

# FERMILAB NEWS

 Fermi National Accelerator Laboratory

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## DOE AUTHORIZES FERMILAB TO BUILD SUPERCONDUCTING ACCELERATOR

The U. S. Department of Energy has authorized the start of construction at Fermilab of its Energy Saver project, estimated to cost \$46.6 million. Of this amount \$12 million will be available in FY 79 (before October 1) and the balance in the next two fiscal years.

The funds were released shortly after Leon Lederman, Fermilab director, F. R. Huson Huson, head of the Accelerator Division and J. R. Orr, head of the Energy Saver-Doubler project, met July 5 in Washington, D. C. with DOE officials for an overall review. It was the final of three meetings at which DOE officials assessed plans and goals for building a new superconducting accelerator at Fermilab.

The Energy Saver project involves the installation of a ring of superconducting magnets below the present Fermilab main accelerator. This would make possible another stage of acceleration of protons, taking them to higher energies than is possible with the present machine. The new energy levels would then be used in experiments to probe ever deeper into the nature of matter, the goal of all high energy physics facilities.

"The Energy Saver project can now go from the research and development phase in which we have been operating for many years into the construction phase," said Huson, "and we have the funds committed to see us through to the end of the project." When the Energy Saver is completed, the level of power usage will result in annual savings for electricity of around \$5 million, Huson said.

The news about the funds' release was announced by Lederman at a hastily-called celebration held at the Magnet Facility where much of the work will be carried on preparing for the new accelerator. Lederman told the several hundred Laboratory employees gathered there, "An accelerator is like a space ship that carries us deep into



*...Leon Lederman addresses Fermilab employees during celebration at Magnet Assembly Facility...*



*...Technicians install superconducting magnets in Main Ring for tests and evaluation...*

(Continued on Page 2)

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...Signing project directive authorizing start of Energy Saver construction project. From left, Rich Orr, Jim Miller (seated) of DOE Batavia area office, Andy Mravca, DOE's Chicago office, Leon Lederman and Russ Huson...

the atom. We have been using our 400 GeV Main Ring accelerator since 1972 and have made some discoveries that have immediate application and some that will not be used for a long time.

"In the course of developing our superconducting magnets," he continued, "we have produced a technology that may be quite useful in furthering the search for other sources of energy, such as fusion, in conservation of energy, and in the construction of energy-carrying lines, to name a few."

Lederman also told the group, "Our new superconducting accelerator will be an improved spaceship that will carry us deeper and deeper, farther and farther into the atom.

"And in this voyage we expect to find some wonderful things," he concluded.

The money had been approved by Congress in October 1978 but was held by DOE pending its review of Fermilab's ability to meet DOE's rigorous criteria for the Energy Saver project.

A great deal of credit must go to the new head of the DOE's Office of Energy Research, Dr. James Leiss who, with veteran program officers William Wallenmeyer and David Berley, successfully guided the proposal through the maze of DOE intricacies. The Fermilab resident DOE official, Mr. James Miller, was also involved in these negotiations. On June 14 and 15 the project under-

went a DOE technical review, the emphasis of that meeting being primarily on the Laboratory's ability to construct superconducting magnets with sufficient quality and reliability to use in an accelerator. This was followed by a meeting June 26 and 27 to review budget and management procedures. The results were positive, Huson reported.

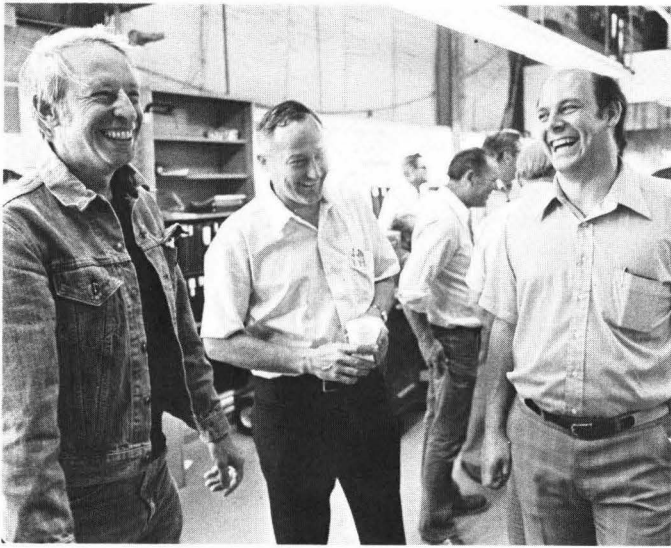
Other reviews of the project in recent months also were "very favorable," said Huson. Dr. Lederman appointed a committee to review the project in September 1978 when he became Fermilab Director Designate. A Scientific Review Committee of the Universities Research Association Board of Trustees also evaluated the Saver/Doubler plans. Then, at their June meeting, Fermilab's Program Advisory Committee studied the project.

Fermilab's strong position also was based on experiments and successful tests of its superconducting magnets. On January 11, with little interference to the Fermilab experimental program, the Switchyard group successfully tested two superconducting magnets in the Switchyard beam line. Then, on February 1--for the first time in the history of experimental high energy physics--scientists at Fermilab successfully guided a beam of high energy protons through a string of 25 superconducting magnets installed in the main accelerator tunnel in the position planned for the new accelerator ring. It was a crucial test that went better than anyone anticipated, yielding important data for future planning of the Energy Saver project.

All along the superconducting magnet section, lead by William Fowler, has been improving the design of superconducting magnets as well as their manufacture. The magnet R & D program, led by Alvin Tolles-trup, has produced a superconducting magnet of sufficient reliability and quality for

#### COMMUNICATIONS CENTER OPEN HOUSE

The new communications center will hold an open house from 2 to 4 p.m. July 19. It is located in the NE corner of the 1st floor of the Central Laboratory. A modern, comfortable facility with an array of sophisticated equipment, the center considerably improves telephone switchboard and dispatching services at Fermilab.



*...Enjoying celebration, from left, Rich Orr, Russ Huson and Bruce Chrisman, assistant business manager...*

accelerator use. Each magnet, before it is approved, must meet strict acceptance and testing criteria.

"With this new ring of superconducting magnets," said Orr, "we will be able to operate routinely at 500 GeV for physics. We plan at some future time to ask for another appropriation to upgrade it to the doubler level. We will build that capability into the Energy Saver. Our ultimate goal, of course, is the doubler (1000 GeV) or 1 TeV."

He added that credit for Fermilab's impressive showing before the DOE must also go to physicist Helen Edwards who led a team which recently completed a detailed report of the latest design of the Energy Saver. The report was invaluable to the final decisions about the project, Orr said. Edwards will serve as deputy head of the Energy Saver project.

The timetable tentatively calls for the construction of 2-1/2 superconducting magnets each week until the early part of October 1979. At that time, construction will double to five a week, then later to ten a week. The immediate goal is to install 16 superconducting dipole magnets in sector A in the Main Ring during the summer shutdown, said Orr. The more projected schedule calls for completing one-fourth of sector A in the winter shutdown and finishing the full sector during the spring shutdown, Orr also said. The Energy Saver is to be finished by the end of 1981.

"When we reach our crescendo, we antici-

pate we'll be able to complete two sectors during one shutdown," he added. "We can expect to see an atmosphere reminiscent of the original installation of the Main Ring."

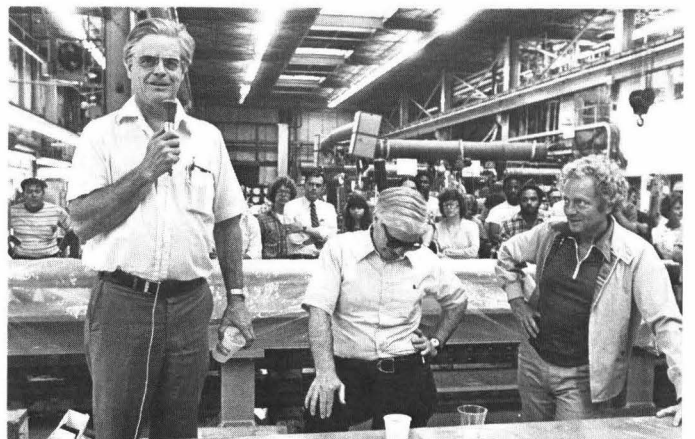
The installation and construction of the liquid helium and liquid nitrogen cooling systems will parallel the construction of the superconducting accelerator, said Orr, as will conversion of power supplies and the construction of new radio frequency cavities.

In the longer term schedule, completion of sector A will be followed by construction in sectors F and E with sector E being the injection point for protons from the existing Main Ring into the superconducting ring. "There are good technical reasons for following this sequence," said Orr.

Fermilab will enlarge the staff of its Accelerator Division and the Magnet Facility by around 150 people, said Huson.

Orr said the Energy Saver project will rely heavily on the Laboratory's most experienced people, utilizing much of the manpower of the present Accelerator Division support groups. The management complexities of building a superconducting accelerator and at the same time running an active physics program are enormous, he said. "These problems bother me far more than the high technology of the project."

"Most people will have two responsibilities in this dual operation that we will be in for the next few years," said Huson. "And we must also make provision for the escalating amount of reporting required by the Department of Energy."



*...Fermilab director emeritus Robert R. Wilson addresses gathering at celebration. Listening are William Fowler (center), head of Superconducting Magnet Section, and Leon Lederman...*

TWO FERMILAB EMPLOYEES RETIRE

A. Russell Jones and Willis G. French retired June 29.

For five years Jones was with DUSAF and the last five years with Fermilab.

He was an electrical, mechanical and structural estimator in Architectural Services. Jones and his wife, Frances, will retire to Leisure Village by Fox Lake. They plan to travel extensively and to visit their many relatives throughout the country. Next spring they plan to visit Alaska, taking the intercoastal route, and this fall they expect to be on the Delta Queen, a paddle-wheel ship that runs up and down the Mississippi River.

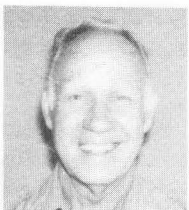
Jones, who said he knows practically every crevasse at Fermilab, will continue to work for Fermilab on a consulting basis, possibly one day a week, although he doesn't expect to continue the pace he has been at for many years. He said he owes it to himself and his wife to take it easy now and do many of the things they have always wanted to do.

French joined the Technical Services Magnet Facility of Fermilab in May 1974. At the time of his retirement, he was manager of custodial maintenance.

He moved to St. Petersburg, Fla. Before coming to Fermilab, French was an electrician with the Vendo Manufacturing Co. He also had served with the U.S.Navy.



...Jones...



...French...

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CLASS II SHARES, A GOOD WAY TO SAVE AT CREDIT UNION

The Argonne Credit Union--the one that services Fermilab--offers \$1,000 class II shares as an attractive way to save money.

The shares must be held onto for a minimum of 12 months before earning their holder 6-3/4 percent interest. Other financial institutions usually require a higher minimum deposit or a longer deposit period.

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ONLY TEN DAYS AWAY AND COUNTING

NALREC's popular family picnic is on its way: July 22 from 11 a.m. to 6 p.m.

It's the good old days, when a dime will buy chicken, baked beans and potato salad. And if that's not enough, pop, cotton candy, snow cones, pop corn and other beverages also will be available.

It's family fun: the cake walk, kiddy rides, model airplane show, magic show, radar ball, door prizes and the levity of clowns.

But it's a team effort also, said Brenda Moylan, chairman of the picnic committee. She needs people help at the picnic and volunteers to bake cakes, cookies or cupcakes for the cake walk.

She can be reached at Ext. 3218.

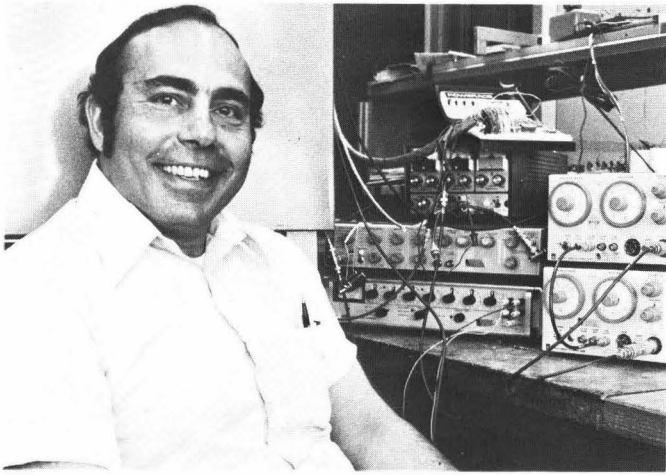
The picnic will be held in the recreation area in the Village. In addition to Moylan, other committee members are Ralph Ovitt, Chuck Grozis, Keith Schuh, Jo Baaske and Jesse Guerra.

Last year, about 1,300 persons attended the picnic, now a well-established tradition at Fermilab.

Instead of obtaining them in advance, food and entertainment tickets will be sold at the picnic. Ten cents will purchase a picnic lunch of chicken, baked beans and potato salad.

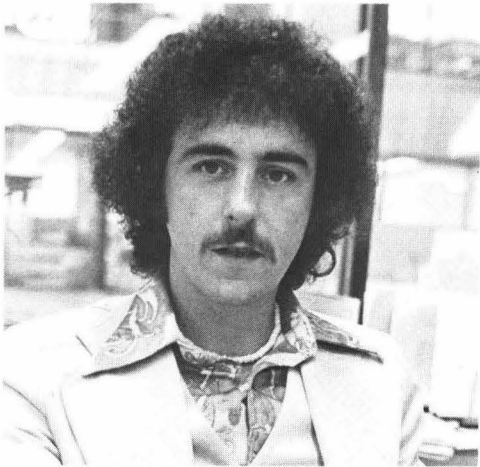
ENERGY SAVING THOUGHT...

Carpool your resources, share your horses.  
G. A. Sowell, BNL



...Award winner Carmen J. Rotolo in his laboratory at Fermilab. An engineer with Research Services, Rotolo was given a U. S. Savings Bond Award by EDN, a trade magazine, for his winning design on a modification of a widely used electronic circuit. In addition, Rotolo also shared the honor of having the design-idea-of-the-month, the recipient being chosen by readers of EDN. He had submitted his article to the "Design Ideas" section of the publication under the title of "Technique simplifies multiple-input exclusive-OR gates." Rotolo has been with Fermilab nearly six years...

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...Fermilab's purchasing administrator J. P. Morgan has the distinction of being one of the 18 "toughest in the country" buyers. The elite 18 were selected by distributor salesmen during Electronic Buyers' News annual survey. Morgan has been with Fermilab for 5-1/2 years and a purchasing agent for 11 years...

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### INTEREST IN CAR POOL GROWS

More than 50 persons already have submitted their blue cards to the Fermilab car pool information center.

The cards are contained in a grey metal file card box on the desk of Beverly Kaden, secretary in the Public Information Office, CL1-W. An individual who wants to add his name to the car pool can fill out a blue card and have it placed in the box, making it available to others. Everyone is welcome to the information. Call Kaden at Ext. 3351 for more information.

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### FERMILAB SCHEDULES SPECIAL TOUR

The Public Information Office has scheduled a special tour July 31 for adults and young people in the ninth grade and up.

The tour will begin at 1:30 p.m. in the Central Laboratory atrium near the reception desk. Persons who are interested in this conducted tour should make reservations with Patricia Zack of PIO, Ext. 3351. Zack, Fermilab tour director, is coordinating the special tour, which has been organized primarily for individuals and their families.

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### HISTORY'S LARGEST PRIME NUMBER

Recognize  $2^{44,497}$  minus 1?

You don't. Well, for the moment at least, it's the world's largest prime number. It contains 13,395 digits and its value far exceeds the number of atoms in the universe.

A prime number is one that can only be divided by itself and 1 to give an answer that does not require a decimal point. One, 3, 5 and 7, for example, are simple prime numbers.

What good is a prime number that large? It gives considerable intellectual satisfaction to the computer scientists at the Lawrence Livermore Laboratory who discovered it. Realistically, the search for gigantic prime numbers is a game that people all over the world play.

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## SCIENCE ON TELEVISION

A number of educational programs dealing with science will be shown this month on television. Viewers should consult their local program directory for specific times and stations.

July (sometime), CBS--"Skylab is Falling." The show will be aired at the time the crippled space vehicle re-enters the atmosphere.

July 19, ABC--"Infinite Horizons: Space After Apollo." Timed to coincide with the 10th anniversary of the Apollo 11 landing on the moon, this show will forecast the future of the space program.

July 23, CBS--"The Body Human: The Vital Connection." The brain and nervous system are explored in this award-winning show.

NOVA, the popular PBS series, will present:

July 12--"The Beersheva Experiment."

The path leads to Ben-Gurion University Center for Health Sciences in Israel, where the show looks at a program that trains physicians to care for their patients as a person rather than as a set of symptoms.

July 19--"Einstein." This portrait examines the myth and reality of the man who revolutionized the world of science. Interviews and rarely seen archival footage have been included to present a picture of Einstein as a rebel and visionary.

July 26--"The Keys of Paradise." A show that evaluates the promise endorphins hold to revolutionize the treatment of pain. Manufactured in the brain, endorphins and their component enkephalins perform the same painkilling function as analgesics such as morphine.

Science News magazine was the source for this listing.

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...Members of the U.S.-USSR Joint Coordinating Committee on Research in the Fundamental Properties of Matter meet at Fermilab. The committee, which meets every other year, last met in Russia. After their session here, they toured various research facilities in this country. In the dark suit in the front row is Dr. Ivan Chuvilo, head of the Soviet delegation. Standing to his right

is James E. Leiss, associate director for high energy and nuclear physics, DOE, Washington, D.C., and head of the American delegation. Dr. Leon Lederman, Fermilab director, is second from left. Dr. Timothy E. Toohig (fifth from left), just returned from Dubna, Russia, where he participated in a research project on the 10 GeV synchrotron...

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## CERN CELEBRATES 25th ANNIVERSARY

CERN is now celebrating its 25th year of sub-nuclear physics.



The official ceremony marking CERN's 25th anniversary officially began June 23 with ministers from member states attending the affair. The opening program was preceded by the 63rd session of the CERN Council, which was held at Meyrin-Geneva, seat of the European Organization for Nuclear Research. The epigram CERN comes from "Organisation Europeenne Pour La Recherche Nucleaire."

The president of the council is Jean Teillac of France. The executive director-general is J. B. Adams and the research director-general is L. Van Hove.

Twelve countries make up the member states of CERN. They and the percent of the total CERN budget they pay are: Austria, 2.39; Belgium, 4.33; Denmark, 2.32; France, 21.44; Germany, 25; Greece, 0.33; Italy, 12.55; Netherlands, 5.62; Norway, 1.69; Sweden, 4.46; Switzerland, 4.07; and United Kingdom, 15.80.

CERN occupies 109 hectares in Switzerland and 451.5 hectares in France at the Swiss-

French border. According to recent figures released by CERN, its 1979 annual budget is 590 million Swiss francs. The staff consists of 3,495 scientists, engineers, technicians, administrators and workmen, 115 fellows, 1,695 paid and unpaid associates, 153 supernumeraries and 33 students and apprentices, for an overall total of 5,491 persons.

The four major areas of study that CERN is involved in are the 600 MeV synchrocyclotron (SC), 28 GeV proton synchrotron (PS), 400 GeV super proton synchrotron (SPS) and intersecting storage rings (ISR). CERN's major detection systems consist of a 3.7 meter European bubble chamber at the SPS, an omega spectrometer at the SPS and a split-field magnet at the ISR.

As of December 1978, the number of active experiments at CERN consisted of 14 at the SC, 10 (all electronic experiments) at the PS, 9 at the ISR and 38 (26 electronic and 12 bubble chamber experiments) at the SPS.

The number of universities and institutes that are participating in the experiments totals about 110, with 1,400 experimental physicists involved.

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## THOUGHTS ON BRIDGING COMMUNICATIONS GAP BETWEEN HARD AND SOFT SCIENCES

For many years Tom Wilbanks of the Oak Ridge National Laboratory has been struggling to bridge the communications gap between the hard and soft sciences--sometimes successfully.

At the Second Annual Practical Conference on Communications sponsored by the East Tennessee Chapter of the Society for Technical Communication last fall in Gatlinburg, he talked about his personal experiences and philosophy in facing up to that subject. The spring 1979 issue of the laboratory's Review published an excerpt from Wilbank's talk, and in that article was a segment titled "Exceptional Gatekeepers," which is reprinted below.

"...I think we need to recognize that communication between hard and soft sciences depends a great deal on what sociology calls gatekeepers--exceptional individuals who play a special role in connecting a community with the outside world. There are nuclear engineers, such as David Rose, who talk with theologians. Or economists, such as Lester Lave, who talk with engineers and physical scientists. Or political scientists, such

as Don Kash, who talk with earth scientists--people with a special gift for communications and a desire to communicate. I am not talking about the John Kenneth Galbraiths or the Isaac Asimovs or the Carl Sagans, although they help, too. I am talking about scientists who spend a great deal of their time building and maintaining bridges to groups of professionals outside their own fields. You can't program this, and I am not sure that people can be trained to do it. But it is surely possible to encourage and reward it.

"We live in a society that isn't working as well as it ought to, and I think the main reason is that we have gotten so compartmentalized. We need to learn to build bridges between all sorts of compartments. The private sector and the public sector need to be able to work together without suspicion and rhetoric. Management and labor should be able to work as partners rather than as adversaries. Ethnic groups and neighborhoods and regions need to understand each others' concerns. All of mankind would benefit by hearing what is being said by all of womankind."

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## NEW POSTAL REGULATIONS TO BEGIN JULY 15

New postal regulations that will change Fermilab's mail system will go into effect July 15.

On that day, the U. S. Postal Service will not accept letters and postcards smaller than 3-1/2 inches high and 5 inches long.

Letters and postcards larger than 6-1/8 inches high and 11-1/2 inches long and weighing one ounce or less will require an additional seven cents postage.

Fermilab's stockroom carries the proper sizes of envelopes. Mail officials at Fermilab recommend that larger brown envelopes not be used for mailing single letters. When using a larger brown envelope, make sure it and its contents weigh more than one ounce.

Employees in Fermilab's mailroom will return mail that is the wrong size or if additional postage is required. One exception is mail containing photographs, provided the exterior of the envelope is properly marked.

The Batavia Post Office is now part of the express mail network. Persons no longer need to drive to the nearest larger city to send a letter or parcel package that must be received the next day.

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## MORE CANOES NOW AVAILABLE

Fermilab now has eight canoes available for rental, Helen McCulloch, recreation coordinator, reported.

The canoes, which may be obtained at 16 Potawatomi in the Village, may be rented for various lengths of time. Paddles and life jackets also are available. For additional information call Ext. 3082.

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## NEW IN THE LIBRARY

"The Amateur Magnet Builder's Handbook"  
by Alvin V. Tollestrup of Fermilab

"Solar Energy in America" by William  
D. Metz and Allen L. Hammond

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## ARE MUSICIANS BETTER LISTENERS?

Out of the 50th anniversary meeting of the Acoustical Society of America comes the intriguing question: Are musicians better listeners?

It seems to Dr. Murray Spiegel of the department of psychology and social relations of Harvard University that the answer is neither a simple "yes" or "no," but rather is wrapped up in statistical analyses, training and background of the subjects tested. The subjects consisted of members of the St. Louis Symphony and non-musicians selected from students, faculty and staff at the Central Institute for the Deaf at St. Louis. In the paper he presented June 13, Dr. Spiegel said, "I have found some evidence that non-musicians can attain the listening capabilities of experienced musicians. This evidence comes from a study of how people detect changes in complex patterns of sounds."

He also said, "I found that most of the musicians could detect smaller changes in the patterns than the non-musicians could. I have reason to believe that listening to the complex patterns (during the experiments) was very taxing, even for the musicians. This is because we tested other listeners, often high school students, who performed dramatically better than members of the St. Louis Symphony."

He explained that these other listeners had far more training on the patterns than did the symphony orchestra players, who visited his laboratory only one afternoon.

Which leads to his main conclusion: "For these complex patterns, an average young listener who has been highly trained for these tasks over a period of months can detect changes perhaps 10 times smaller than a musically-trained person can detect during his or her first hour of listening to these patterns.

"Thus, extensive training is a large component of how well non-musicians and musicians listen to complex sounds. An experienced listener can easily attend to things in a complex pattern that a naive listener--even a professional musician--can't, although their basic capabilities may be similar."

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