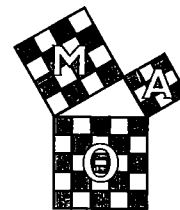


THE MATHEMATICAL LOG



Volume XXII, No. 1

October, 1977

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WOMEN IN MATHEMATICS: BIOGRAPHICAL SKETCHES

The study and practice of mathematics has been regarded popularly as male territory. In actuality, the "women's liberation movement" in mathematics is not something recent. It has been evolving for many centuries. Through the years, women have had to overcome much social pressure and actual discrimination in order to achieve some measure of recognition for their mathematical efforts. Who were these women who dared to invade mathematics? What problems did they encounter? What did they achieve? This material has been written in an attempt to answer such questions and to spark further interest in feminine mathematical contributions.

SOPHIE GERMAIN

Known as one of the founders of mathematical physics as well as a philosopher, Marie-Sophie Germain was born in Paris on April 1, 1776, the daughter of Ambroise-Francois Germain and Marie-Madeleine Gruguelu. The family was prosperous, her father being a goldsmith by trade and later, the director of a bank. Growing up during the political upheavals of late eighteenth-century France, she had to circumvent many extant prejudices against women scholars in general and women mathematicians in particular.

Her initial mathematical training was self-acquired, much against the wishes of her parents. Despite the fact that the newly-founded École Polytechnique did not formally admit women students, Sophie managed to obtain lecture notes of courses taught. She became particularly interested in the mathematical analysis of Lagrange. Using the name of M. le Blanc, she submitted a paper to Lagrange which impressed him. He ascertained her identity and became her mathematical mentor. She also used the same pseudonym in later correspondence with Gauss on number theory problems. Most of her advanced training was acquired by means of correspondence with scholars of the day rather than by formal class attendance.

Sophie's early research was in number theory. She also became interested in a problem involving vibrations of elastic surfaces. Her first paper on this topic, submitted anonymously in 1811 to the French Academy of Sciences, was flawed. She continued to work on this problem, however, winning the grand prize offered by the Academy in 1816 for her "Memoir sur vibrations des lames élastiques". She was honored publicly for her achievement and was invited to attend sessions of the Academy. Sophie published several additional papers dealing with the theory of elasticity, the last of which appeared posthumously in 1831.

Sophie's interests were not restricted to mathematics, however. She studied philosophy, outlining her views in "Considérations générales sur l'état des sciences et des lettres aux différentes époques de leur culture". The physical sciences and history also attracted her attention.

In recognition of her mathematical talent, Gauss recommended that the University of Göttingen grant her an honorary doctorate degree. Before the degree could be conferred, however, she died of cancer in Paris at the age of 55 on June 27, 1831.

SONYA KORVIN-KRUKOVSKY KOVALEVSKY

Another woman who had to scheme and plot to obtain a thorough mathematical education and an appropriate position was Sonya Kovalevsky. Born in Moscow on January 15, 1850, Sonya Korvin-Krukovsky was the daughter of Vasily Korvin-Krukovsky and Yelizaveta Shubert, the middle child of three. Her parents were members of the Russian nobility, the father being a general in the army. Despite the fact

that both her grandfather and great-grandfather were mathematicians, she had to overcome strong parental opposition to a mathematical career.

Her early training in mathematics was under the tutelage of Strannolyubsky at the naval academy in St. Petersburg. Since Russian universities were closed to women students, Sonya was forced to go to a foreign university for further training. To gain freedom to travel, she contracted a marriage of convenience with Vladimir Kovalevsky. The couple went to live in Heidelberg where Sonya attended classes in both mathematics and physics but was not permitted to matriculate. Her teachers included the mathematicians Königsberger and Du Bois-Reymond as well as the physicists Kirchoff and Helmholtz. Her desire to study at the University of Berlin under Weierstrass was foiled by the prohibition against women students. To circumvent this, Sonya went directly to Weierstrass and asked him to give her private instruction. When he discovered that even he could not change university policy, he became her private tutor for four years discussing with her not only his lecture notes but also many of his as yet unpublished mathematical ideas.

During this period of study with Weierstrass, Sonya wrote three research papers including her dissertation, entitled "Zur Theorie der partiellen Differentialgleichungen". The other two papers were published -- "Über die Reduction einer bestimmten Klasse Abelscher Integrale dritten Ranges auf elliptische Integrale" and "zusätze und Bemerkungen zu Laplaces Untersuchungen über die Gestalt der Saturnsringe". In 1874, Sonya was granted her doctorate degree without examination, *summa cum laude*, by the University of Göttingen. It was conferred in absentia because she was a woman.

Weierstrass attempted to find a position for her but again, the fact that she was a woman, stood in her way. She returned to Moscow and busied herself for almost three years with various literary endeavours—writing newspaper articles, poetry, and drama criticism. With the passing of time, Sonya became more and more unhappy and decided to return to Berlin on her own. Nevertheless, her husband's subsequent suicide, in the spring of 1883, affected her deeply.

While in Berlin, she worked with Weierstrass on the refraction of light in crystalline medium. The results were presented at a scientific congress held in Odessa in September 1883. Through the intercession of Gosta Mittag-Leffler, another student of Weierstrass; Sonya obtained an appointment at the University of Stockholm to lecture on the theory of partial differential equations. Initially, she was an unpaid lecturer (1883-4). Her title was then changed to Professor of Higher Mathematics. In 1889, she was granted a life professorship. She proved to be a popular, effective, and inspirational teacher. The courses she gave covered a broad spectrum of then known mathematics. She also served as editor of the journal ACTA MATHEMATICA which was founded by Mittag-Leffler in 1882.

Sonya continued doing research and in 1888 won the Prix Bordin from the French Academy of Science for her memoir entitled "Sur le problème de la rotation d'un corps solide autour d'un point fixe". In 1889, she received a prize from the Stockholm Academy for additional research on the same problem. That same year, she was elected to membership in the Russian Academy of Sciences, the first woman so honored.

Sonya's interest in literature also continued. Her published novels include *The Sisters Rajevsky*, an account of her childhood recollections, and *Vera Vorontzoff*, (or *The Nihilist*), a description of life in Russia.

(Unfortunately, the last years of her life were not particularly happy from a personal standpoint. Her older sister had died suddenly in 1887. She became involved in

(cont. Pg. 4, col. 1)

The official publication of the National High School and Junior College Mathematics Club, Mu Alpha Theta, which is sponsored by the Mathematical Association of America and the National Council of Teachers of Mathematics. Address correspondence to: Mu Alpha Theta, 601 Elm Avenue, Room 423, The University of Oklahoma, Norman, Oklahoma 73019.

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ANNOUNCEMENTS

The annual mathematics tournament sponsored by the Mu Alpha Theta Chapter of Pecos High School in Pecos, Texas, will be held on January 14, 1978. Kim Hawkins is President of the Pecos Chapter and Caroline Rankin is the Sponsor.

The Eighth Annual Mu Alpha Theta National Convention is scheduled for Stevens Point, Wisconsin, next summer.

The Third Annual Florida Mu Alpha Theta Convention is scheduled for February 17-18, in Miami. The meeting is being jointly planned by three schools, and the Sponsors are Mary Elizabeth Sullivan, Jo Anne Taber, and Hector Hirigoyen.

The Third Annual Tennessee Mu Alpha Theta Convention is scheduled for March 10-11, in Knoxville. Elizabeth Coffin is the State President.

The Annual High School Mathematics Examination has been set for March 14. Registration is handled regionally and closes January 15. A list of regional chairpersons can be obtained from Exec. Director Walter Mientka, The University of Nebraska, 917 Oldfather Hall, Lincoln, NB 68588.

Mu Alpha Theta's first book of STUDENT PAPERS will be out very soon. It will be called, appropriately, "Mathematical Buds, Vol. 1". Papers for the second volume are now being solicited. A submitted paper, in order to be considered, must have won some top award in some competition, or, if there is none in the region, must have the sponsorship of a mathematics teacher. When submitting your paper, remember:

1. Title of paper
2. Name of author
3. Address of author, including the zip
4. Telephone number of the author, including the area code
5. The award the paper won, or the name of the teacher sponsor
6. Name of school attended and its address
7. Four (4) copies of the paper mailed to:

Harry D. Ruderman
2624 Davidson Avenue
Bronx, New York 10468

Include a self-addressed envelope to return the papers after the judging, and a self-addressed postcard to acknowledge the receipt of the paper.

In order to obtain possibly a more objective evaluation, the papers sent to the judges will have the author's name and address blocked out. If three of the four copies did not have this information, it would be very helpful for then it would not be necessary to block out.

The Nominating Committee is seeking candidates for Governors of Region III and IV and for President-Elect. Region III includes the states; Illinois, Indiana, Ohio, Pennsylvania, New Jersey, Michigan, Wisconsin, Connecticut, New York, New Hampshire, Massachusetts, Vermont, Maine, and any European countries. Region IV includes the states; Kentucky, West Virginia, Virginia, Delaware, Maryland, Tennessee, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Cuba, and any South American countries.

Nominations should be sent as soon as possible to:

Dr. Sarah Herriot
Mathematics Department
Henry Gunn Senior High School
Palo Alto, California 94306

MESSAGE FROM THE PRESIDENT

If the activities of our student members at the recent National Convention in Dubuque, Iowa, are at all indicative, then Mu Alpha Theta has had another successful year.

There are several actions I'd like to suggest we take so that this coming year may be equally successful. My first suggestion arises from a recent action of your Governing Council - to give our clubs and student members a chance to influence national Mu Alpha Theta policy, the Council has established a Delegate Assembly of students, to be convened at each National Convention. Each club should now select one delegate, sending his or her name to the National Office. Having thus been formed, the Delegate Assembly shall have its first two-hour meeting at our eighth annual convention at Stevens Point, Wisconsin, next August. At that time, in addition to whatever other recommendations it may suggest and business it may transact, the Assembly will give delegates from each of our four Regions an opportunity to select a representative to a newly formed year-long Student Advisory Board to the Governing Council.

Elsewhere in this issue of the Log is an announcement from the Nominating Committee for the selection of a new President-Elect and a Governor for each of Regions III and IV. I urge student members and sponsors to take part in the nominating process by recommending names of sponsors or other mathematics teachers who have contributed wisely and consistently to the welfare of our clubs and to mathematics instruction in general.

Mu Alpha Theta has always been proud of its sponsorship of the High School Mathematics Contest. This contest has in turn led to our support of the U.S.A. Olympiad, and to American participation in the International Olympiad. So I am positive that all Mu Alpha Theta members take particular pride in the USA team's taking first place in this past year's International Olympiad, and thank not only the student members of this team, but all those who took an active leadership role in their Olympiad participation.

Many sponsors and students have in recent years expressed some concern over the content of the High School Contest. Should you have any feelings about this, make them known to the Governor from your region, the national office, or our Mu Alpha Theta representatives to the High School Mathematics Contest Committee: Dick Pieters of 13659 Preston Rd., #210, Dallas, TX 75240 or Martha Zelinka of 32 Pigeon Hill Rd., Weston, MA 02193. The more specific your suggestion, the easier it will be to understand and implement it. Robert Kalin

INTRODUCTION:

The Four-Color Conjecture is now a Theorem, proven by mathematicians Kenneth Appel and Wolfgang Haken of the University of Illinois. Professor Appel was a speaker at the August, Mu Alpha Theta Convention in Dubuque, Iowa. At the 1976 summer meeting of the American Mathematical Society in Toronto, Professor Haken was a speaker and presented an outline of their proof. Stephen Wax, an eleven-year-old schoolboy, whose father is a microbiologist, attended this presentation with his mathematician grandfather, Dr. Goldberg. The following is his report to his teacher.

No One Sleeps at the Math Meeting

In a recent study, I have noticed that 1 out of 3 microbiologists fell asleep during a microbiology lecture. Yet, only one out of 4,000 mathematicians yawned!

Why is it that no one sleeps at the Math meetings but $\frac{1}{3}$ the Microbiologists fall asleep at their meetings. Is it the problems? The solutions. Is it the four color problem.

You may ask what the four color problem is. It's a simple problem but it's hard to prove. It's a problem where you have to prove that any map given, can be colored in four colors without any of the regions touching each other with the same color. Mathematicians have been working on this for 123 years. But finally the proof comes. Two guys spent 4 years and 1300 hours computer time (300 have on a modern computer). They have $4\frac{1}{2}$ feet high of computer proofs. Everyone is so excited about this. But who really cares, my box of crayons has 16 colors, so I don't really have a problem.

Giving a problem to a mathematician is like telling a person to get the peeing in the corner in the round room (it keeps 'em busy!)

A Mathematician needs a problem like an alcoholic needs a drink! He needs a problem to be happy.

By,

Stephen Wax

CONVENTION HIGHLIGHTS

Approximately 325 persons attended the 1977 Mu Alpha Theta National Convention in Dubuque, Iowa, in August. Forty schools and twenty-five states were represented.

The winner of the Math Bowl competition was New Trier East High School of Winnetka, Illinois. Team members include Kei Mu Yi, Victor Milenkovic, Susan Levine, and Michael Spertus. The second place team in the Math Bowl was Gainesville High School of Gainesville, Florida, and the team members are Fred Tou, Philip Hren, Mark Bagnall, and Scott Blackowitz. Third place went to Wauwatosa West High School of Wauwatosa, Wisconsin, and the team members are Bradley Werner, Jay Nitschke, Mitchell Colton, and Alan Kopischke. In fourth place was Austin High School of Decatur, Alabama, and team members are Michael White, Richard Borie, Robert Sampson, and Jamie Oliver. Sponsors are Jeanne Travis of Gainesville, LeRoy Dalton of Wauwatosa, Gwen Snoddy and Thomas and Jeretta Thrasher of Decatur, and Sandra Whipple and Richard Rhoad of Winnetka.

An excellent program was provided. Loras College was a beautiful place and the people were great. Participants were both challenged intellectually and entertained royally. You missed a wonderful opportunity if you were not there.

A special thanks is in order to Miss Joyce Hubka of Wahlert High School in Dubuque who was Convention Chairperson and to Sister Paschal Nurré, the Program Chairperson. This list could extend to fill up The Log since so many people worked so hard. Let's just say, "Thanks Dubuque, Loras College, and Mu Alpha Theta members of Wahlert High School".

Plan NOW for next summer in Stevens Point, Wisconsin.



Attentive Listeners at Dr. Henry Pollak's presentation on "Mathematics and Industry" in Dubuque. (See---it pays off to sit down front.)

ARE YOU THINKING METRIC?

- How many centimeters tall are you?
- How many kilograms do you weigh?
- How many kilometers is it from your house to your school?
- How many square centimeters is the area of your desk top?
- How many milliliters of uncola do you drink at lunch?
- How many cheerliters do you have at your school?

(cont. from Pg. 1, col. 2)

an affair with Maxim Kowalesky who demanded that she give up her work to marry him. Finally, on February 10, 1891, she succumbed to influenza and died in Stockholm at the age of forty-one.

EDITOR'S NOTE: Dr. Grinstein has submitted biographical sketches of eight women whose contributions to mathematics have been notable. Other sketches will be presented in subsequent issues of The Mathematical Log. See if you can second-guess Grinstein and predict the other six. Big clues: They are all deceased; one taught in Bryn Mawr; See Dictionary of Scientific Biography.

U.S. MATHLETES WINNERS IN INTERNATIONAL MATHEMATICAL OLYMPIAD

A team of eight U.S. high school students won the first prize in the 19th International Mathematical Olympiad (I.M.O.) held in Belgrade, Yugoslavia on July 3,4. Two U.S. team members, Randall Dougherty of Fairfax, Virginia, and Michael Larsen of Lexington, Massachusetts, won individual first prizes with perfect scores on the two-day I.M.O. examination. Three U.S. teammates, Peter Shor of Mill Valley, California, Mark Kleiman of New York City, and Victor Milenkovic of Glencoe, Illinois, won individual second prizes. Team member James Propp of Great Neck, New York won a third prize.

The I.M.O. annually brings together teams of high school students from 17 nations for a spirited competition based on an examination requiring both broad knowledge and great mathematical ingenuity. The U.S. students topped teams from the U.S.S.R. (second place), Great Britain and Hungary (tied for third) and The Netherlands (fifth place).

The United States has competed in the I.M.O. only since 1974. This year's U.S. team is the first to win top honors, although the Americans have never finished below third place.

The U.S. team in the I.M.O. is chosen on the basis of performance in the U.S.A. Mathematical Olympiad which was held this year on May 3. The team was honored in Washington on June 7 at the Sixth U.S.A. Mathematical Olympiad Awards Ceremony and prepared for the I.M.O. at a training session held at the U.S. Military Academy, June 8-29.

The Mathematical Olympiad activities are sponsored by four national societies in the mathematical sciences. Financial support is provided by IBM, the Army Research Office, and the Office of Naval Research.

The Members of the U.S. team were:

- Randall Dougherty, Fairfax, Virginia
- Ronald Kaminsky, Albany, New York
- Mark Kleiman, Staten Island, New York
- Michael Larsen, Lexington, Massachusetts
- Victor Milenkovic, Glencoe, Illinois
- James Propp, Great Neck, New York
- Peter Shor, Mill Valley, California
- Paul Weiss, Brooklyn, New York

Sponsors of the U.S.A. Mathematical Olympiad and the U.S. team in the I.M.O. are:

- The Mathematical Association of America
- The National Council of Teachers of Mathematics
- Mu Alpha Theta
- The Casualty Actuarial Society

EDITOR'S NOTE: This is a News Release from The Mathematical Association of America. Dr. Nura Turner and Colonel Anthony Simkus provided us with the accompanying picture. An excellent write-up of the event appeared in the July 14, 1977, issue of the New York Times. Did you notice that Victor Milenkovic was on the Math Bowl team that won the competition in Dubuque, Iowa, at our Convention?



19th International Mathematical Olympiad

Members of the winning team shown in photo left to right are:

- Randall Dougherty, Fairfax, VA; Mark Kleiman, Staten Island, NY; Victor Milenkovic, Glencoe, IL; Peter Shor, Mill Valley, CA; Ronald Kaminsky, Albany, NY; Michael Larsen, Lexington, MA; James Propp, Great Neck, NY; Paul Weiss, Brooklyn, NY; Dr. Murray S. Klamkin, Professor of Mathematics, University of Alberta, Canada.

LETTERS TO THE EDITOR

Flash! A Letter! Flash! A Letter! Flash! A Letter!

Dear Mathematical Log,

Here is some feedback on your CRYPTARITHMS, tax + tax + tax + tax = math; the answer is: 821 + 821 + 821 + 821 = 3,284. And now for my cryptarithm: ask · h.ow = me.ss

I also bring you some ABSOLUTELY |SILLY|s.

- A person that can do anything. Variable
- Men that lie in the summer sun. Tangents
- What the bird owner said to his parrot that was on a diet. Polynomials
- What advice would you give to a person who can't draw arcs well. Triangles

I hope you like these as well as I like yours.

Your avid reader,
Todd D. Gatts

AN INTERESTING COMPUTATION

$$\begin{array}{r}
 56^2 - 45^2 = 1111 \\
 556^2 - 445^2 = 111111 \\
 5556^2 - 4445^2 = 11111111 \\
 55556^2 - 44445^2 = 1111111111
 \end{array}$$

Can you prove that

$$\underbrace{(555\dots56)^2}_{n \text{ digits}} - \underbrace{(444\dots45)^2}_{n \text{ digits}} = \underbrace{111\dots11}_{2n \text{ digits}} ?$$