

STATE OF THE COLLEGE NEW DEVELOPMENTS AND NEW FACES

BY SHELDON AXLER, DEAN
COLLEGE OF SCIENCE & ENGINEERING

The College of Science and Engineering now has an events web site, listing all the talks, seminars, colloquia, thesis defenses, and special events held by departments in our College. To get to it, go to our College's web site (<http://www.sfsu.edu/~cse>) and then click on "Events in the College". Check this web site often, as you may find talks that you will want to come hear, especially during the Fall and Spring. And you can browse through the archives of past talks to see the awesome variety of activities in our College.

This past year many universities throughout the country cancelled searches for new faculty due to the difficult economic climate. Thus people seeking faculty positions had fewer possibilities. We took advantage of the situation by hiring a remarkable group of truly outstanding teachers and researchers. Each of these new faculty members who will join us in Fall 2003 will bring to our students exciting new developments in science, mathematics, or engineering:

Sarah Cohen, Assistant Professor of Biology with a research appointment at the Romberg Tiburon Center, received her Ph.D. in Zoology from the University of Washington. She comes to us from Harvard University, where she had a postdoctoral position. Sarah uses genetic and ecological approaches to understand population level processes relating to a variety of basic problems in ecology, evolution, and marine conservation.

Joseph Gubeladze, Assistant Professor of Mathematics, received his Ph.D. in Mathematics from Leningrad State University. He comes to us from the Georgian Academy of Sciences (the one in Tbilisi, not Atlanta) and the Mathematical Sciences Research Institute in Berkeley. Joseph's research focuses on commutative algebra and combinatorics.

Michael Holden, Assistant Professor of Engineering, received his Ph.D. in Aeronautics and Astronautics from Stanford University. He comes to us from MLB, where he has been vice-president and lead engineer. Michael's work focuses

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Alumni Domain Three's a Charm for COSE Hood Recipient

by Merrik Bush-Pirkle



Photo by Jason Doi

"Learning is like rowing upstream; if you stop rowing, you are bound to go backward."

Although 22-year-old engineering student **Nelly Lau** stands before an audience of thousands, her voice doesn't waiver as she delivers this Chinese proverb.

Chosen as this year's student commencement speaker, Lau isn't proffering

empty sentiments—she embodies this wisdom. She admits that when she first entered San Francisco State as a Presidential Scholar she felt "somewhat lost and uncertain," overwhelmed by the new environment and the numerous options presented: making new friends, choosing a major, joining clubs and selecting classes. But Lau rowed hard during the ensuing four years, guiding herself along a phenomenal course of success that culminated in May

with an academic Triple Crown. In addition to being selected as this year's student commencement speaker and being named Hood Recipient for the College of Science and Engineering, Lau, a first-generation Chinese-American, leaves the University with a National Science Foundation Graduate Fellowship in electrical engineering, one of only 46 awarded in the nation. She will use the fellowship, which pays full tuition and living expenses at the graduate school of her choice, to enter the doctoral program in electrical engineering at Stanford University. She says her hope is to return to SFSU as a professor and as a role model for other young women interested in science, particularly the male-dominated field of engineering.

"When I chose engineering as my major, I discovered there were few females in the field," says Lau. "But I found in both our school of engineering and in the larger campus community a nurturing environment that is far better than other universities."

Despite her many successes, including holding leadership positions in numerous honor societies that emphasize outreach and community service, Lau is

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DYNAMICS IN THE WORLD OF MICROSCOPIC GEOMETRIC STRUCTURES



*Arek Goetz, Associate Professor,
Department of Mathematics*

Professor Arek Goetz, a mathematician, delivered an expository talk about the interplay of dynamics, geometry and computer graphics. In Dynamical Systems, an active area of contemporary research, one studies the long term behavior of objects subjected to a repetitive application of the same rule, frequently called a function. Objects of study may vary. Usually they are numbers or points in the plane. For example, a function $f(x) = x+1$ assigns a number to its successor. An orbit of number 10, is the sequence 10, 11, 12, 13, ... This orbit will eventually become arbitrarily large. In general, for some other functions, orbits may exhibit a different behavior. They may be cyclical, or they may not exhibit any particular pattern. The main goal in Dynamical Systems is to understand the orbit behavior of various functions. While this task is intriguing in its own right, additional applications of dynamical systems are found in physics, chemistry, computer science, meteorology and economics.

Dr. Goetz's dynamical world is that of geometry. He studies orbits of points subjected to a collection of rules called isometries. An isometry is an action that does not change shapes of objects. Isometries are divided into three groups: rotations, translations, and reflections (mirror images). The dynamics of the action of a single isometry are well understood. What makes the subject intriguing is the presence of discontinuities—lines separating different rules. The study of the impact of discontinuities is a rather new trend in the theory of dynamical systems. Maps with discontinuities have recently appeared in a number of applications, for example, in the theory of billiards, or the modeling of digital filters, electronic components used to filter out unwanted frequencies. (During his talk, when asked about “real world applications” of the systems, Dr. Goetz, smiled, then replied that an even more important application of these systems is the ability to attract many undergraduate students to the study of dynamical systems, and in the process, entice students to learn more about tools needed to investigate the complexity of the systems.)

One of the most tantalizing challenges of dynamics of piecewise isometries is to understand the structure of all these objects, which under the action of the piecewise

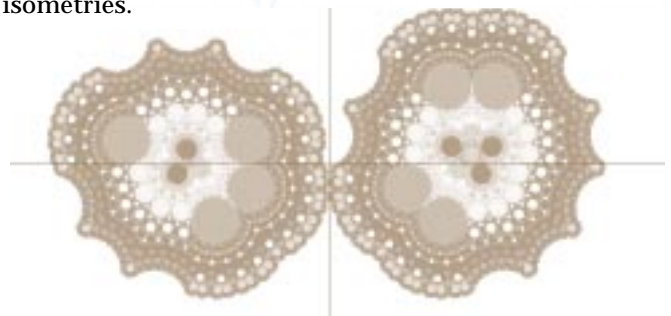


An illustration of a more complicated piecewise rotation with 10 pieces.

isometric system, are not broken up into smaller pieces. Only recently, thanks to powerful computers, has one been able to glimpse the complexity of this structure. This structure frequently appears to be a fractal, an object whose pieces are a smaller rescaling of the original object. These fractals consist of an infinite number of characteristic polygons. The polygons eventually come back onto themselves without being cut by discontinuities. While numerical computations were an early indication of the rich microscopic structures, they did not provide any mathematical proof of the presence of fractal-like phenomena. Within the past two years researchers have realized that convenient and powerful tools that allow them to think about the newly discovered structure more precisely are found in a seemingly distant area of mathematics, algebra, or more precisely, Algebraic Number Theory. In this area of mathematics, researchers are investigating relationships among integer numbers and as well as roots of unity. Roots of unity are complex numbers whose repetitive multiplication eventually yield the number one. Dr. Goetz and others think about these special numbers as vertices of equilateral triangles, squares, regular pentagons, etc. The collections of complex numbers that are derived from elementary operations on roots of unity, called cyclotomic fields, are particularly easy to handle on a computer. Their multiplication and division can be quickly and precisely handled using a representation of a list of integer numbers.

It turns out that the fractal mosaic of objects can be described precisely using cyclotomic fields.

This is remarkable unto itself. Hopefully—as has happened a number of times in the past when the application of tools from one area of mathematics leads to major progress in another area—the use of cyclotomic fields will lead to a breakthrough in the understanding of piecewise isometries.



Periodic structure of a piecewise isometric attractor. An attractor is a region to which all orbits are eventually attracted.

5TH ANNUAL STUDENT PROJECT SHOWCASE & ALUMNI RECEPTION

The College of Science and Engineering's 5th Annual Student Project Showcase and Alumni Reception, held on May 6th, was a huge success. By 4 p.m. the second floor of the Science Building transformed into a gallery of 70 scientific displays and demonstrations, highlighting everything from testing friction and building solar cars, to computer software wizardry and breakthroughs in genetic therapy. Graduate and undergraduate students from the College's eight departments competed for \$2,400 in prize money and the invaluable experience of presenting their research to the public. Each team also received an incentive of \$30 for participating in the showcase. Under the direction of our top-notch faculty, COSE students are involved in many high quality research projects.

While winning a cash prize is second-to-none for cash-strapped college students, the opportunity to showcase hard work offers its own rewards. Students have a chance to practice their presentation skills in a supportive setting and learn the very important art of communication.

Thanks to Drs. Kenneth and Pamela Fong for their continuing and generous support of the Student Project Showcase. If you or your company would like to sponsor this annual event or contribute to the showcase, please contact Lannie Nguyen-Tang (science@sfsu.edu or 415/338-7662).



The audience is intrigued with Dr. Arek Goetz's presentation entitled "Dynamics in the World of Microscopic Geometric Structures". Dr. Goetz is renowned for using technology to present exciting developments in mathematics to audiences of nonmathematicians.

Dean Sheldon Axler congratulates the graduate-level first place winner **Geoff Krampitz**, a Biomedical Laboratory Science student, for receiving the \$600 **Kenneth and Pamela Fong Student Excellence award**. His research was on "Regulation of Placental Cytotrophoblast Proliferation and Invasion by Jun Activating Binding Protein".

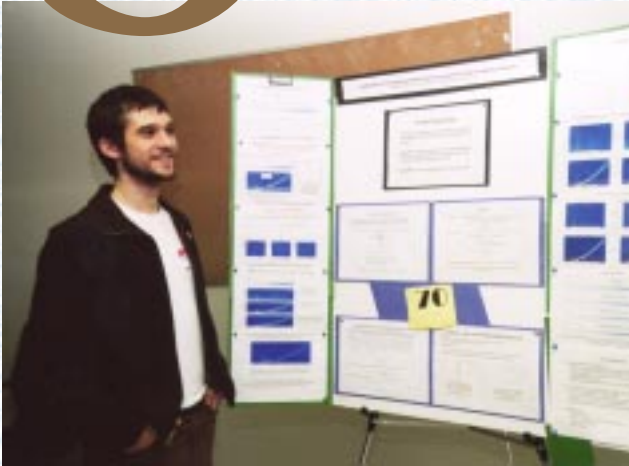


Dean Sheldon Axler presents the \$600 undergraduate-level first place **Kenneth and Pamela Fong Student Excellence award** to **Raymond Wu**, who majors in Chemistry and Biochemistry. Raymond's research is entitled "Interactions of Porphyrins with Micelles".

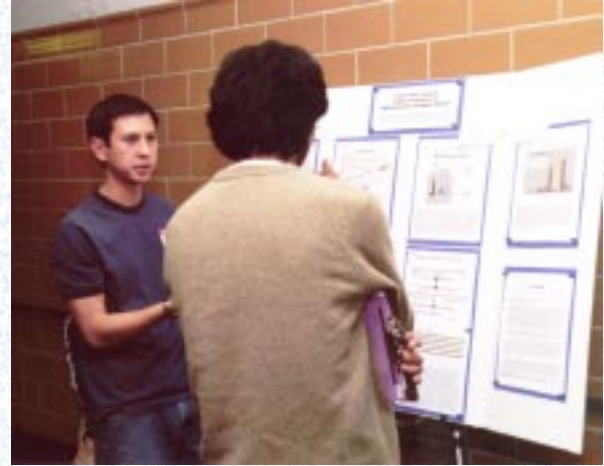
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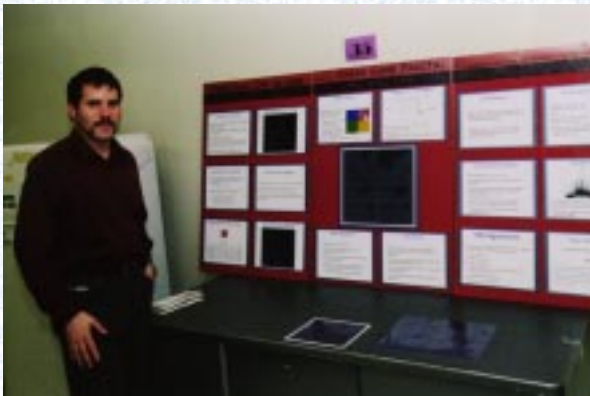
STUDENT PROJECT SHOWCASE & ALUMNI RECEPTION



Mike Hoffman, a double major in Physics and Mathematics, won the \$400 undergraduate-level second prize for his math project on “Applications of Non-Uniform Multi-Goabor Expansions to Time-Frequency Analysis”.



The \$200 graduate-level third place winner, **Ryan Kendle** (left), is presenting his research on “Fission Yeast Telomere Length and Sequence in DNA Replication and Repair Mutants” to faculty judge Albert Uy. Ryan majors in Cell and Molecular Biology.



Alexander Milowski, a Mathematics major, swept the graduate-level second prize for \$400 with his project on “Predicting CpG Islands using the Chaos Game Fractal”.



Raymond Wu (left) and faculty judge Andrew Ichimura (right).

THANK YOU!!!

for volunteering your time to be the Judges of the COSE Student Project Showcase.

- Dr. Carina Anttila, Department of Biology
- Dr. Teaster Baird, Department of Chemistry & Biochemistry
- Dr. John Caskey, Department of Geosciences
- Dr. Lily Chen, Center for Biomedical Laboratory Science
- Dr. Carlos Crocker, Department of Biology
- Dr. Ahmad Ganji, School of Engineering
- Dr. Toby Garfield, Department of Geosciences
and Romberg Tiburon Center
- Dr. Eric Hsu, Department of Mathematics
- Dr. Andrew Ichimura, Department of Chemistry & Biochemistry
- Dr. Barry Levine, Department of Computer Science
- Dr. James Lockhart, Department of Physics & Astronomy
- Dr. David Meredith, Department of Mathematics
- Dr. Nilgun Ozer, School of Engineering
- Dr. Arno Puder, Department of Computer Science
- Dr. Diana Smith-Beckerman, Center for Biomedical
Laboratory Science
- Dr. Albert Uy, Department of Biology



← **Abraham Khoury** (right), an Electrical Engineering senior, demonstrates his “Stethoscope” to President Corrigan (left).



↑ **Cornell Wells** (far left), the \$200 undergraduate-level third place winner, explains his project entitled “Receptor Ligand Interactions of Ecdysis Triggering Hormone (ETH)” to President Corrigan (far right).

→ Left to right: Dean Sheldon Axler, President Corrigan, **John Kpaka**, and **Adam Selvin**. Adam and John, Mechanical Engineering students, displayed their “Friction Testing” project.



← **Kseniya Zakharyevich** (middle), a Cell and Molecular Biology undergraduate, talks to judges Carina Anttila (left) and Lily Chen (right) about “In Planta Transient Expression of avrRxv Protease Domain Mutant”.

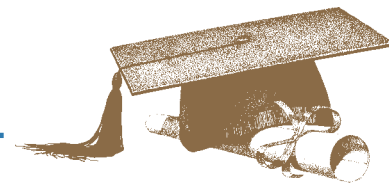


↑ **Yashieka Blount** (middle) is talking to Dr. Leroy M. Morishita (right), Vice President for Physical Planning and Development and SFSU alumnus, about their project entitled “The Role of Phosphatidylinositol 3-kinase (PI3-K) in IFN- β Production”. Both Yashieka Blount and **Kristen Wolslegel** (left) major in Cell and Molecular Biology.



← Judge David Meredith (left), Chair of Mathematics, listens to **Andy Danielson's** explanation about his “Got Galaxies?” project. Andy is a graduate student in the department of Physics and Astronomy.

More photos can be found online at www.sfsu.edu/~science.



Congratulations to the spring semester's scholarship winners! **Bonnie B. Bertolet** (Cell & Molecular Biology), **Mark Co** (Biology), **Orville J. Canter** (Computer Science), **Luping L. May** (Computer Science), and **Haijie Xiao** (Computer Science) received the \$1,000 COSE Community Service (Radin Foundation) Scholarship.

Laura M. Garrison (Ecology & Systematic Biology) and **Toni N. Torres** (Mathematics) earned \$1,250 Kenneth and Pamela Fong Scholarships for Biology and Mathematics majors.

Without you—our supporters—these scholarship opportunities would not be possible. Our students appreciate your generous gifts and will put the money to good use. In an ongoing effort of increasing the numbers of scholarships and awards for science and engineering students, the College is requesting your generous contributions.

If you would like to establish a new fund or have any questions regarding our Scholarships and Student Project Fund Program, please contact Lannie Nguyen-Tang at (415) 338-7662 or email to: science@sfsu.edu.

SFSU SCIENCE & ENGINEERING CAREER FAIR BY SHIRA BEHIRI

Employers who participated in the Science and Engineering Career Fair were impressed by the diversity of interested students and the well organized and convenient facilities in which the event was held. The College of Science and Engineering and the University Career Center received overwhelmingly positive feedback from off-campus employers:

“The cost was affordable and the student interest was excellent.”

“SFSU has provided us with quality employees—many talented individuals go to school here.”

“Students asked great questions and most knew what career path they would take. Students have the qualifications we are looking for.”

Employers were impressed by the University's accessibility by public transportation and free shuttle service. Employers also expressed enthusiasm for the luncheon buffet and the friendliness and professionalism of the Career Center staff. Most importantly, companies that have hired SFSU Science and Engineering students have reported that the students greatly exceeded job performance expectations.

Part of the proceeds collected from Career Fair revenues are awarded to student associations in the form of Career Grants. The SFSU Career Center recently awarded \$250.00 to each of the following associations: The Society of Hispanic Engineers, The Society of Women Engineers, and the National Society of Black Engineers.

The Fall 2003 Science and Engineering Career Fair will be held in late October. **Please contact Laura Carter at (415) 338-1762 or lcarter@sfsu.edu to reserve space.**



Science@sfsu.edu

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Visit our cyberhome at <http://www.sfsu.edu/~science/>

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• WANTED •

WOMEN ENGINEERING ALUMNI!

The **Society of Women Engineers (SWE)** at San Francisco State University is seeking women Engineering alumni to assist us in rebuilding and strengthening our Women's Engineering Program. We would like to secure future speakers for events and to possibly renew our Shadow Program. Our goals include promoting awareness of women in the engineering fields and enriching both the academic and professional lives of women engineering students by providing them educational and emotional support. For more information, please e-mail us at sfsuswe@sfsu.edu. We hope to hear from you soon!

SEEKING ENGINEERING DESIGN CENTER PROJECTS

Many of our Engineering alumni remember working on EDC projects as students. These projects are a good way for students to gain experience and assist local industries and governments with gaining access to University help at a low cost (or even no cost). We've done more than 40 in the past ten years. Since the School of Engineering is about to bring some new faculty on board, we would like our grads to help us identify some potential new projects (or contacts) within their companies. Projects can range from no cost, Engr. 697 type projects, to small research or application type projects in the \$10k-\$30k range.

Please contact ShyShenq Liou, at ssl@sfsu.edu or 415-338-1174.

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on robotics, and in particular on miniature robotic aircraft.

Dragutin Petkovic, Chair and Professor of Computer Science, received his Ph.D. in Electrical Engineering from UC Irvine. He spent most of his career at the IBM Almaden Research Center, where he received several awards, including IBM Research Awards (1989, 1991, and 1993), Seybold Innovation Award (1995), Blue Chip Award (1994), and IEEE Fellow (1998). Dragutin's work focuses on image processing and analysis.

Felipe-Andres Ramirez-Weber, Assistant Professor of Biology, received his Ph.D. in Molecular and Cell Biology from UC Berkeley. His previous work was mostly at UC San Francisco, with a brief stay at CSU Fullerton. Felipe's work focuses on the mechanisms that govern the proper

growth and patterning of embryonic tissues.

Debra Fischer, Assistant Professor of Physics and Astronomy, received her Ph.D. in Astrophysics from UC Santa Cruz. She comes to us from UC Berkeley. Debra searches for (and discovers!) new planets outside our solar system, using facilities at the Lick Observatory combined with spectrometer optics and Doppler analysis algorithms.

Leonard Sklar, Assistant Professor of Geosciences, received his Ph.D. in Earth and Planetary Science from UC Berkeley this year. His research focuses on the erosional processes that shape the surface of the earth, with a primary emphasis on river incision into bedrock and the role of sediment supply.



Alumni Domain continued from page 1

humble, and she is quick to credit University staff and faculty—three in particular—for helping here succeed.

"I personally want to thank Dr. Gail Whitaker, Dr. Shy-Shenq Liou and my mentor, Dr. Sung Hu, for their support and guidance," she said.

"Even though Nelly has accomplished a great deal in her life already and has held many leadership positions, she is also very humble," said Hu, an engineering professor and COSE's Associate Dean. "She is a well-balanced, mature and motivated young woman."

For Lau, it seems, everything comes in threes. She is the oldest of three children, she has served as president of three honor societies and she is highly successful in the three realms that dominate her life: academia, leadership and, finally, community service. Beginning at age 10, when most kids her age were playing video games or cruising shopping malls, Lau was volunteering at her local library, teaching children to read. She didn't tire of the novelty. Instead, it blossomed into a lifestyle. She has cleaned alleyways and planted trees in Chinatown, regis-

tered voters, fed the poor, cared for the elderly, collected books for needy children, and more.

During her commencement speech, Lau also offered three messages to graduates. In addition to encouraging the audience with the wisdom of her ancestors, she emphasized the need to use communication, compromise, and compassion in living our lives, and finally, to avoid the pitfalls of stereotypes.

Looking out over a sea of gowns and mortarboards, flanked by university leaders and luminaries, she speaks with the determination of a woman well beyond her years.

"I think engineering is a wonderful profession for the clear mind of a female," says Lau, who has proven that she holds her oar firmly in hand. "Therefore, do not be limited by society's stereotypes."

In quoting Ralph Waldo Emerson, she adds, "Do not go where the path may lead, go instead where there is no path and leave a trail."



PROMOTING STUDENT-FACULTY INTERACTION THROUGH BOWLING

BY DIANE SHEM AND FRANK CHIN

Given the lack of social activities available to university students at SFSU, the Chemistry & Biochemistry Student Association (CBSA) has created *Chembowl*, a bowling league, for the 2002-2003 academic year. Teams are comprised of faculty members and majors, including both graduates and undergraduates. In the first semester alone, 12 teams were established, totaling approximately 60 participants. The success of previous faculty-student challenges that take place at the end of each semester has led to the evolution of this monthly activity where more people in the department can participate. Funded entirely through the sale of lab manuals and corporate donations, *Chembowl* is based on the idea that faculty-student activities improve student retention and promote a community atmosphere.

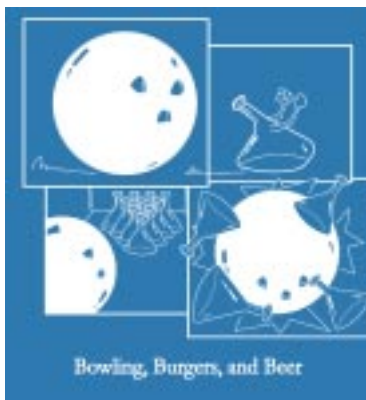
Chembowl meets four times a semester on the first Friday of each month at Serra Bowl in Daly City. Participation is free for all students and faculty, allowing for both undergraduates and graduates to meet with faculty and learn about their research in a social manner. Many students have expressed their appreciation for the opportunity to converse with faculty members and their peers on a regular basis. The faculty has also taken the opportunity to get to know their students and recruit them into their research labs.

Members of the CBSA attended the spring national meeting of the American Chemical Society to present a poster titled, *Chembowl: organizing, funding and maintaining a year-round social activity*. The poster was well received by other ACS Student Affiliates that were interested in establishing a similar activity at their campus. They were also impressed by the implementation of a uniform, which is the *Chembowl* T-shirt.

Although *Chembowl* began as a student activity, much of the success is attributed to the faculty, who permitted their manuals to be sold through the CBSA. The CBSA must actively fundraise a minimum of \$1,200 per semester to pay for *Chembowl*. Any donations from alumni would greatly help in offsetting this cost.

A photo gallery of the faculty, students, and teams is on display on the 7th floor of Thornton Hall. Additionally, the department glass blower was commissioned to design four bowling balls made out of glass to be used as trophies. These are awarded to the top three teams and the most improved team at the end of each semester, whereupon each trophy is prominently displayed in the office of the winning faculty member.

Graphic: Design of the official Chembowl T-shirt with the slogan, "Bowling, Burgers and Beer." Artist: Andrew Shem



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