

Paul Christman . . .

would have graduated from Missouri this spring, and that never-before published story can tell you a lot about the character of Missouri's premier all-American and the affection he felt for his University.

You see, what with the War and marriage and a job, Paul got away from Columbia five hours short of a degree. It obviously didn't keep him from becoming highly successful, but he was never happy about it. So on one of his trips to the campus a year or so ago, he asked whether there was some way he could earn those final five hours. There was, and an independent study program was arranged. Paul was working on the last 2½-hour course this semester.

Paul Christman, of course, was a Missouri legend long before he died on March 2. To thousands of Tiger fans who never saw him play, he symbolized football greatness at Missouri, and there hadn't been much of that before he arrived. To those hundreds of alumni around the country and friends around the campus who knew him well — who knew how freely he had given of his time and energies over the years for Ol' Mizzou — he simply symbolized greatness.

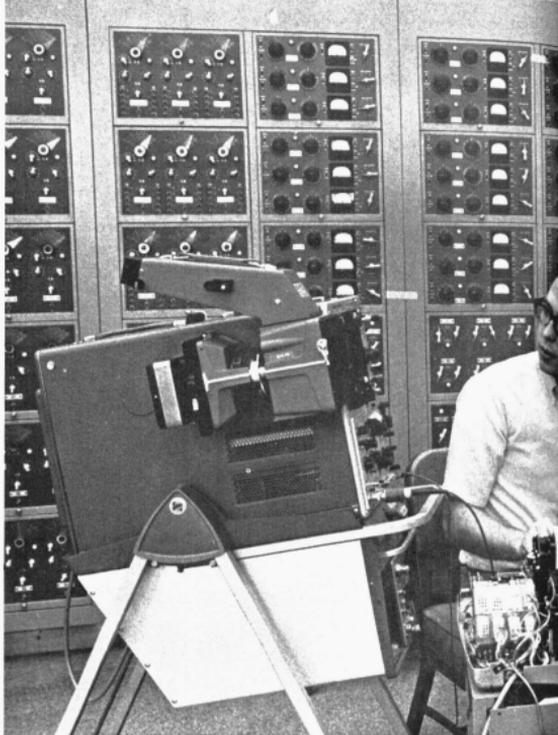
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Graduate students Deene Ogden, seated, and Lewis Walker study fault wave forms with the network analyzer, above. At right, a technician demonstrates a flashover test setup while preparing to run a test utilizing the 1,000,000-volt transformer for students visiting the High Voltage Laboratory of the A. B. Chance Co. Engineering Research Center.



With demands
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Tudor becomes...

Engineering's



Even more than the American mother, electric power in the U. S. household is taken for granted. Performing a remarkable number of chores, it's not surprising that our demand for electric power has doubled every 10 years since the nation's first central power station went into service 90 years ago. And it is expected to keep right on doubling every 10 years in the future.

Last September, the investor-owned power companies of Missouri donated a substantial sum of money to establish and maintain a professorship in electric power systems at the College of Engineering on the Columbia campus. The expanded electric power systems program is under the direction of Dr. James R. Tudor, who was named "Missouri Electric Utilities Professor of Power Systems Engineering."

"One of the objectives of the program," he said, "is to encourage superior engineering students to choose careers in power systems engineering."

It's interesting that, although the business of generating electric power is growing twice as fast as the rest of the economy, the utilities have not been getting the numbers of new electrical engineering graduates they'd like to have.

"Historically," said Professor Tudor, "there's a good reason for this. During the depression years of the early 1930s, the electric power companies took most of the engineering graduates. But as the more glamorous areas like electronics and communications came on strong right after World War II and started siphoning off electrical engineering graduates, the power people became increasingly defensive.

"Instead of accentuating the positive things about electric power engineering, instead of describing the challenges and opportunities held out by its wide-open, infinitely expanding future, they chose instead to rest on their laurels. And because many utilities haven't been too anxious to support long-range basic research, the attendant lack of research money from these industries has seriously hampered engineering faculty efforts to pursue investigations in electric power engineering."

The job now facing both the power companies and the engineering schools is to encourage a resurgence of student interest in the production, distribution, and application of electric power.

The utilities companies in Missouri are among the

Professor of Power

By Phil Lincoln

**On-line
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most forward thinking in the country in terms of their financial support of higher education. And power companies in other states are catching on. For instance, twenty of them in Pennsylvania, New Jersey, and Maryland, recently pooled their educational contributions and invited forty schools in the area to apply for financial support of their electric power programs.

This semester, the department of electrical engineering has 15 undergraduates and 10 graduate students in its power sequence. Two things have held down graduate enrollment: There's just enough money to support this number of students, and the draft no longer exempts graduate students from military service.

"In terms of curriculum evolution," said Professor Tudor, "we're changing course content to bring in computers to detect and solve power system problems. Although there are no electric power plants in the U. S. completely under computer control, a few are even now using computers for starting and operating. Eventually, on-line computers will be capable of anticipating the nature and location of a potential power failure and automatically take appropriate action to prevent it.

"Our network analyzer, which is really a complete operating electric power system in miniature, enables us to simulate the real-life problems that plague the design and operating personnel of the utilities companies," said Professor Tudor.

"Right now, we're in the process of interconnecting the network analyzer with the College's SEL 840 digital computer. With the analyzer under computer control, we'll be able to test some of our laboratory concepts of the control of electric power systems by computers. Our objective here is to determine experimentally how much time is needed to sample the condition of a power system, appraise its state, and then take action with the computer to make whatever adjustments and corrections are necessary.

"Ultimately, we feel that the computer on a real power system will make these analyses and decisions

on faults. The human operator will merely be told what happened, where it happened in the system, and what action the computer took to correct the difficulty. There's some monitoring by computer going on now for determining the state of the system, but not to the completely automatic extent we're proposing.

"We envision the computer taking over the decision-making role of the human operator in our electric power plants of the future. With this kind of system control, we should no longer be plagued by the kinds of massive power blackouts we had in 1965 and 1967."

A current research project in fault analysis and detection is aimed at the elimination of these interruptions in electric power.

"This is one of the things we're looking at in our research programs and it will go into our courses as soon as possible. After development and refinement in the laboratory, we'll introduce it early in the curriculum. Even our juniors are getting some of the words and some of the techniques explained to them."

Columbia campus researchers feel that, through the proper gathering and analyzing of information, power stations should soon be able to confine any current or voltage disturbance to a relatively small geographical area and thus prevent the spread of power failures. In other words, corrective steps will be taken before a failure can occur.

Electrical engineering students in the power sequence are also getting a firsthand introduction to the complexities and potential hazards of working with high voltages. During the second semester, students periodically visit the extra-high voltage laboratory of the A. B. Chance Company, Centralia—one of only ten such extra-high voltage laboratories in the entire country — to observe and take part in nine experiments.

The students are introduced to hot-line maintenance of an elementary nature. Each student goes up in an insulated bucket, takes hold of a live line and carries out his assigned experiment — perhaps changing a fitting. They'll also observe tests on insulators and fuses conducted with voltages and currents not available in most engineering labs.

Mizzou's graduates will be well-prepared. And it is the generous support of the nine investor-owned power companies in Missouri that is helping make this preparation possible. □