



# Quaternion

Department of Mathematics Newsletter

Vol. 5, Number 1

Fall, 1988

## CHAIRMAN'S COMMENTS

I recommend an article entitled "Mathematics: Art and Science" by A. Borel which appeared in The Mathematical Intelligencer (Vol. 5, No.4). In this article Borel describes how "mathematics is an extremely complex creation which displays so many essential traits in common with art and experimental and theoretical science that it has to be regarded as all three at the same time, and thus must be differentiated from all three as well."

Consider just one of these three - mathematics as art. Many great mathematicians would heartily agree that mathematics has a strong analogy with art if it is not art itself. G.H. Hardy felt that mathematics' right to exist was that it was art. H. Poincare' is quoted as saying to the First International Congress of Mathematicians that mathematics "provides its disciples with pleasures similar to painting and music. They admire the delicate harmony of numbers and the forms; they marvel when a new discovery opens up to them an expected vista; and does the joy that they feel not have an aesthetic character even if the senses are not involved at all?..."

What makes mathematics art? Here are a few observations gleaned from the paper by Borel.

(a) Much of the development of mathematics has been de-

rived from, guided by, and judged according to aesthetic criteria, which included intellectual elegance and beauty of ideas in a very special world of thought which can hardly be shared with non-mathematicians. However, the aesthetics also include the earthy yardsticks of meaning, consequences, applicability, and usefulness of theories and theorems within the mathematical sciences. For example, Galois theory is beautiful!

(b) Mathematics is primarily a creation of the mind and progress is achieved by intellectual means, many of which issue from the depths of the human mind, and for which aesthetic criteria are the final arbiters.

(c) The activities of a mathematician are much like that of an artist. As a painter combines colors and forms, as a musician combines tones, and as a poet combines words, so a mathematician combines ideas. A Mathematician works out of inspiration with essential ideas often occurring to him quite unexpectedly.

John William Navin Sullivan in "Mathematics as an Art" (see Vol. 3 of The World of Mathematics by J.R. Newman) encapsulates these ideas also. "Since, then, mathematics is an entirely free activity, unconditioned by the external world, it is more just to call it an art than a science. It is as independent as music of the external world; and

although, unlike music, it can be used to illuminate natural phenomena, it is just as 'subjective', just as much of a product of the free creative imagination. And it is not at all difficult to discover that the mathematicians are impelled by the same incentives and experience the same satisfactions as other artists. The literature of mathematics is full of aesthetic terms, and the mathematician who said that he was less interested in results than in the beauty of the methods by which he found the results was not expressing an unusual sentiment."

Much can be said to illustrate that mathematics is art (and science) and will be in a later issue.

## STUDENT NEWS AND ACTIVITIES

We congratulate the following students who graduated with degrees in Mathematics in the past year.

### Fall, 1987

B.A. Degrees: Cheryl Bundrage, Miriam Calvo, Joseph Nieten, John T. O'Connor, Phillipa (Wilson) Robertson, William Rockwell, Timothy Stevens, David P. Taylor.

M.A. Degrees: Peter Cheng, Xisheng He

### Spring, 1988

B.A. Degrees: Kelly Caffery (INS/Math), William Encinosa, Barbara Crimm, Paula J. Jones (Magna Cum Laude), James Loafman (Cum Laude), Junette McBryde-Hill, Richard

-continued from front-  
Moscatello (Cum Laude),  
Helen Doody Potter (Cum  
Laude), Jorge Romero,  
Keith Terry (Magna Cum  
Laude), Zohreh Torabian,  
Scott S. Tyler, Sandra  
White, James Zielinski

M.A. Degrees: Gang Li,  
Nalina Suresh

Summer, 1988

B.A. Degrees: Brian  
Fielding (Cum Laude),  
Jacqueline Goodman, Mark  
Johnson, Thomas Milcic,  
Stephanie Tripp

M.A. Degrees: Barbara  
Duncan, Jeffrey Linek,  
Ellen Stickell, Thomas  
Wangerman

Ph.D. Degrees: Deborah  
Levinson (Dissertation  
Title: The Least Noise  
Resistor Design Problem.  
Dissertation Coauthors:  
Dr. Mary Parrott and Dr.  
A. David Snider from  
Electrical Engineering)

New teaching assistants to  
the Department this fall are  
Naeem Ahmad (M.A. University  
of Karachi, M.A. University  
of Manitoba); Jianjian Gong  
(M.A. Zhejiang University,  
Hangzhou); Todd Piersall  
(BA/MA Program, USF); and  
William Wilder (BA/MA  
Program, USF). There are  
currently 43 teaching  
assistants in the Depart-  
ment.

Richard Moscatello, a 21-  
year-old senior under-  
graduate student at the  
University of South Florida,  
has won the prestigious  
COURANT INSTITUTE PRIZE  
FOR MATHEMATICAL TALENT,  
with a First Prize of  
\$1,000. This is a  
national competition for  
undergraduate scientists  
who submit original sol-  
utions to mathematical  
problems of their own choos-  
ing.

Moscatello's entry was his

1987 Undergraduate Honors Pro-  
ject, entitled Optimal Strate-  
gies for a Two-Person Game In-  
volving Control of Regions." Game Theory is a branch of 20th  
Century Mathematics with many  
economic and military applica-  
tions. The game studied by  
Moscatello was difficult and  
interesting because randomness  
was present. His discoveries  
are relevant, for example, to  
the planning of advertising  
campaigns.

His advisor, Professor R.W.R.  
Darling, said: "Richard posed  
the problem, and solved it him-  
self, with very little help  
from me; he is a very good  
researcher, and thoroughly  
deserves this prize." Moscatello's article will be  
published in a mathematical  
journal.

Richard Moscatello graduated  
Cum Laude from USF with a  
Major in Mathematics in May,  
1988. He is a Tampa native,  
an alumnus of Leto High School  
in Tampa, and lives in Tampa  
with his family.

#### NEW FACULTY

Joining the Department this  
year as an Assistant Professor  
of Mathematics in Dr. John  
Pedersen. Dr. Pedersen comes to  
USF from the University of  
Calif. at Los Angeles. He  
received his M.S. & Ph.D.  
degrees from Emory Univ. with  
his major field of study being  
in the intersection of comput-  
er science, logic, & algebra.

#### THE INSTITUTE OF CONSTRUCTIVE MATHEMATICS

Joint USA-USSR Meeting in 1989.  
In December, 1989, the ICM will  
host a joint USA-USSR meeting  
on Approximation Theory. Soviet  
participants will come mainly  
from the Steklov Institute in  
Moscow and Leningrad. The  
Organizing Committee will be:  
E.B. Saff (Director), R. Devore  
(University of South Carolina),  
Paul Nevai (Ohio State Univer-  
sity), and A.A. Gonchar (Head  
of the Mathematics Department  
of the USSR Academy of Science)  
In view of the restrictions on

scientific cooperation between  
the superpowers in recent  
years, this meeting will be  
an historic event.

#### Florida Power & Light Co. Contract in its Second Phase.

In April 1988, Florida Power  
& Light Co. was so pleased  
with the results of the first  
research contract with the  
ICM, that it awarded a second  
contract for \$38,200. The  
principal investigators are  
Professors Darling, Saff and  
Snader, and Professor M.  
Brannick (Psychology) is  
serving as a consultant. The  
topic of the research is the  
evaluation and development  
of mathematical algorithms  
for deciding the order of  
priority in which to per-  
form modifications on the  
Turkey Point nuclear power  
station. At any time,  
about 400 modifications  
are under consideration,  
some proposed by the com-  
pany and some by regulatory  
agencies, costing up to  
tens of millions of  
dollars each. An algorithm  
proposed in the February  
1988 ICM report has already  
been successfully implement-  
ed by Florida Power & Light  
Co.

Springer-Verlag Contract  
Extended Springer-Verlag  
has awarded the ICM a  
second five-year contract  
to serve as the editorial  
base for the journal  
"Constructive Approxi-  
mation."

#### DEPARTMENT NEWS

Dr. R. Darling attended a  
meeting of the Institute of  
Mathematical Statistics held  
at Madison, Wisconsin in  
June. Beginning in May, Dr.  
Darling served as a principle  
investigator in a research  
contract between Florida  
Power and Light and the  
Institute of Constructive  
Mathematics. In August,  
Dr. Darling contributed a  
paper on Infinite-dimen-  
sional Stochastic Difference  
Equations at the Symposium

on Probability in Fort Collins, Colorado, and in October he served as expert witness on probability in the federal court trial of "U.S. versus Michael Tsalickis et al."

Dr. A. Goodman will present a paper "The Coefficients of Infinite Valent Functions" at the annual meeting of the AMS next January in Phoenix.

Dr. M. Ismail was an invited speaker at a symposium on q-series at the Institute for Mathematics and its Applications at the University of Minnesota in March. During June, Dr. Ismail was an invited speaker at the special session in Approximation at the Canadian Mathematical Society Meeting in Regina and also at the U.S.-Norway Conference on Pade' Approximation and Continued Fractions. Dr. Ismail gave the following colloquium talks: in China at Fudan University, Hangzhou University, Jiao Tong University, and Qingdao University (Dec., 1987); at Ramanujan Centenary Conferences in India (Dec., 1987); at the University of Waterloo (July, 1988), and West Virginia University (Oct., 1988). Dr. Ismail was also a coorganizer of a summer research seminar at York University in Toronto beginning June, 1988.

Dr. G. McColm gave a talk on "Applications of Monotone Induction to Computer Science" at the fourth SIAM Discrete Mathematics Conference held at San Francisco during June 13-16.

Dr. A. Mukherjea has been invited to speak at the AMS Short Course on Matrix Theory at the annual meeting in January in Phoenix. He recently gave invited addresses at the AMS meeting

in Knoxville and at the Indian Statistical Institute in India. Dr. E. Saff is the director of an organizing committee for the joint US-USSR meeting on approximation theory to be held in December. Dr. Saff was also a principal investigator in a research contract between Florida Power and Light and the Institute of Constructive Mathematics.

Dr. J. Snader was a principal investigator in a research contract between Florida Power and Light and the Institute of Constructive Mathematics.

Dr. C. Williams presented a paper at the Alexander von Humboldt Colloquium on Celestial Mechanics held at Ramsau, Austrian March. During that month she also gave three lectures at the University of Zaragoza in Spain. In April, Dr. Williams gave lectures at Frostberg University in Maryland on the New Cosmology and new results in Hamiltonian Dynamics. During July and August, she worked as a consultant to the Naval Research Laboratory and the United States Naval Observatory through the office of Universities Space Research Association.

At the Honors Convocation in October, Dr. F. Zerla was recognized as one of the outstanding undergraduate teachers of In November, Dr. Zerla lectured on "History of Mathematics" at the Mu Alpha Theta induction at Charlotte High School in Punta as President of the Florida Section of the Mathematical Assoc., Dr. Zerla presided at its recent meeting in Winter Park.

#### FACULTY PROFILE

##### Mourad E. H. Ismail

Mourad Ismail was born in Cairo, Egypt in 1944, and was raised in the Bab-El-Khalque area of Cairo together with his brother and sister. Their father worked in the distribution side of the movie business. Their neighborhood was not an affluent one, but there was a good local school where he showed early promise in mathematics. Ismail was awarded a Mathematical Fellowship

to study at the University of Cairo, where he received a B.Sc. in Mathematics in 1964. He wished to leave the country to pursue further studies, but was unable to do so until 1968 because of restrictions on Egyptian citizens arising from the war with Israel. Instead he worked for 4 years as a teaching assistant at Cairo University.

In 1968, he obtained an Assistantship at the University of Alberta, Canada, where he received the M.Sc. in 1969, and the Ph.D. in 1974 under the supervision of Professor Al-Salam. His thesis was on difference equations and discrete operational calculi. By this time he was accompanied by his wife, Thanaa, to whom he was engaged before he left Egypt, and whom he married in 1969.

The following year (1974-75), he held a postdoctoral position at the Math Research Center at Wisconsin, where he met Richard Askey. Ismail cites Professor Askey as the major influence on his mathematical career.

He spent the next year at Toronto, and then three years at McMaster University. From 1978 to 1987, Ismail worked at Arizona State University, where he became an Associate Professor in 1980, and a Full Professor (at the age of only 38) in 1982. He joined the faculty at USF as a Professor in 1987. He has also held visiting positions at Minnesota, Kuwait, and Paris. For the last ten years his research has been supported by the National Science Foundation; his current grant (through 1991) is for the study of monotonicity and spectral properties of orthogonal polynomials, and is joint with E. Saff.

His 75 publications span the

areas of approximation theory, asymptotics, combinatorics, integral transforms and operational calculus, orthogonal polynomials, and special functions. The ones he considers his best include: "A simple proof of Ramanujan's one psi one sum" (1977), a two-page paper in which he presented a much cited new proof technique; "A combinatorial approach to some positivity problems" (1979), with Tamhankar); "Special functions, Stieltjes transforms, and infinite divisibility" (1979), with Kelker); "Recurrence relations, continued fractions and orthogonal polynomials" (1984, research monograph with R. Askey); "The combinatorics of q-Hermite polynomials and the Askey-Wilson integral" (1987, with Viennot & Stanton).

Professor Ismail is much in demand as a conference speaker and travels ext-

ensively. His leisure pursuits include reading and swimming.

#### USF STUDENT CHAPTER THE MATHEMATICAL ASSOCIATION OF AMERICA

A new Student Chapter of The Mathematical Association of America is being established at the University of South Florida. Membership in this Chapter is open to all students interested in mathematics. This new Chapter will work with the existing Chapter of Pi Mu Epsilon Fraternity in which invitations to membership are still given only on the basis of academic achievement. The meetings are being held bi-weekly, featuring for the most part presentations by undergraduate students. Dr. F. Zerla, who is Faculty correspondent of Pi Mu Epsilon Fraternity, is sponsoring the new club. The application for affiliation with the Mathematical Association of America will be sent in early December.

Students who submit an application for membership by that time will be considered Chapter Members. The Chapter Officers are: Misty Campbell, President; Teresa Bates, Vice President; and Chrissy Mooney, Student Correspondent. Presentations this semester have been: October 5, Maria Rametta, Student Correspondent of Pi Mu Epsilon Fraternity, gave information on Careers in Mathematics and Mathematics in Careers. On October 19, the NOVA TV Production on Ramanujan, "The Man Who Loved Numbers" was shown with comments by Professor E. H. Ismail. The November meetings feature three presentations in the Student Exploration Series: "Logarithms" by Chrissy Mooney and Anh Vu Nguyen; "The Theory of Limits" by Teresa Bates, Julie Husbands and Eric White; and "Matrices and Quaternions" by Misty Campbell and Maria Rametta. Dr. Zerla is also coordinating efforts statewide to help install Student Chapters of the MAA in the colleges and universities of Florida.



DEPARTMENT OF MATHEMATICS  
TAMPA, FLORIDA 33620-5700

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