

## THE 1985 SUMMER INSTITUTE FOR SCIENCE TEACHERS

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### Introduction

The third Summer Institute for Science Teachers of secondary schools was held at Fermi National Accelerator Laboratory from June 17 to July 12, 1985. This project was made possible by a partnership among the National Science Foundation, private foundations, and local school districts, and was sponsored by the Friends of Fermilab Association.

The Summer Institute is an unusual approach to continuing education for practicing high school science teachers. For four weeks they are brought into contact with scientists working at the very forefront of research. Here, an energetic exchange of ideas, facts, and excitement takes place. This is a two-way exchange; not only does the teacher benefit from exposure to new or perhaps forgotten ideas, but the researcher also benefits by encountering the problems which teachers of high school science are facing and how these problems may be better approached and solved.

### Objectives

The ultimate goal of the Summer Institute is to attract more students to science classrooms by helping teachers update and improve high school instruction and curriculum in biology, chemistry, and physics. The program endeavors to:

1. Target successful and lively teaching techniques for existing materials, including laboratory preparation and techniques, and computer applications.
2. Improve the teaching of problem-solving skills.
3. Enhance teachers' backgrounds in basic subject matter.
4. Expose teachers to current developments in scientific research and basic objectives and problems in modern science.
5. Strengthen the awareness and teaching of contemporary relations among science, technology, and society.

### Curriculum Highlights

The 1985 program included both separate sessions in biology, chemistry, and physics which focused on lectures; and laboratory and computer sessions and plenary sessions in which all participants gathered for lectures and discussions. Participants received three graduate credits in science from Northern Illinois University upon successful completion of the program.

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Speakers from seven institutions presented three-hour plenary sessions devoted to advanced topics in various scientific disciplines and societal problems. Titles included "The Integrated Mind: How the Two Halves of the Brain Talk to Each Other"; "How Trace Chemical Analysis of Meteorites Unveils the Solar System's History"; "The Teaching of Science"; "Everything You Want to Know about Particle Physics"; "The Role of the Arboretum in Society"; "Cholesterol in Health and Disease"; and "Recent Research Advances in the Study of Severe Local Storms."

The parallel sessions included morning lectures and afternoon laboratory sessions. The theme of these sessions was sharing. The goal was to give teachers materials which they could use in their classrooms next year. Some experiments and demonstrations were presented by the Institute staff. However, equally important was the opportunity for each participant to present a classroom activity that he or she developed. The Institute will publish these materials and make them available at cost to interested teachers and schools.

The biology program was coordinated by Lowell Nicolaus (Northern Illinois University) and Georye Zahrobsky (Glenbard West High School). Lecturers from four Illinois universities presented material on current developments in genetics, evolution, ecology, and cell physiology and anatomy. In the afternoon, participants critiqued and improved labs related to the lecture topics and developed new labs. Because teachers indicated little exposure to computers, they learned some basic programming and how to use some readily available software. They were required to use the word processor to prepare lab handouts.

The chemistry program was coordinated by Morley Russell (Northern Illinois University) and William West (Naperville Central High School). The curriculum followed the main topics in a first-year college chemistry course. Participants made half-hour presentations of favorite demonstrations and experiments. They received five computer disks containing software for the chemistry classroom and learned some computer basics.

The physics program was coordinated by Christopher Hill (Fermilab), John Schaffer (Northern Illinois University), James Ruebush (St. Charles High School), and Peter Ogilvie (Wheeling High School). Topics followed the successful Saturday Morning Physics program but at a level appropriate for teachers. Fermilab lecturers included Chris Hill, Drasko Jovanovic, Leon Lederman, Ernie Malamud, and Terry Walker. Lou Voyvodic (Fermilab) supervised a laboratory session. The afternoon sessions offered a variety of experiences so that each participant could develop further his or her own school's laboratory offerings in physics. Experiments, demonstrations, and computer utilization were featured.

### Participants

45 participants (15 biology teachers, 15 chemistry teachers, and 15 physics teachers) were selected for the 1985 Institute.

<u>45 Participants</u>	<u>Years of Teaching: 2-40</u>
Male 23	2 - 5 years: 13 teachers
Female 22	6 - 10 years: 10 teachers
	11 - 15 years: 11 teachers
<u>Age</u>	16 - 20 years: 7 teachers
20's - 5	21 - 25 years: 3 teachers
30's - 22	26 - 30 years: 0 teachers
40's - 13	30 - 40 years: 1 teacher
50's - 5	

In the three years that the program has operated, teachers from 76 schools in Northeastern Illinois have participated.

### Follow-Up

As the number of teachers with a common inservice experience grew, the follow-up program was expanded to include not only the four half-day sessions for the current participants, but also a continuing education program, Physics West, for previous participants and other science teachers in the western suburbs of Chicago. Physics West began in 1985 under the supervision of Allan Etzbach, Jim Ruebush, and Walt Schearer, all laboratory supervisors of the Institute. Monthly meetings in area high schools were scheduled during the school year. After an informal gathering with coffee and donuts, teachers shared successful experiments and demonstrations with one another. The first session was held at Fermilab where Lou Voyvodic gave teachers bubble chamber pictures for film analysis. This program was modeled on the successful Illinois State Physics Project carried on in the Chicago schools by Earl Zwicker (Illinois Institute of Technology). The mailing list includes some 80 secondary and college physics teachers. This fall, Chemistry West will begin with the same format.

### Impact

It is difficult to assess the impact of the Summer Institute on the students we hope to reach. Teachers do report using lecture notes, experiments, demonstrations, and computer programs in their classrooms. They have also shared Institute materials with other teachers, not only those in their own school, but also those in other buildings and districts. We know that a few students were able to work with one of the plenary session speakers on an advanced independent research project. Other students will have a chance to participate in Saturday Morning Physics because



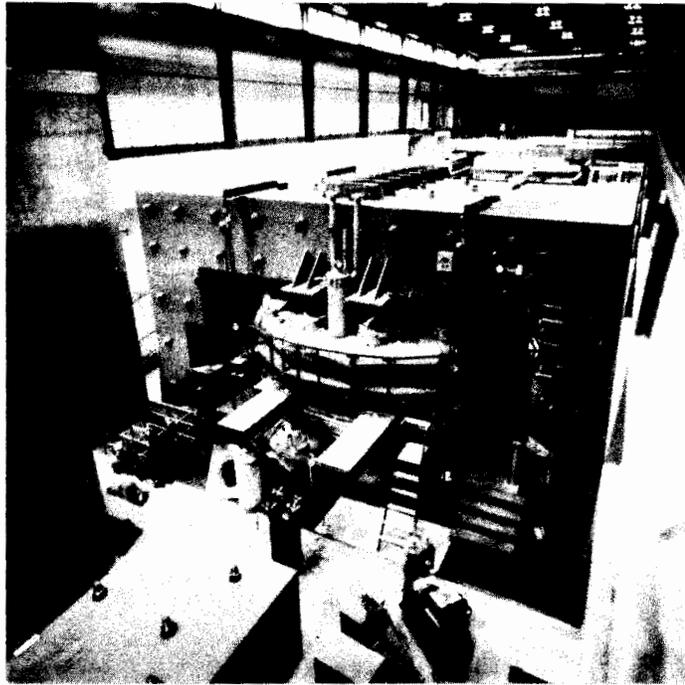
of their teacher's involvement in the Summer Institute. Research suggests that it takes as many as three years for a teacher to change his or her method of teaching. That is why Physics West and Chemistry West play such an important role in the impact the program has.

Perhaps the best evidence of rejuvenated science programs comes from the comments of the participants as they evaluate their summer experience. Those include:

"The 1985 Summer Institute was by far the most worthwhile institute that I have attended. It was professionally and personally stimulating, exciting, and at times overwhelming! The awareness of physics groups and networks gives needed help and encouragement." (Physics teacher)

"I definitely feel that my time and efforts were well directed and that I'll be a better teacher because of the program." (Chemistry teacher)

"You people need to keep this kind of program going. This is the only way to get science teachers out of their mold and help stretch their minds." (Biology teacher)



*The Chicago Cyclotron Magnet, built after World War II for Enrico Fermi's research at the University of Chicago, was converted at Fermilab in 1979 to a superconducting analysis magnet. It is presently being prepared to run for E-665, a Tevatron experiment in muon scattering.*

*(Fermilab photograph 85-325-4)*