Math Times

University of Illinois at Urbana-Champaign Fall 1992

Letter from the Chair

Dear Colleague,

This is my first letter to you as Department Chair. Ward Henson has returned to full time teaching and research after doing an excellent job as chair for four and a half years. In fact, he is spending this year in Germany, perhaps to get as far as he can from administrative work. We know he is glad to get back to his mathematics and wish him a great year.

I first came to the University in 1968, and I have a deep affection and loyalty to the department, as I am sure you who are colleagues and alumni also do. The past two years I was in Ann Arbor working as Executive Editor of Mathematical Reviews. When I was asked to serve as Department Chair I knew it would be a challenging job.

This is an excellent department with active and productive faculty, superior students with a broad range of interests and an excellent supporting staff. Even though we as part of the University have been affected by the nationwide recession, we will work together to protect and enhance our department.

Last spring four faculty members retired. We have one new assistant professor, Steven Bradlow, and several visiting faculty members this year, who are helping to carry the teaching load. We do not want to cut back on classes, but with less money will have to offer somewhat fewer in order to maintain the quality of our classroom offerings.

We are glad that so many of you have written to us. Keep the letters coming. Your friends and colleagues want to hear what you are doing, where you are, and what plans you have.

Jerry Janusz

Math Sci Disc

The Mathematics Library, through the generosity of **Kitty Cairns** and other library friends, was able to purchase the back files of Math Sci. We now have *Mathematical Reviews* 40-1992 on CD-Rom.

Carmichael Numbers in News

by **Paul T. Bateman**

Robert D. Carmichael, who was a member of this department, was mentioned in the September issues of Focus and the Notices.

Carmichael was born in Alabama in 1879. Before coming to Illinois in 1915 he was a professor at Alabama Presbyterian College, a graduate student at Princeton, and a member of the Indiana University mathematics department.

He was head of this department from 1929 to 1934 and Dean of the Graduate College from 1934 until he retired in 1947. **Paul Halmos** gives an affectionate portrait of Carmichael in *I Want to be a Mathematician* and writes that his first published paper, which was related to work of Ramanujan on quaternary quadratic forms "was inspired by Carmichael."

Mathematicians sometimes like to think that their theorems will give them immortality. Some do, but many excellent mathematicians are better known today for the questions they raised than for the theorems they proved. R. D. Carmichael is a case in point.

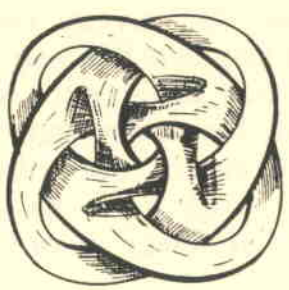
Although he had an impressive list of publications, Carmichael is best known today for two difficult but easily understood questions.

The first was formulated in two papers in the Bulletin of the American Mathematical Society [**13** (1907) 241-243 and **28** (1922) 107-110] and deals with Euler's arithmetical function ϕ. Carmichael made the following conjecture: "If the equation $\phi(n) = C$ has one solution, then it always has a second solution, C being a given positive integer and n being an unknown positive integer."

Carmichael's conjecture is true for $C < 10^{10000}$ but no general proof is known. This Carmichael conjecture is of sufficient current interest that two problems closely related to it appeared in 1991 in the American Mathematical Monthly (pages 443 and 862).

Another Question

The second question asks whether or not there are infinitely many of what are now called Carmichael numbers; this was answered last year by three mathematicians at the University of Georgia who presented their work at the Illinois Number Theory Conference in Urbana in April, 1992.



A Carmichael number is a composite positive integer n having the Fermat property, namely that "$a^n - a$ is divisible by n for every integer a." Of course Fermat proved that any prime number has this property, but Carmichael [BAMS **16** (1910) 237-238 and the Monthly **19** (1912) 22-27], pointed out that an occasional composite number also does.

Thus, while the Fermat property provides an indication that a positive integer n might be prime, it does not give an absolute guarantee of primality. There are five Carmichael numbers less than 6000 and these were given by Carmichael, namely 561, 1105, 1729, 2465 and 2821. Carmichael believed "this list might be indefinitely extended" and gave methods for finding further Carmichael numbers, but was unable to give a rigorous proof that there are infinitely many.

Eighty years later Red Alford, Andrew Granville, and Carl Pomerance finally gave such a proof. Specifically, they proved that if x is a sufficiently large positive integer, then more than $x^{2/7}$ of the positive integers up to x are Carmichael numbers. Granville has an excellent exposition in the September Notices.

Letter from the Library

Dear Friends of the Library,

This is a report on the financial situation of the UIUC Mathematics Library at the end of September 1992.

Professor **Nancy Anderson**, the mathematics librarian, projects that the expenses for 1992-1993, beyond the built-in acquisitions budget, will be $27,100. These are for monographs and new journals requested by the faculty and the library committee.

New state funds of $3,700 are available towards these expenses. The unfunded balance of approximately $23,400 has to come from other sources, if the math library is to operate at the projected level.

As currently planned, approximately half of that deficit will be covered from regular department funds and, it is hoped, approximately half from private donations from faculty, alumni and friends.

Cuthbert Hurd, a 1936 Ph.D. student of Professor Trjitzinsky, has offered the following challenge. He will contribute $1,000 to the UIUC math library on a one to nine basis; if by December 1, 1992, $9,000 has been pledged Dr Hurd's gift will make a total of $10,000.

Paul Halmos (1938, Doob) took up the challenge and pledged a $1,000 contribution towards Dr. Hurd's target. Other friends of the library have sent contributions or pledges, often with thoughtful comments about the role the library and their mathematical associations at the University of Illinois played in their lives. Our gratitude goes to all of these contributors.

Since May $7,274 has been collected to date through contributions by faculty members in cash or by payroll deductions, and also from various private donations. But more money is needed to reach the goal and to cover the expenses. Checks should be made out to UIF/UIUC Mathematics Library and sent to:

UI Foundation
244 Illini Union MC-386
1401 West Green Street
Urbana IL 61801-9902

An endowment fund would be a solution to the recurring financial problem of the library, a deficit of approximately $24,000 per year. The committee has applied for a grant to a foundation and has approached several corporate leaders who have expressed their interest in contributing to such a fund. Details still need to be worked out.

If you are willing to or are planning to contribute to such a fund now or in the future please contact the undersigned or the University of Illinois Foundation.

Thank you for any help you can give.

Philippe Tondeur
Finance Committee
UIUC Mathematics Library

Carmichael left Urbana in 1947. Unfortunately I never met him. However, I learned elementary number theory when I was an undergraduate by reading his book on the subject. While I was a graduate student I wrote him a letter asking about a difficult point in his book on group theory; he gave a detailed reply by return mail.

In the late seventies Carmichael's youngest brother, a retired physician, came to see me to get material for a biography which he was writing about his brother. I presented him with a preprint of a long article on Carmichael numbers by Pomerance, Selfridge, and Wagstaff.

Last fall an octogenarian who sits behind me at the Lyric Opera in Chicago told me that she had been an undergraduate mathematics major here in the twenties. She spoke in glowing terms of the courses she had taken with Carmichael.

Faculty Notes

Donald Burkholder has been elected to the National Academy of Science. He has also been made a Fellow of the American Academy of Arts and Sciences.

Among the lectures **Julian Palmore** gave this summer were two in California in June, one at a seminar in nonlinear science at the University of California-San Diego, and another at a Military Operations Research Symposium in Monterey. In the spring he also conducted a Professional Development Seminar at the headquarters of the U.S. Army Training and Doctrine Command at Fort Monroe VA, participated in a Simulation Validation Workshop at the Institute for Defense Analysis, and lectured at the Army Concepts Analysis Agency in Bethesda MD.

This term he spoke on his research to the Army Model and Simulation Management Office and is lecturing at the Army Operations Research Symposium at Fort Lee, VA in November.

Gaisi Takeuti was honored at a conference on Proof Theory and Applications to Computer Science this summer at the Universite d'Aix, Marseille, in France.

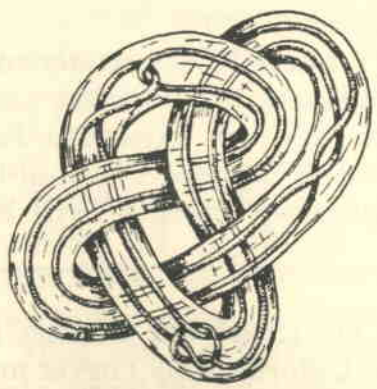
Robert Ash is a visiting professor the University of Minnesota during the fall quarter where he is giving a course in computational complexity.

Frank Knight reports that during the spring he visited Friedrich Schiller University in Jena, formerly in East Germany. The mathematics department has been subsisting there for over 10 years in a building originally intended for the Zeiss Company which makes optics, computers, etc. The faculty have no private offices or blackboards and must speak quietly to keep from disturbing others. Remarkably, he says, they seem able to maintain high standards.

In the spring **Bruce Berndt** gave invited lectures at two universities in Montreal, McGill and Concordia, as part of a special year on automorphic forms with applications to number theory sponsored by the Centre de Recherches Mathematiques. He also gave a colloquium talk at the University of Montreal.

In June he gave the invited banquet talk at the Northwestern Sectional meeting of the MAA

Derek Robinson was the principal speaker at a group theory symposium in Western Michigan University in spring, gave a talk at the AMS special session on infinite rings in Tuscaloosa, and was a speaker at IUPUI, Indianapolis, IN.



Fellowships

A substantial number of our students are fully supported by fellowships this year. Eighteen American students are supported by a Department of Education Grant. In addition, **Kevin Ford** and **Claudia Miller** are NSF Fellows, while **Karin Johnsgard** has a Sloan Doctoral Dissertation Fellowship for this academic year.

International students who are fully supported by grants or fellowships from their countries include two from Korea, two from Indonesia, and one each from Malaysia, Denmark, Venezuela and Germany. Six international students are partly supported by **Bourgin**, **Schark** or **Trjitzinsky** fellowships awarded by the department.

It may be true that people who are merely mathematicians have certain specific shortcomings; however, that is not the fault of mathematics.

Carl Friedrich Gauss

Bulletin Board

One of the phrases Mattel's new Teen Talk Barbie said was "Math class is hard."

Many people have accused Mattel of programming little girls to avoid math. Mattel says the company isn't claiming other classes are easy and that they have a doll that says "I want to be a doctor."

An anonymous writer, on a note pinned to the department bulletin board, wrote, "I'm sure we all wish Barbie good luck in achieving her goal of becoming a doctor without any math skills."

To this a hand written note adds, "Actually math class *is* hard, even for mathematicians," Lee Rubel.

And another note, "But it wasn't back when I was playing with Barbies," Karin L. Johnsgard.

Barbie has been reprogrammed, and no longer thinks that math class is hard.

New Faculty Member

The newest faculty member of the department is Assistant Professor **Steven Bradlow**, a native of South Africa, who graduated in 1980 from the Witwatersrand University in Johannesburg and soon after came to the United States for graduate work at the University of Chicago. Steve says all of his family and most of his friends have now left South Africa and are living in the U.S.

He received a master's degree in physics in 1982, then switched to mathematics. He stayed at the University of Chicago, received a master's degree in math and then a Ph.D. in 1988. His faculty adviser was **Karen Uhlenbeck**, formerly a member of our department.

Steven then went to Stanford where he taught for a year, was a postdoctoral fellow at MSRI in Berkeley, then was an assistant professor for two years at the University of California-San Diego.

This fall he came to Urbana-Champaign from Warwick University in England where he spent last year at a symposium on gauge theory, geometry and topology.

He and his wife Bridget, also a native South African, whom he met when they were both students at Witwatersrand, have two children, 3 year old Rebecca and baby Henry. Bridget has a Ph.D. in physics and biophysics and works at the Beckman Institute doing optical visualization.

Steve works in differential geometry, gauge theory and holomorphic bundles. With two children and two jobs the Bradlows are busy. When he does have time he likes music, jogging, the theatre and, Steve says, formerly he used to read.

A mathematician, like a painter or poet, is a maker of patterns. If his patterns are more permanent than theirs, it is because they are made with ideas.

G. H. Hardy

News from Mathematics Alumni

Lawrence E. Somer (1985, Parker) has been promoted to Associate Professor at Catholic University of America, Washington, DC.

William Harris (1992, Reznick) is an assistant professor at Georgetown College, Georgetown, Ky, where he says the emphasis is on teaching. He teaches college algebra, statistics, discrete math and probability, and says the students are fine.

Dana Weston (1986, Fossum) has been promoted to Associate Professor at the University of Missouri in Columbia, starting with the academic year 1992-93.

Madjid Amir (1990, Knight) has a 100% research position at the University of Mannheim, Germany.

Ernest E. Blanche (1941, Craythorne) sent a letter along with a contribution to the library fund challenge established by **C. C. Hurd**. Dr. Blanche, who now lives in Rockville, Maryland, was a teaching assistant at the U of I from 1938 to 1941. After he received his Ph.D. he went to Michigan State where he met Professor Hurd who was teaching there. During World War II Dr. Blanche worked at the Curtiss-Wright Corporation in Buffalo, NY.

James Heyda (1940, Trjitzinsky) sent as a contribution toward the pledge challenge of C. C. Hurd a check he received as payment for translating two recent articles for Plenum from the Russian periodical Matemmaticheski Zametki. In the fall of 1936 Dr. Heyda was working towards his master's degree at Michigan State when C. C. Hurd joined the faculty and recommended him for an assistantship here at the U of I.

Daniel Naiman (1982, Bohrer) was recently promoted to full professor at Johns Hopkins University, Baltimore, MD.

Y.S. Chow (1958, Doob) is spending this year in Taiwan. His wife, Y. C. Chow who received her master's degree in math in 1958 has been working for IBM for many years and so was not able to accompany her husband to Taiwan.

Everett Welker, who received an A.B., an A.M. and a Ph.D. (1938, Crathorne) from the U of I writes that after receiving his degree he went to work for the American Medical Association analyzing medical research statistics. From there he went to Washington, DC, to the Department of Defense as a scientific advisor.

He later worked closely with NASA, on rocket studies such as estimating the reliability of Saturn before any booster had been built.

In 1957 he began work for ARINC Research Corporation where he evaluated the development of missiles for many NASA contracts, including one in which the team he managed worked closely with a French team, developing the Coralie stage of the Europa launch vehicle

His last study before he retired was evaluating the Bay Area Rapid Transit System (BART) for TRW as to its reliability, maintainability, safety and performance.

Despite all his other work, throughout his long career Dr. Welker has managed to keep on teaching, and has taught statistics, probability, etc. for the military, NASA, and at universities.

His wife Dorothy, died on May 27, 1991. Dr. Welker now lives at Tuscaloosa, Alabama, where he is near his son.

David Peifer (1992, Schupp) sends greetings to all of his former colleagues from Northfield, MN where he is an assistant professor at St. Olaf College. He will be occupying Lynn Steen's office, which is equipped with a SPARC 2

Perfect numbers certainly never did any good, but then they never did any particular harm.

J. E. Littlewood

workstation, for two years and is renting a pleasant house five minutes walk from the math building. He is teaching three courses, including a computer calculus and a principles of mathematics. This keeps him busy, but he will get a two month midwinter break, as he won't teach during intersession.

J. M. Borden (1981, McEliece) sends word that he enjoys living in the Boston area and working for Wellfleet Communications, a company that builds routers (not the woodworking kind) that connect computer networks. He finds that there are interesting computer communications problems to solve. The company is located in Bedford MA.

Charles Bu (1992, Carroll) is also living near Boston. He started teaching at Wellesley College this fall and finds that his classes, a grant proposal he is writing, and submitting papers is keeping him busy. He has six papers accepted and has submitted another three.

Mathematics takes us still further from what is human, into the region of absolute necessity, to which not only the actual world, but every possible world, must conform.

Bertrand Russell

Notices

Kaj L. Nielsen

Kaj L.Nielsen (Ph.D. 1940, Trjitzinsky) died in February this year at Fort Myers, FL. Professor Nielsen, who was born in Denmark in 1914 and came to this country in 1926, was a professor and head of the Mathematics and Science Department at Butler University in Indianapolis during 1961-63 and from 1971 until he retired in 1985.

Before coming to the University of Illinois he received a bachelor's degree from the University of Michigan and a master's from Syracuse. Among other positions Professor Nielsen was also Director of Systems Analysis at Battelle Memorial, Columbus, Ohio, and Chief of Operations analysis at GM Corporation, Warren, MI.

He was the author of 16 books and 200 articles, and received two patents. He is survived by his wife Carlene, (UIUC B.A. 1944) whom he met when he was a student, daughters, Janice and Cheryl, and one granddaughter.

Herbert Vaughan

Emeritus Professor **Herbert Vaughan** died March 21, 1992 in Champaign. Professor Vaughan received a B.S. in civil engineering and engineering mathematics in 1932, and a Ph.D. in mathematics from the University of Michigan in 1939. He taught at Brown University from 1935-36 and was an A.H. Lloyd Fellow at the University of Michigan 1936-37. He joined the UI faculty in 1937 and retired in 1978.

He was a member of Phi Beta Kappa, Sigma Xi, the American Mathematical Association and the Association of Symbolic Logic as well as other professional societies.

He is survived by his wife Irene. A son and a brother preceded him in death.

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Mathematicians Retire

Four members of the department retired last spring. **Felix Albrecht, David Muller, Irma Reiner,** and **T. W. Ting** were honored at a reception at Krannert Center for the Performing Arts.

Felix Albrecht, a native of Rumania, received his diploma in mathematics from the University of Bucharest in 1951, and came to the United States in 1964, where he taught first at Wesleyan University. Professor Albrecht joined our department as a professor in 1968.

David Muller, who received an honorary doctorate from the University of Paris in 1989, was awarded a Ph.D. in Physics from the California Institute of Technology in 1951. He came to Illinois in 1952 as a University Fellow in the Digital Computer Laboratory, and in 1960 he was named a professor in mathematics and in the Coordinated Science Laboratory.

Irma Reiner, who received her Ph.D. as well as a B.S. and M.S. from Cornell University, taught at Temple University until she came to UIUC as a faculty member in 1948. At the retirement ceremony a former student gave a moving tribute to her excellence as a teacher.

Tsuan Ting is a native of Anking, China, where he received his B.S. in Mechanical Engineering in 1947. Professor Ting worked as an engineer in China until he emigrated to the United States. In 1960 he was awarded a Ph.D. in mathematics from Indiana University and joined our department in 1966 as a professor.

Except for no longer having to give examinations and grade papers, all of the new emeriti seem to be as active as they were before they retired.

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