining the feasibility of electrophoretic dewatering of chemically stabilized emulsions to the design, construction, and operation of a 60,000 gallon/day reverse

Integrated Content-Design Flowsheet for West Virginia University



Simple laboratory experiments are introduced throughout the curriculum when appropriate. Content and design particulars may vary from year to year. An advantage of the use of the flowsheet is that if more, or less, time is required for student comprehension of a concept of design, the curriculum flow can be shifted. For example, Reactor Design may have a greater emphasis in the junior year for one class, for the next class it may have more emphasis in the senior year.

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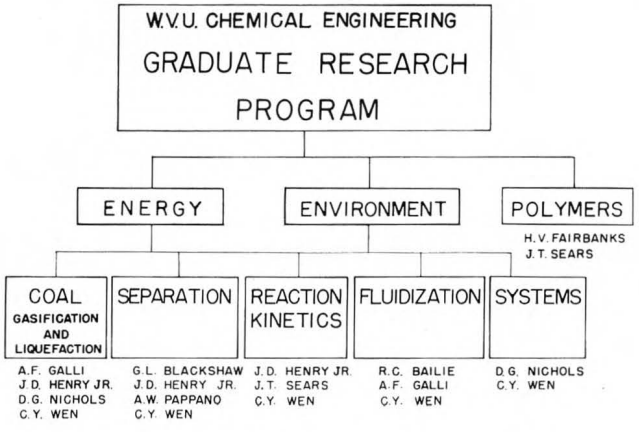
osmosis pilot plant to study the possibility of producing potable water from acid mine drainage.

Extensive research is underway on novel separation processes. Joe Henry's research on dual functional separations combines the interactions of surface, electrokinetic, and diffusion phenomena to develop novel separation techniques. The relevance of these research projects is reflected by the solicitation of Henry and Wen to teach courses on New Separations and Heat Transfer in Fluidized Beds for the AIChE Today Series.

Graduate students are encouraged to take an active role in the department's research activities. Besides the M.S. Ch. E., for students who have earned a B.S. Degree in ChE, students who hold a baccalaureate degree in ChE, in other fields of engineering, or in the physical sciences may work toward the M.S.E. in a broad interdisciplinary program.

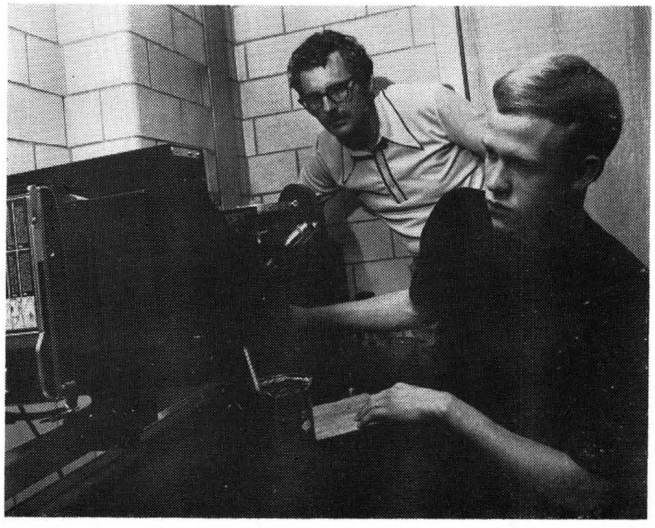
Some of the projects in which these students are involved include fluidization, materials science, separation processes, simulation, and optimization. Interdisciplinary research has also been conducted in biomedical engineering.

For the past fiscal year, $1,200,000 in federal funds have been awarded to the College of Engineering for research in the coal/energy field. The energy research program is diverse, e.g., projects are underway on energy policy, energy farming,



and tertiary oil recovery in addition to coal conversion. Almost half of these grants were administered by the ChE faculty. In addition, grants have been received for research in such diverse areas as dual functional separations, polymer processing and biomedical engineering.

From the state's earliest days, West Virginia's mountaineers have had a reputation for bold thought and decisive action. These characteristics are reflected in the innovative curriculum and farsighted research objectives developed by WVU's Department of Chemical Engineering. Confident of their preparation, students leave the university



Students in the PRIDE program work in laboratories with faculty supervision. Here Dr. Duane Nichols is shown with student.

to pursue their careers. Some go to work in cities and towns in all parts of the country. Others stay here to apply their technical skills to the development and implementation of the potential of West Virginia. □

ACKNOWLEDGEMENT

The faculty expresses its sincere thanks to Susan S. Dotson for writing this article and Marian W. Jones for her editorial work.

ChE letters

Sir:

Since it is the only one of its kind, your readers may be interested in learning of the publication of the book *Comprehending Technical Japanese*, written by E. Daub, R. B. Bird and N. Inoue and published by the University of Wisconsin Press. We hope it will be a useful teaching book and research tool for engineers and scientists.

R. Byron Bird
University of Wisconsin