INTERNATIONALLY ACCLAIMED MATHEMATICIAN TO SPEAK AT KSU

MANHATTAN — Harvard University mathematician Raoul Bott will be the featured speaker at the Kansas State University annual Friends of Mathematics lecture and awards banquet on April 19.

Bott will discuss "On the Points at Infinity" at his 2:30 p.m. public lecture in 102 Cardwell Hall. Bott also will speak following the department's awards banquet which starts at 6:30 p.m. in the K-State Union Flint Hills Room.

A graduate of the Carnegie Institute of Technology, Bott received the 1987 National Medal of Science from President Ronald Reagan for his studies in topology and differential geometry over the decades, Pigno said.

Joining Bott as banquet speaker will be 1959 K-State alumnus Daniel C. Jones, department manager for computer security at Sandia National Laboratories. His talk will be "Mathematics at Sandia National Laboratories."

The purpose of the awards banquet, according to Mathematics Department head Louis Pigno, is to recognize mathematical excellence at Kansas State University. Several undergraduate scholarships and the Hostinsky Distinguished Teaching Award for Teaching Assistants will be presented. An award for the outstanding mathematics professor also will be announced.

"Our teaching assistantships are apprenticeships during which we train graduate students in the skills that will make them effective mathematics educators," he said. "It is important for our students to know that as professional mathematicians they are expected to have a commitment to excellence in teaching as well as research."

Banquet reservations can be made by calling professor Louis Herman at 532-6750.

Prepared by Tim Lindemuth. For more information contact Pigno at (913) 532-6750.
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SPRING 1988 MATHEMATICS COLLOQUIA
LECTURES AND SPECIAL EVENTS
DEPARTMENT OF MATHEMATICS
KANSAS STATE UNIVERSITY

TUESDAY February 4: Jerome Goldstein, Tulane University
Title: Recent Developments in Thomas-Fermi Theory
Time and Place: 2:30 pm CW 122

TUESDAY February 9: Andrew Bennett, University of Texas
Title: The $T(1)$ Theorem for Martingales
Time and Place: 2:30 pm CW 122

THURSDAY February 11: Charles Moore, Washington University
Title: Some Laws of the Iterated Logarithm for Harmonic Functions
Time and Place: 2:30 pm CW 122

TUESDAY February 16: Prof. T. Christine Stevens, National Science Foundation
Title: "An American Solution to a Polish Problem in The Scottish Book"
Time and Place: 2:30 pm CW 122

TUESDAY February 23: Hugh Montgomery, University of Michigan
SECOND ANNUAL ISIDORE AND HILDA DRESSLER LECTURE
Title: Irregularities of Point Distributions
Time and Place: 2:30 pm CW 102

TUESDAY February 23: Hugh Montgomery, University of Michigan
Title: PEG SOLITAIRE
Time and Place: 4:30 pm CW 122

TUESDAY March 22: T.W. Körner, Cambridge University
Title: Molehills Out of Mountains
Time and Place: 2:30 pm CW 122

THURSDAY March 24: Professor Stanley Payne, University of Colorado, at Denver
Title: An Essay on Generalized Quadrangles
Time and Place: 2:30 pm CW 122
Sponsored by: Distinguished Regents Professor Ernie Shult
TUESDAY March 29: William Thurston, Princeton University
SECOND ANNUAL HARRY E. VALENTINE LECTURE
Title: Three Dimensional Geometry and Topology
Time and Place: 2:30 pm CW 102

TUESDAY April 19: Raoul Bott, Harvard University
SIXTH ANNUAL FRIENDS OF MATHEMATICS LECTURE
Title: On the Points at Infinity
Time and Place: 2:30 pm CW 102

TUESDAY April 19: SIXTH ANNUAL FRIENDS OF MATHEMATICS AWARDS BANQUET
Raoul Bott, Harvard University
Title: In the Revolving Door
Daniel Jones, Sandia National Laboratories
Title: Mathematics at Sandia National Laboratories
Time and Place: 6:00 - 6:30 pm Cats Pause (cider and conversation)
6:30 pm Flint Hills Room

April 25: National Mathematics Awareness Week

TUESDAY APRIL 26: Departmental Visitation
Time and Place: 2:30 pm CW 122

THURSDAY APRIL 28: FIRST ANNUAL KSU-KU MATHEMATICS LECTURE
Frank Gilfeather, University of Nebraska
Title: American Mathematics: Into a New Century
Time and Place: 2:30 pm CW 102
By N. J. Ross

Prove it!

Louis Pigno did, even though it took other mathematicians several decades to make only partial progress on the problem.

For Pigno the art of proof is not mechanical; nevertheless there are a number of identifiable problem solving techniques he uses.

"Results are not always obtained in a linear order," Pigno commented, explaining the complications of problem solving. "Identifying and understanding patterns leads to (mathematical) solutions."

So it was when Pigno and two colleagues solved the Littlewood Conjecture.

In 1948, Littlewood and Hardy, two classical British analysts, formalized a conjecture concerning mechanical vibrations:

"There are an infinitude of cases one can consider," Pigno said. "Just because one settles a variety of special cases doesn't mean the conjecture is resolved. Each verification lends more credibility to the validity of the conjecture, but it doesn't settle it."

Three decades after the conjecture was formulated, Pigno and two colleagues confirmed it by giving a general mathematical proof which avoided the necessity of examining numerous special cases.

Pigno shared his problem solving approach by outlining four distinct processes. First, find an environment where creativity is valued. Hours of think-time and interested colleagues help create such an environment. Second, know what is in the available literature. Learn what is known and what is not known about the problem.

This to Pigno does not mean memorizing proofs and results, but rather skimming for a general knowledge of what is being written about the problem. "If I depend too much on what others have written about a problem, I may not be able to develop new ideas," he cautioned.

Extensive research on a related theorem actually led to the solution of the Littlewood conjecture. While Pigno and Brent Smith (currently at Bell Laboratories) were authoring "Quantitative Behaviour of the Norms of an Analytic Measure," an article which appeared in the "Proceedings of the American Mathematical Society," they developed a technique which would have important consequences when applied to mechanical vibrations. Indeed, the research for that publication launched them and O. C. McGhee, Louisiana State University, on the path to the proof of the Littlewood conjecture.

With a sum of cosine waves (N waves) each having amplitude 1, the average size of the resulting wave is always greater than log N.
The third process is to place the problem in its context. Surround it with other things which are related. This brings familiarity to the problem solving ground. "I try to place it in the context of things that I know about, such as other theorems, perhaps," Pigno explained. Placing problems in their context yields solutions such as the one he and S. Saeki discovered in 1974. Their joint efforts solved the Y. Meyer problem involving the union of a Riesz set and a Sidon set.

Organizing plus synthesizing is the final step. Try to find some organizing principle, then deduce the things you wish to deduce as special cases from this more general principle. Sometimes two theorems seem to be linked to each other. Reflections, connections, reverberations cause the problem solver to view them together.

Mathematicians like to find connections between various results; because of some insight, two theorems such as the F. and M. Riesz and Paley Theorems may become connected in the researcher's mind. The researcher does not arbitrarily say, "I'm going to think about these two theorems together." It happens naturally. This leads to the search for that organizing principle which unifies the two seemingly disparate entities.

Then, Voilà! Eureka! After creating the proper environment, reading extensively, placing the problem in a proper context, and recognizing the organizing principles, the answer may appear within a period of several months or several decades.

Pigno's love of mathematics began with geometry and physics, but took a sharp academic turn when he met a role model dynamic enough to cause him to make a decisive curriculum change. Raouf Doss, an Egyptian, advised him on his doctoral thesis in harmonic analysis at SUNY, Stony Brook.

"Raouf Doss is an elegant mathematician. His proofs are simple, beautiful, and insightful, and often have served succeeding mathematicians as a jumping off point for further research," said Pigno.

As KSU mathematics department head, Pigno strives to emulate those characteristics of insight and simplicity, especially as he coordinates the acquisition of a new math laboratory for the fall of 1987. This acquisition he says will offer his students more numerical meaning in their learning experiences. His administrative goal is to offer a program which equips the students to think analytically, and to arrive at valid conclusions, because that is the essence of a university education. Employers seek mathematicians, engineers, physicists who have more than rote processes, Pigno says. Employers have questions, so they search for persons who can formulate, analyze, and ultimately answer these questions.

Employers hire the graduates who can think in novel situations—the problem solvers!
### Mathematics - Modern Languages

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### Department of Modern Languages

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FOR INFORMATION ON RETROACTIVE CREDIT BY EXAM, SEE DEPT.

MLANG 001 STUDY ABROAD
V A REC 16900 C APPT
KOLCHOSKI, WALTER F

MLANG 297 HON/INTRO HUMANITIES
03 A REC 16910 C APPT
OCONNOR, THOMAS A

MLANG 399 HONORS/SEM MOD LANG
03 A REC 16920 T U 0230-0345
DE 124 OCONNOR, THOMAS A

MLANG 499 SENIOR HONORS THERESIS
02 A IND 16930 APPT

W ARABIC

ADVISOR
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