Nomination for

Dr. Bernard J. Feldman
Professor of Physics
Associate Dean, UMSL/Wash. U. Joint Undergraduate Engineering Program
228 Benton Hall

Chancellor’s Award for Excellence in Teaching

Nominated by
Dr. Bruce A. Wilking
Chair, Department of Physics & Astronomy
503J Benton Hall

TABLE OF CONTENTS

I. Nomination Letter

To: Senate Committee on Faculty Teaching and Service Awards

From: Bruce A. Wilking
Chairperson, Department of Physics & Astronomy

Date: April 25, 2008

Nomination of Professor Bernard J. Feldman for Chancellor's Award for Excellence in Teaching

It is my pleasure to nominate Professor Bernard J. Feldman for the **Chancellor's Award for Excellence in Teaching**. Since arriving at UMSL in 1974, Professor Feldman has dedicated himself to teaching physics at the introductory and advanced levels and promoting science to the UMSL campus and community.

Professor Feldman has taught a wide variety of courses at UMSL, but recently his efforts have been with the first introductory physics course (with calculus) for physics, chemistry, and engineering majors and the advanced physics lab. In the introductory course, Physics 2111 (Mechanics & Heat), he has the highest teaching evaluations in the Department and students plan their programs to take the course when he is teaching. He is an engaging lecturer, skilled at holding the student's attention and explaining difficult concepts. He enriches the material presented in the textbook by introducing everyday examples of physics principles in his lectures such as a real life automobile accident, the Nimitz freeway collapse, and automobile technology. Students frequently comment about how much he cares about his students and learning, being accessible outside of class, and advising students about their long term goals. In his letter, former student Bilgehan Donmez comments:

"In addition to Dr. Feldman's ability to explain ambiguous concepts clearly, the simple experiments he did in class were helpful to keep student's attention…..His skills in the classroom inspired me to go to graduate school."

Another former student, James Lafikes, notes the classroom atmosphere Professor Feldman creates:

"One of the many attributes that sets Dr. Feldman apart from other teachers has to include his enthusiasm. … Dr. Feldman always found a way to share his love for science with his students and consistently makes his classes enjoyable to attend."

On a recent trip to South Africa, Professor Feldman shared some of his teaching techniques with colleagues at the University of Western Cape. Professor Delia Marshall writes:

"He struck UWC faculty and students alike as a deeply passionate and deeply committed educator and teacher, who clearly takes a genuine, personal interest in his students. He has a gift of relating physics to everyday contexts that are meaningful and relevant to young people."

Professor Feldman also has a passion for teaching science to non-scientists and helping to create an educated citizenry. He has worked extensively with the Junior Science, Engineering, and Humanities Symposium and the STARS program. He often donates his time to talk to elementary school students about science (see article in Appendix A). When the Honors College called for courses, it was a natural for Professor Feldman to answer the call by developing a "Science in the News" offering (Honors 2050). This course challenges students in the Honors College to investigate and debate current topics such as global warming, the medical use of marijuana, and hybrid cars. In his letter, Dean Bliss comments about this course:

"Students taking this course as an easy or painless way to their general education science requirement have been disappointed. Students looking for intellectual stimulation, challenging reading, and lively discussion have been entranced."

In recent years, Professor Feldman's research has combined his interest in bringing real life examples in to the classroom with innovative teaching techniques. Since 1997, he has published 11 articles in physics education journals that share the unique lecture topics he has developed ranging from the physics of bird flight to the collapse of the Tacoma Narrows Bridge. These articles are designed to help physics teachers present interesting topics not found in standard textbooks. He has also published his ideas on how to teach physics. Professor Art Hobson, Professor Emeritus from the University of Arkansas and author of a popular physics textbook comments:

"*I have valued Prof. Feldman's interest and enthusiasm for such issues as global warming, energy resources, nuclear weapons, and the societal implications of automobiles. We really need more people like him in physics education. These societal topics are vital to the healthy future of the human race."*

In evaluating Professor Feldman's publications in physics education, Physics Professor Patrick Gibbons summarizes:

"…the papers are a treasure trove of good ideas for teaching introductory physics in ways that include active participation by students, analyses of real data, and situations the students find interesting. "

In closing, Professor Feldman has made outstanding contributions to the teaching of science to UMSL students, to the community, and to science teachers worldwide. He is a talented communicator, making difficult subjects comprehensible to students through the use of examples from the real world rather than textbook abstractions. For these contributions and his passion for teaching, I strongly recommend Professor Feldman for the **Chancellor's Award for Excellence in Teaching**.

Sincerely,

Bruce A. Wilking, Chairperson
Physics & Astronomy

III. Bernard J. Feldman's Philosophy of Teaching

My philosophy of teaching is very simple: I ask myself: What do I want the student to retain five years after the course is over? In the case of Physics 2111, the introductory physics class for physical science and engineering students, it is a mastery of problem solving skills: namely the ability to translate a technical word problem into a set of mathematical equations. For Physics 4311, the Senior Laboratory course and capstone class for physics majors, it is a confidence to handle and understand a variety of research equipment and the ability to make both a written and oral reports of their experiments. For Honors 2111, Science in the News, an honors course for non-science majors, my goal is to develop a life-long interest in at least a few areas of science.

Physics 2111. To achieve my goals in this class, I strongly believe that a big part of successful teaching is motivation. I make it abundantly clear that I want and expect all my students to do well. I adjust the work and difficulty level of every class so that everyone has a chance of getting at least a C if they just work harder. I offer make-up exams if the class does poorly on an exam. I put in a great deal of time and effort in the class, not only in my lecture preparation, but in grading all the quizzes and exams, having extensive office hours, visiting the laboratories and discussion section, and holding an extra study session before the final exam. I feel that if they see me working hard on the class, they will also.

Second, I believe in time on task. Besides a homework assignment every week, I have a quiz or exam every week. I have four one-hour exams, and the final exam is comprehensive. I force my students to study throughout the semester, not just the night before exams. Every question on every exam is a word problem. Also, for every quiz and exam, I provide all the equations they need, so they do not have to memorize them—they can focus all their energies on developing their problem solving skills. When they hand in their exams, they receive a solution sheet, and their exams and quizzes are always graded and returned the next class period. Problem solving is a skill that is only learned through practice, and the more practice, the better the skill.

Third, I believe in an interactive class. I am constantly asking students questions to see if they understand the material, and in turn, I encourage questions from the class. I create a class atmosphere where students feel comfortable asking questions.

Fourth, I believe in individual tutoring. I strongly encourage my graduate TAs to work individually with students, watching them work problems on the blackboard, so their mistakes can be corrected while they work problems. All my make-up exams are individual oral exams, where I watch each student work problems on the black board and correct their mistakes as they make them.

Fifth, I believe that real-life examples make the class interesting and relevant. I have incorporated into the class, materials from special relativity, modern physics, the assassination of John J. Kennedy, a real life automobile accident, radon gas and lung cancer, the Tacoma Narrows Bridge and Nimitz freeway collapses, how birds fly, and a whole lecture on automobile technology. (A great deal of this material I have published in *The Physics Teacher*, so other high school and college teachers can use it.)

Sixth, I believe that students have a short attention span, and it is much better to have three 50 minute lectures instead of two 125 minute classes. Consequently, I opposed my Dean's efforts at eliminating Friday classes and reinstated the Monday, Wednesday, Friday schedule for Physics 2111.

Physics 4311. To achieve my goals in this class, I believe in students working individually on experiments. When two or more students work on an experiment, most times one student does all the work and the other watches.

Second, I believe in the importance of oral presentations. Students need practice talking about scientific material. The students perform three experiments each semester, and they have to give three twenty minute, power point presentations, one for each of the three experiments they do. During these presentations, the students are interrupted with questions to see if they understand what they have said. This is good practice both for future job interviews and for oral presentations on the job.

Third, I believe that the students need to understand sources of errors and limitations of equipment. For example, if they are measuring the pulse width of a laser beam, they have to understand the time response of the detector and the RC time constant of the circuitry.

Fourth, I believe students need to be acquainted with a variety of experimental techniques. That is why we insist that the three experiments they perform use different equipment; they are not allowed to do three optical experiments or three electrical experiments. They use oscilloscopes, lasers, lock-in amplifiers, computers and computer interfaces, and electrical multi-meters.

Fifth, I believe that students need the experience of designing and building their own experiment. For the third experiment in this class, the students have to design and build an experiment of their choice. We provide them with a list of potential experiments—see syllabus for this class—and then guide them through the experiments of their choice. We also consider experiments off the list suggested by the students, if we think it is doable in the five week period.

Sixth, I believe in the importance of written presentation. Each student must write up one of the three experiments he or she has done. The write-up includes references, data presentation and analysis, and error analysis.

Honors 2050. To achieve my goals in this class, I believe in encouraging students to develop and pursue their interests in science. Each student selects a scientific topic of his or her own choice to research, to present a twenty minute power point presentation to the class, and to write a 10 page summary, including references. Last semester, topics ranged from the medical value of marijuana, scientific view of homosexuality, HIV/AID, hybrid cars, and black holes.

Second, I believe in choosing topics that are controversial, topical, and relevant to students. My hope is to expose students to scientific topics that pique their interests enough that they want to learn more about those topics. Last semester, the topics I chose to cover included global warming, health effects of cell phones, automobile technology, scientific fraud, psycho-pharmacology and the biological basis for personality.

Third, I believe students learn about science by talking about science. Students have to write six one-page essays on various science controversies (for example, what should this country's policy towards global warming be?), read them in class and defend their positions against opposing viewpoints of their classmates.

Fourth, I believe that students should be exposed to both sides of a scientific controversy, and should be allowed to make up their own minds—not regurgitate the teacher's viewpoint. I make it perfectly clear that the student is not graded on how close or far he or she is to my viewpoint, but how well he or she defends his or her position.

Fifth, I believe students should be exposed to on-going scientific research. I invite a number of my colleagues to give a talk about their research to my class. I also give a tour of some of the research laboratories on campus.

IV. Evidence Supporting Nomination

The evidence supporting the nomination of Bernard J. Feldman for the Chancellor's Award for Excellence in Teaching consists of a number of elements in addition to my letter (Sec. I), Course Evaluations (Sec. VII), Dean Bliss' letter (Sec. VIII), and letters from students and professional colleagues (Sec. IX). The first is his teaching at UMSL, in particular his teaching of Physics 2111, Physics 4311 and Honors 2050.

Professor Feldman has taught Physics 2111, the introductory class for physical science and engineering students, approximately once a year for most of his 34 years at UM-St. Louis. He has incorporated the motivational, time on task, interactive, tutoring, real-life examples and the MWF schedule elements into all these classes. The evidence that these elements are successful is found in the class evaluations, the letters from students, and the success of students taking the next course in the sequence, Physics 2112.

Professor Feldman has taught Physics 4311, the senior laboratory course and capstone course for physics majors in the engineering and general physics options, about once a year for the last seven years. He created this course in the late 1970s, and each course incorporated the one person to an experiment rule, oral presentations, sources of error and limitations of equipment, variety of experimental techniques, student designed and built experiments, and written presentation elements. Given that the class has had up to eight students in this class, at least eight built experiments were needed. Professor Feldman has built five of the ten built experiments –gallium arsenide laser spectroscopy, high temperature superconductivity, nuclear magnetic resonance, semiconductor Hall effect, and the magneto-optical Faraday effect (Wayne Garver, the departmental electrical technician, developed the remaining five). The evidence that these elements are successful is found in the class evaluations, the letters from students, and the future success of those students.

Professor Feldman has taught Honors 2050, Science in the News, six times in the last 19 years. The course is designed to expose non-science majors to recent developments in science. Professor Feldman created this course for the Honors College and this course has always included controversial topics, presentation of both sides of a controversy, exposure to research on this campus, and students talking, writing and speaking about science. The evidence that these elements are successful is found in the class evaluations and letters from students.

Professor Feldman has shared his pedagogical materials and techniques with the physics community through the publishing of articles. All the articles in *The Physics Teacher* are on topics that will excite students (and teachers) about science and engineering, that can be presented with a minimum of mathematics, and contain unanswered questions to be left for future scientists or engineers. For example, the reasons for the collapse of the Tacoma Narrows Bridge or the Nimitz Freeway are not known. The evidence for the value of these publications is found in the letters from physics educators.

Professor Feldman has given numerous talks on automobile technology, fraud in science and collapsing bridges to a wide variety of audiences. The talk on automobile technology has been given to students in the Physics 1001, How Things Work, every year, to an audience at the St. Louis Science Center speaker series, visiting students from Japan, scientists at NASA Goddard Space Center, retirees of Monsanto Company, faculty and students at Toyo University and the University of the Western Cape, and physics teachers at an American Association of Physics Teachers meeting. The talk on scientific fraud was given to UMSL faculty and graduate students, UMSL Chemistry graduate students, UMSL Physics club members, at Stellenbosch University, the UMSL Chapter of Sigma Xi, at the UMSL Junior Science, Engineering and Humanities Symposium to 300 high school teacher and students, and physics teachers at an American Association of Physics Teachers meeting. The talk on collapsing bridges was given to the UMSL Physics Department, St. Louis Community College pre-engineering students, and the University of the Western Cape.

Professor Feldman has worked with grammar school and high schools students in the St. Louis area. He has presented an interactive talk on forces and magnetism to many 4th and 5th grade students in the St. Louis area, and has published an article about that experience in *Physics Today* (see publication c7 also in Appendix A). He has participated in the STARS program and conducted research with seven high school students; this effort has led to eight publications jointly with these STARS high school students (publications c10, e66, e65, e51, e48, e46, e45, and e43). He has also participated in the JSEHS for many years, either judging papers or oral presentations.

Professor Feldman has taught a number of courses recently as an overload without compensation, so that both physics and engineering students could graduate on time. These include Modern Optics in the summers of 2005 and 2007 and Electricity and Magnetism in the summer of 2006 and the Fall of 2007.

Professor Feldman has taught Physics 4311, the senior advanced laboratory, in recent years as an unpaid overload, in order to assist the Physics and Astronomy Department which is short of faculty.

V. List of Courses Taught (1994-2008)

Bernard J. Feldman

Winter, 2008
Physics 2111: Physics: Mechanics and Heat
Physics 4311: Advanced Physics Laboratory I (no compensation)

Fall, 2007
Honors 2050: Inquiries in the Natural Sciences
Physics 3223: Electricity and Magnetism (Directed reading for 1 student, no compensation)

Summer, 2007
Physics 4311: Advanced Physics Laboratory I (no compensation)
Physics 4323: Modern Optics (Directed reading for 7 students, no compensation)

Winter, 2007
Physics 2111: Physics: Mechanics and Heat
Physics 4311: Advanced Physics Laboratory I (no compensation)

Fall, 2006
Honors 2050: Inquiries in the Natural Sciences

Summer 2006
Physics 3223: Electricity and Magnetism (Directed reading for 1 student, no compensation)

Winter 2006
Physics 2111: Physics: Mechanics and Heat
Physics 4311: Advanced Physics Laboratory I (no compensation)

Fall 2005
Honors 2050: Inquiries in the Natural Sciences

Summer, 2005
Physics 4323: Modern Optics (Directed reading for 6 students, no compensation)

Winter, 2005
Physics 2111: Physics: Mechanics and Heat

Fall 2004
Physics 2111: Physics: Mechanics and Heat

Winter 2004
Honors 3050: Advanced Seminar in the Natural Sciences
Physics 4311: Advanced Physics Laboratory I (no compensation)

Fall 2003
Physics 2111: Physics: Mechanics and Heat

Summer 2003
Physics 4331: Quantum Mechanics (Directed readings for 3 students, no compensation)

Winter 2003
Physics 311: Advanced Physics Laboratory I (no compensation)[1]
Physics 111: Physics: Mechanics and Heat

Fall 2002
Physics 231: Introduction to Modern Physics

Winter 2002
Physics 311: Advanced Physics Laboratory I (no compensation)
Physics 111: Physics: Mechanics and Heat

Fall 2001
Physics 111: Physics: Mechanics and Heat

Winter 2001
Buy out of time to prepare ABET accreditation documents for the Joint Engineering program.

Fall 2000
Physics 111: Physics: Mechanics and Heat

Winter 2000
Honors 305: Advanced Seminar in the Natural Sciences

Fall 1999
Physics 111: Physics: Mechanics and Heat

Winter 1999
Physics 111: Physics: Mechanics and Heat
Honors 300: Advanced Seminar in the Natural Sciences

Fall 1998
Physics 111: Physics: Mechanics and Heat

[1] Note that beginning in summer 2003, Physics 111 was renamed Physics 2111 and Physics 311 was renamed Physics 4311.

Winter 1998
Physics 351: Elementary Solid State Physics
Physics 111: Physics: Mechanics and Heat

Fall 1997
Honors 300: Advanced Seminar in the Natural Sciences
Physics 341: thermal and Statistical Physics

Winter 1997
Physics 111: Physics: Mechanics and Heat

Fall 1996
Physics 11: Basic Physics I

Winter 1996
Physics 111: Physics: Mechanics and Heat
Physics 400: Special Problems

Fall 1995
Honors 300: Advanced Seminar in the Natural Sciences
Physics 381: Directed Readings in Physics

Winter 1995
Physics 111: Physics: Mechanics and Heat
Physics 390: Research

Fall 1994
Physics 231: Introduction to Modern Physics

VI. Selected Syllabi

Honors 2050: Science in the News

Professor Bernard J. Feldman
228 Benton Hall
feldmanb@umsl.edu

Syllabus

Textbook: Peter Kramer, "Listening to Prozac."
Scientific articles handed out in class.

35% of grade: A series of about six short essays (about one type-written page each) on scientific topics assigned in class. Students will read their essays to the class as well as hand them in for grading.

20% Twenty minute oral presentation, usually power point, on a scientific topic of the student's choice, but with the instructor's approval. A rehearsal is required.

20% Ten page, type written report on the same scientific topic as the oral presentation, including references and figures.

25% Student Attendance. Attendance will be taken every class. If 30 minutes late, 67% credit; if one hour late, 33% credit.

Note about plagiarism. If you use text or even ideas from another source, you must reference them in all written and oral work.

Syllabus for Physics 2111, Spring 2008

Instructor: Dr. Bernard Feldman
Office: 228 Benton Hall
Office Hours: 11:00 –12:00 MW
E-Mail: feldmanb@umsl.edu
Text: Serway and Jewett, Physics, Sixth Edition

Prerequisites: Math 80 or Math 100, Calculus 1

Course Description: An introduction to the phenomena, concepts, and laws of mechanics and heat for physics, chemistry, computer science and engineering majors.

Grading: One hour exams: 50%
In class weekly quizzes: 10%
Laboratory: 20%
Final Exam: 20%
Final exam and homework: Between grades.

Homework assignment: Ch.2. #9, 19, 37, 42, 47, Subway problem.
Due: Wednesday, January 25.

Discussion Sections:
9:30-10:20 Tuesday, 240 Benton
9:30-10:20 Thursday, 240 Benton

Laboratories:
9:30-11:20 Tuesday, 331 Benton
9:30-11:20 Thursday, 331 Benton

Tentative Schedule:
Ch.2 , Jan. 14, 16, 18
Ch. 3, Jan. 23, 25
Ch. 4,. Jan.28, 30 Feb. 1
Quiz on Ch. 2, Jan. 23
Quiz on Ch. 3,. Jan. 30
Review for Exam 1, Feb. 4
Exam 1, Feb. 6
Ch. 5, Feb. 8, 11 13, 15, 18
Ch. 6, Feb. 20, 22
Ch. 7 & 8, Feb. 25, 27, 29
Review for Exam 2, March 3
Exam 2, March 5
Ch. 9, March 7, 10, 12, 14
Ch. 10,& 11, March 17, 19, 21, 31, April 2
Ch. 12, April 4
Review for Exam 3, April 7
Exam 3, April 9
Ch. 15, April 11, 14
Ch. 19&20, April 16, 18, 21
Ch. 22, April 23, 25, 28
Review for Exam 4, April 30
Fourth Exam, May 2

Final Exam: May 7, 7:45-9:45 am

Physics 4311 Syllabus

Requirements: Each student working alone must complete three experiments. At the end of each five week section, the student will give a 20 minute power point presentation on his or her experiment that includes a brief summary of the theory, experimental procedure, data, data analysis, and results. A written report of about ten pages that also includes a brief summary of the theory, experimental procedure, data, data analysis, and results, on one of the three experiments done by the student, is due at the end of the semester.

For the first two experiments, the student can choose one of the following built experiments:
Growth of high temperature superconductor
Chaos in an electronic circuit
Hall effect in germanium
Photomultiplier tube
Gallium arsenide laser spectroscopy
Nyquist noise in a resistor
Nuclear magnetic resonance
Laser inteferometry
Faraday magneto-optic effect

For the last experiment, the student will design and build an experiment of his or her choice. Possible experiments are:
Critical temperature of a high temperature superconductor in a magnetic field
Spectral output of blackbody source
Mode locked laser diode
External cavity laver
Frank Hertz experiment
Measuring atomic beam velocities using a laser diode
Pulsed NMR
Speed of light using a laser diode
Chaos in dripping water
Counting radioactive decays with a scintillation counter
Hall effect in metals
Characteristics of FETs at low temperature
Microwave interference and absorption

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March 26, 2008

Dr. Bruce Wilking
Chair and Professor of Astronomy
Physics and Astronomy
503D Benton Hall
UM-St. Louis

Dear Bruce:

I am pleased to have the opportunity to endorse the nomination of Dr. Bernard J. Feldman, Professor of Physics, for the Chancellor's Award for Outstanding Teaching. Bernard has been a long-time participant in the Junior Science, Engineering and Humanities Symposium (JSEHS) and the Students and Teachers As Research Scientists (STARS) programs. He has served as speaker, student research mentor, research paper reader, judge and career advisor. In all of these capacities over his more than a decade of involvement, he showed exceptional interest, rapport and support for student achievement.

This March Bernard was the keynote presenter for the JSEHS banquet and addressed 200+ talented high school juniors and seniors from around the state and 50 of their exemplary teachers. According to the participant evaluations, his presentation was praised as one of the very best over the 35-year history of the program and I would concur.

In every teaching venue in which I have been involved with Bernard, he has been very effective, warm and supportive of students and peers alike. I believe he would make an excellent role model as recipient of the Chancellor's Award for Outstanding Teaching.

Sincerely,

Dr. Charles R. Granger, Ph.D.
Professor of Biology and Education
Curators' Distinguished Teaching Professor
Departments of Biology and Teaching & Learning

CRG/kjk

APPENDIX A

Reprint of “Physics for Third Graders” as appeared in *Physics Today*, December 2004

Physics for Third Graders: An Example

About twice a year for the past five years, I have been invited to speak to third-grade students about forces. My visits in the St. Louis area are arranged by the St. Louis Academy of Science, which matches school requests with willing scientists, and have been primarily to the suburban, middle-class Rockwood School District, about 25 miles west of the city.

With my small collection of magnets, I drive to the appointed grammar school. The students usually have just finished a section of their science curriculum on forces, including a hands-on experience with magnets. I ask the students to move their chairs into a half circle around me, and I in turn sit on a student's chair, so that I can easily make eye contact with them. The teacher generally sits at the back of the class and listens in.

I introduce myself and tell the students I want to hear them talk about science. I first ask what they have learned about forces. What is a force? I emphasize the idea of attraction and repulsion as the signature of a force. What are examples of forces? I make a point of telling them that two magnets stuck together and the students stuck on Earth's surface are both examples of attractive forces.

I then mention the Van de Graaff generator. A small St. Louis science museum, the Magic House, has a Van de Graaff generator, and nearly all of the students have visited the museum and had their picture taken with their hand on the top of the generator and their hair standing out from their heads. I ask, Why does your hair do that? The students have no idea, so I ask a series of related questions: What is your body made of? Bones. What are bones made of? Cells. What are cells made of? What are all things made of? After some wrong answers and hints from me, the class arrives at the correct answer—atoms. What are atoms made of? The students groan, but finally I talk about electrons, protons, neutrons, and a planetary model of the atom.

Returning to the Van de Graaff generator, I explain—incorrectly—that at the bottom of the machine electrons are scraped off a surface and put on a belt, which carries the electrons to the top of the machine where they are transferred to the student's hand. Actually, the generator removes electrons from the top of the generator, but talking about missing electrons would unduly complicate the discussion.

So why does your hair fly out the way it does? After more wrong answers and hints about electrons repelling each other, I explain that repelling objects—electrons—want to get as far away from each other as possible. Where are the electrons? At the end of each strand of hair.

After a brief discussion of static electricity—balloons attracted to walls, for example—I take out of my pocket two magnets that are stuck together. I ask if they will stick together if I place a piece of paper between them. We take a vote. I ask how we decide who is right, and then I do the experiment. What about aluminum foil? Will the two magnets stick together if I place a piece of aluminum foil between them? Most of the students vote no. Again, I ask them how do we decide who is right? I do the experiment. I emphasize that science is not a democracy, it is not the majority but the experiment that decides what is correct.

Next, I place a number of sheets of Mumetal between the two magnets and demonstrate that, with those sheets separating them, the magnets do not stick together. I tell the students that Mumetal is a magnetic shield. How does it work? After more wrong answers, I explain that the sheets of Mumetal act like a magnet with the opposite polarity of the two permanent magnets. (If both permanent magnets have a north-south polarity, then the sheets of Mumetal have a south-north polarity.) The sheets of Mumetal repel both permanent magnets with almost the same force as the two permanent magnets attract one another. The two magnetic forces acting on each permanent magnet almost cancel each other out and there is almost no net attraction.

I begin the last part of my presentation by asking, What is a gravitational shield? What would happen if you had a rug that was a gravitational shield and you sat on it? Have you ever seen or owned a gravitational shield? No, the students tell me. Why is there no such thing as a gravitational shield? After I hint that there is no gravitational repulsion, sometimes a third-grade student gives the right answer. In any case, I end my presentation by repeating how a magnetic shield works, how magnetic repulsion is an essential part of the process, and how one cannot have a gravitational shield because there is no gravitational repulsion.

Each presentation runs about 20 minutes. I usually do about four, one right after the other, to all the third-grade classes at a given school. I realize that 20 minutes probably will not change a student's view of science; the presentation is really aimed at the teacher. Maybe the teacher will realize that science is not a collection of facts to be memorized, but an investigation into nature, a two-way inquiry between students and teacher, and a cultivation of the students' enthusiasm and curiosity. I have always enjoyed my visits to the third grade, and I hope my positive experiences will motivate other scientists to do something similar in the schools in their neighborhoods.

Bernard J. Feldman
(feldmanb@msx.umsl.edu)
University of Missouri–St. Louis

When Physicists Volunteer, All Parties Benefit

I commend PHYSICS TODAY for the story celebrating volunteerism in the physics community (September 2004, page 30). As a student in physics and astronomy, I saw that many of my professors considered volunteer work a waste of time, an interruption in the journey to professorships. But as a Peace Corps volunteer in West Africa, where I taught math and physics, I saw just how beneficial the work was to me and to my students.

A handful of teachers or a single person can make a difference teaching and learning through outreach programs. I encourage everyone in academia and industry to find some way to help out fellow educators or students, on the other side of the globe or in a local school.

Virginia Valentine
(daphigone@yahoo.com)
Las Cruces, New Mexico

Correction

October 2004, page 93—Mario Iona completed his PhD thesis under the direction of Theodor Sexl and Egon von Schweidler, not Roman Sexl as reported. ■