Marietta College
DEPARTMENT OF PHYSICS

January 7, 2014

Dear Physics Teacher,

Do you have a current junior or senior student who might like to major in physics in college? Perhaps you know a student with strong mathematical and analytical skills who has not yet considered what opportunities majoring in physics could bring. I am writing in the hope that you can put the enclosed information about the physics program at Marietta College into the hands of such a student.

One of the most exciting pieces of information you will find in this packet is an application for a Rickey Physics Scholarship. Marietta College offers competitive, $18,000 per year scholarships for students to major in physics. This reflects our significant commitment to fostering education in physics. We have a high quality physics program in a liberal arts college setting. We are dedicated to nurturing students in advising, teaching, and mentoring relationships. Most of our graduates go on for advanced degrees in physics, astronomy, mathematics, engineering, materials science, and other related fields. Graduate schools attended by recent alumni include Bowling Green, Cal Tech, Clark, Columbia, Duke, Missouri, Ohio State, Oklahoma, Purdue, Rice, Toledo, Wisconsin-Madison, and Yale, among others.

I have included an article about summer research internships several of our majors completed during the summer of 2013. In addition to off-campus research, some of our students complete summer research internships with our own faculty here on campus. All of our students are required to complete a mentored senior research project with a faculty member, and in recent years those students have presented their research at a meeting of professional physicists. Our goal is to provide the education and experiences that will enable our students to be successful when they take the next step, whatever that might be.

You will also find information about our Binary Engineering program. This exciting program provides a way for students to study fundamental science at a liberal arts college as an Applied Physics major at Marietta, coupled with earning an engineering degree from a top engineering university.

Finally, our program is approved by the Ohio Board of Regents for licensure in physics teaching. If you know of anyone who would like to become a high school physics teacher, please pass the enclosed information on to them. Thanks for your time.

Best Regards,

Dennis E. Kuhl

Dennis E. Kuhl
Rickey Associate Professor of Physics
dennis.kuhl@marietta.edu, 740-376-4482

Application for a Rickey Physics Scholarship

Marietta College

Directions:

1. Complete parts I, II, and III of this Application and mail to: Chair, Department of Physics, Marietta College, 215 Fifth Street, Marietta, OH 45750.
2. Apply for admission to Marietta College. To receive a general application, email (admit@marietta.edu) or call the Office of Admission, at (800) 331-7896.
3. Complete the top portion of the Recommendation Form and give it to your reference(s).
4. Upon admission to the College, completion of all parts of the Scholarship application, you will be considered for a Rickey Physics Scholarship. Finalists will be contacted for a phone interview with a faculty member.
5. Rickey Physics Scholarships are available for students intending to major in Physics. They are not available to those intending to major in Applied Physics.
6. Students who are selected will be awarded a scholarship of up to $18,000 for the first year. This scholarship is renewable annually (up to a total of $72,000 over four years).

I. Personal Information (please print or type)

Name _____
last *first* *middle*

Home Address _____
number and street

_____
city *state* *zip*

Mailing Address _____
(if different from home address) *number and street*

_____
city *state* *zip*

Permanent Home Phone (_____)_____ - _____

Mailing Address Phone (_____)_____ - _____

E-mail (if available) _____

Date of Birth _____/_____/_____
month *day* *year*

Place of Birth _____
city, state (or country)

Citizenship _____

State of Legal residence _____
country

(continued on back)

II. Academic History

High School (include city and state) _____

High School GPA_____ High School Rank _____/_____
rank *class size*

SAT scores _____/_____ and/or ACT scores _____/ _____/ _____
critical reading *math* *science* *math* *composite*

Previous physics and calculus courses and grades received (please note if an AP or honors course):

_____

_____

_____

List any science or math honors or awards you have received as well as science and math activities in which you have participated (science fairs, etc.).

_____

_____

_____

III. Reference(s)

I have asked the following individual(s) to write on my behalf and have given him/her the Recommendation Form.

Note: You may have up to three references send letters on your behalf. Your recommendation(s) should be completed by someone who knows you well, and he/she should be able to comment on both your general academic ability and potential as a physics major. If you have more than one reference, please make additional copies of the recommendation form included with this application.

Name of Reference	Institution and Position	Phone Number (with area code)
_____	_____	_____
_____	_____	_____
_____	_____	_____

Signature _____ Date_____

Recommendation for Rickey Physics Scholarship

Marietta College

To the Applicant: Please fill in the information below and give this form to the person you have asked to write a recommendation on your behalf. Please make additional copies of this form as needed.

Name of Applicant _____
last *first* *middle*

Address _____
number and street

_____
city *state* *zip*

To the Reference: The student named above has applied for a Rickey Physics Scholarship at Marietta College. These competitive scholarships are available to full-time students with superior academic records who intend to complete the Physics major.

Name of Reference _____
last *first* *middle*

Relationship to Applicant _____

Address _____
number and street

_____
city *state* *zip*

Phone (_____) _____ - _____ E-mail _____

Below, we have described some of the characteristics we are looking for in Rickey Physics Scholars:

- Academic excellence as demonstrated by coursework and standardized test scores.
- Physics (or other science) activities.
- Intent to major in Physics with the goal of continuing on to graduate school and a scientific or technical career.

(continued on back)

How long and in what context have you known this student? _____

_____

_____

How would you compare the applicant to other young people you have known in the following categories? Enter the appropriate number in the space provided.

1. Truly outstanding (one of the top students I have taught/known)
2. Excellent (top 10%)
3. Good (above average)
4. Average
5. Below average

Genuine interest in learning	_____	Potential for growth	_____
Responsible completion of work	_____	Emotional maturity	_____
Commitment to hard work	_____	Energy/motivation	_____
Self-confidence	_____	Intellectual ability	_____
Independence/initiative	_____	Creativity/originality	_____

Please comment on the potential of the applicant to excel as a physics major in a liberal arts context (attach extra pages as necessary):

_____

_____

_____

_____

_____

_____

_____

I recommend this applicant for a Rickey Physics Scholarship

_____ enthusiastically _____ strongly _____ with some reservations

Signature _____ Date _____

Please return as soon as possible to:
Chair, Department of Physics, Marietta College, 215 Fifth Street, Marietta, OH 45750

Marietta College

Six students experiencing similar internships through REU program

Any physics major walking past Joe Andler's room on the day he learned he had received an REU internship would have completely understood what they saw.

"I had a stupid grin on my face that I couldn't seem to lose — I did not really want to though. I called my parents, I called my brother, and I called some close friends from here and back home," says the Rickey Scholar. "Strangely, I kept finding myself jumping on my bed, for reasons that I still do not understand. I think I just felt like a kid on Christmas or something."

Andler '15 (Canal Fulton, Ohio) is one of six Marietta College students, including five from the Physics Department, who earned internships as part of the National Science Foundation's Research Experience for Undergraduates (REU). Science majors around the nation scour the Internet looking for these internships in hopes of landing the right fit, but more importantly getting one at all.

"We encourage students every year to apply for REUs. In addition to being an academically talented group of students, this group was particularly diligent about getting applications out," says Dr. Dennis Kuhl, Rickey Associate Professor of Physics. "That, combined with a little good luck, has resulted in our best year for placements in summer research internships."

Andler is interning at the National High Magnetic Field Laboratory in Tallahassee, Fla. He is researching heat capacity, thermal conductivity and electrical resistance studies of materials used in pressure cells.

"It's less than an hour from the beach, and I will be housed somewhere on Florida State University's campus," he says. "They said it would also be a possibility that I would work with two high school students, so I am assuming that if I do, I would be a 'group leader' of some sort."

The 10-week REU program supports active research participation by undergraduate students in any of the areas of research funded by the National Science Foundation. REU projects involve students in meaningful ways in ongoing research programs or in research projects specifically designed for the REU program.

Marietta's other participants are Laura Carpenter '14 (Pennsboro, W.Va.), Alexandra Jurgens '15 (Walnut Creek, Calif.), Nicholas Miller '15 (Creston, Ohio) and Ryan '15 (St. Clairsville, Ohio) and Vance Turnewitsch '14 (St. Clairsville, Ohio).

For months after she applied, Jurgens was concerned that she would not receive one of the scarce REU internships. In the end, though, she received her top choice — Stanford Linear Accelerator Center National Accelerator Laboratory, which is one of 10 Department of Energy Office of Science laboratories.

"Being from the Bay Area, I knew about SLAC in high school and wanted to work there someday so badly, so getting the email that I had been selected was literally a dream come true," she says. "I am working on the Linac Coherent Light Source (LCLS), a laser that produces ultrafast X-ray pulses. The pulses used by scientists to take stop-motion pictures of atoms and molecules in motion, and have applications in many fields."

Miller is working in Chicago with the Department of Energy's (DOE) Science Undergraduate Laboratory Internships (SULI) program at the Argonne National Laboratory. He is with the High Energy Physics Department and he is working on Dark Energy Survey Supernovae, which is a joint project between the DOE and the NSF to study the nature of dark matter and dark energy.

"This is a huge opportunity. I was really focused on possibly securing a position at a smaller REU as I thought I had better chances at those," he says. "The SULI program is nationwide. Once I got my letter from the DOE and then Argonne, I was all at once very excited, nervous, and anxious to learn more about my project. I didn't know much about what High Energy Physics meant other than what I looked up about it when I selected it as a preference on my application, but I would never have thought it would have lead to a cosmology like study like this one."

Miller believes the amount of personal lab experience he started getting at Marietta during his sophomore year has properly prepared him for this internship.

"They are not new world, state of the art experiments, but they get us thinking and really solidify the concepts and knowledge that is taught to us in the classroom," he says.

Miller knows students at other colleges and universities offer the same course, but many of them don't get the same opportunity to conduct the experiments that are provided by Marietta's faculty.

"I think my experience with experimenting and having background in lots of different studies that can apply to my work (physics, computer science and astronomy) is what gave me an edge or made me stand out," he says. "I am only a sophomore, so getting this opportunity with what little classwork I have taken must draw some sort of conclusions to the quality of classroom/educational work here at Marietta."

Jurgens took note at a recent physics conference when students from larger schools were asking questions about how to approach a faculty member for a reference.

"I never had to worry about approaching my professors, they make themselves super accessible, and I don't have to worry that they won't remember me after a class with only three other people," she says. "Beyond that, it's impossible to hide in classes that small, so it's really obvious when you don't understand a concept. Even though that can be uncomfortable, it means that the class can really focus on the things that students struggle with. It also makes you accountable for everything that you do, or don't do, which is good preparation for entering grad school or the work force. Personally, I think that the physics program at Marietta is unique and a great preparation for various careers."

Carpenter, a Rickey Scholar, believes the College has helped her appreciate learning outside of her major. This should be beneficial to her as she interns in the Summer Undergraduate Research in Wind Innovation and Development program at Case Western Reserve University in Cleveland.

"I will be doing wind energy research motivated by interest in offshore wind power in the Great Lakes region. There are a number of possible projects for the summer," she says. "I could be studying turbulence sensors in turbine blades or analyzing off-shore wind and ice flow. Another couple options are structural behavior of wind turbines and integration of renewable resources into the grid."

Vance Turnewitsch, a Rickey Scholar, landed in sunny South Florida at Florida International University in Miami where he is working in the School of Computing and Information Science.

His program is focused on security projects in networks and sensors.

"In recent years, sensors have become quite important in traffic control, building monitoring, terrorist surveillance, etc.," he says. "I am working with a Ph.D. student on management of resources in virtualized systems."

Vance is confident his undergraduate experience at Marietta has properly prepared him for this opportunity.

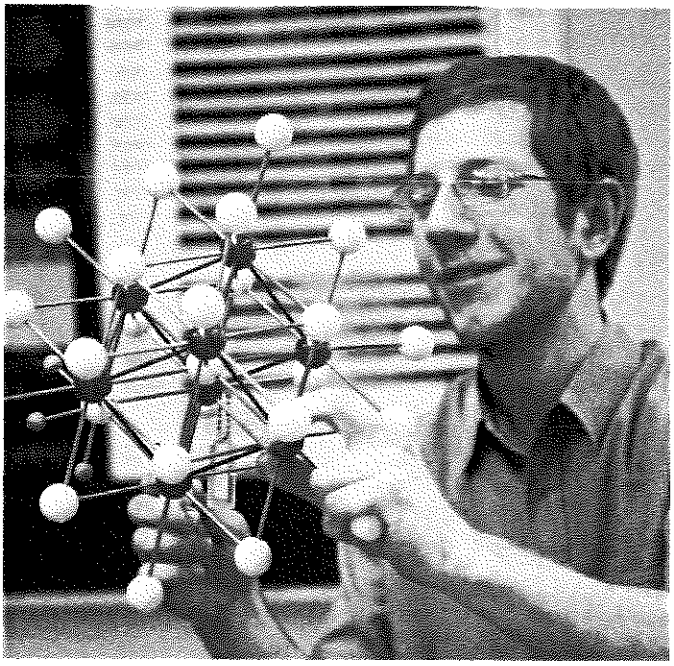
"I think the Marietta physics education has forced me to become a very good independent learner who can use multiple resources to solve problems," he says. "At the same time, the Marietta information systems education has prepared to work on a team; thus, I think I am prepared to work independently on my own project while being involved in the research group as a whole."

Vance's younger brother, Ryan, is Marietta's only non-Physics major to receive one of these highly sought after internships. The Biochemistry major is working at the Department of Molecular and Cellular Biochemistry at the University of Kentucky's College of Medicine.

"I am working in the laboratory of Dr. Peter Spielmann, and our project involves synthesizing an organic compound, which his lab developed and found to inhibit the metastasis of cancer cells. Once we synthesize the compound for testing, we will use laboratory mice to determine proper dosages of the compound and measure its effects on the metastasis of breast cancer cells using high performance liquid chromatography," Ryan says. "The study involves applications of organic and analytical chemistry, biochemistry, molecular biology and cellular biology."

After being waitlisted by three other programs, Ryan was accepted by Kentucky in the early spring. This was the same time he was conducting an Honors Fellowship research project in the biochemistry lab under the mentorship of Dr. (Suzanne) George.

"That experience introduced me to independent scientific research and taught me a wealth of information that helped me both in the application process for REUs and helped to prepare me for the work in biochemistry I will be doing in my project," Ryan says. "The many science courses I've had so far at Marietta have laid the foundation I needed to be able to compete for this kind of program, and my Organic Chemistry, Introductory Cellular Biology, and Microbiology classes in particular have been indispensable to me so far as I have begun to work on this very involved project here at UK."



MARIETTA COLLEGE

Physics

Degree: Bachelor of Science in Physics
Bachelor of Science in Applied Physics

Study physics and you'll start to unlock the nature of the universe. Study physics at Marietta and you'll unlock your potential at the same time. Whatever your goals, our program will provide you with a rigorous and comprehensive background in theoretical, experimental, and computational physics. You'll work together with faculty members who are recognized for their research in highly specialized fields and who make that expertise accessible to students.

Full-time faculty:
Dr. Dennis Kuhl, Associate Professor
Dr. Craig Howald, Associate Professor
Dr. Cavendish McKay, Associate Professor
Dr. Ann Bragg, Associate Professor, Planetarium Director

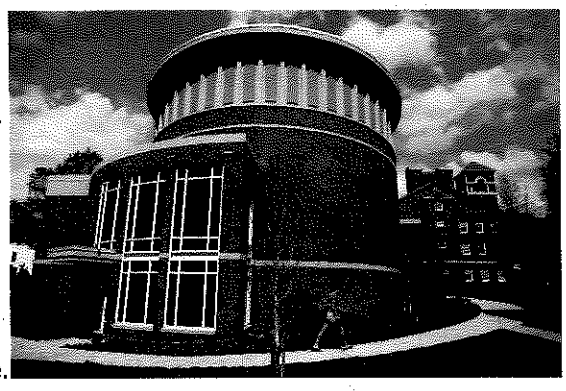
Facilities:
Physics classes and labs meet in state-of-the-art facilities at the **Rickey Science Center.** Faculty and student research projects make use of a parallel computing cluster, a scanning probe microscopy laboratory, and a surface science laboratory. Astronomy courses utilize the telescopes in the **William Chamberlain Gurley Observatory** located on the roof of Mills Hall. In the spring of 2009, the campus opened the **Anderson Hancock Planetarium**, which houses a 102-seat star theater featuring a hybrid projection system consisting of a Chronos optomechanical starfield projector and a Digistar full-dome video projector. The building includes physics faculty offices and a lobby with an astronomy gallery and NASA ViewSpace video feed.

Special Features:
At Marietta, you can choose from two physics majors and two minors:

- The **Physics major** will prepare you for graduate or professional study and for a career in physics or related fields.
- The **Applied Physics major** offers a flexible curriculum designed to prepare you for either the 3-2 engineering binary program, secondary school teaching licensure, or employment in technical positions.
- The **Physics Minor** provides students with a foundation in the tools, techniques, and concepts of physics in order to enhance the study of other fields
- The **Astronomy Minor**, accessible to motivated students in all disciplines, introduces the manner in which the process and concepts of physical science can be used to address questions in astronomy. With a Physics Major and Astronomy Minor, students are well prepared to continue their studies of astronomy in graduate school.

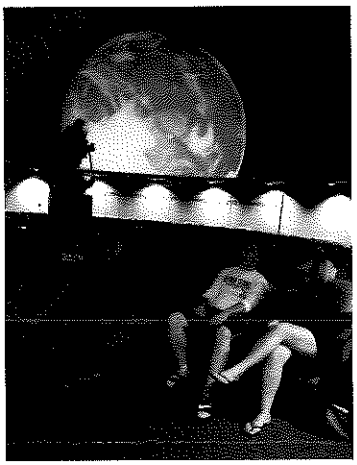
Scholarship Opportunities:

The **Rickey Scholarships in Physics** support the study of physics at Marietta College. The scholarships are awarded to full-time students showing excellent academic achievement and intending to major in physics with the goal of continuing on to graduate school and a scientific or technical career. The current scholarship is $18,000 per academic year and is renewable given satisfactory progress towards the degree.



The **Samuel R. Ruby Scholarship** goes to a deserving student in physics or chemistry who has completed a full year at the college.

Many physics majors complete summer research internships both on and off campus. A limited number of Rickey **Summer Research Grants** are available for on-campus summer research.



Clubs & Organizations:
Marietta's **Society of Physics Students** is a student affiliate of the prestigious American Physical Society, a group dedicated to promoting the understanding and study of physics. **Sigma Pi Sigma** honors outstanding scholarship in physics.

Career Outcomes of MC Graduates:
Technical Staff, Los Alamos National Laboratory
Physicist, Sandia National Laboratory
Physicist, National High Magnetic Field Laboratory
Senior editor, *Astronomy* magazine
Member of Technical Staff, AT&T Bell Labs
Officer and nuclear specialist, U.S. Navy
Researcher, 3M Company
High School Teacher

"It was a decision I never regretted because majoring in physics afforded me employment opportunities in many research and development fields."
-- William Thieseen, Jr., (Class of 1961) Engineering Consultant

Graduate/Professional Schools MC Graduates Have Attended:
Penn State University, PhD, Physics
Duke University, PhD, Math
Yale University, PhD, Biophysics
University of Wisconsin-Madison, PhD, Mechanical Engineering
Clark University, PhD, Physics
Purdue University, MS, Materials Science
University of Toledo, PhD, Astrophysics
Columbia University, PhD, Environmental Engineering
California Institute of Technology, PhD, Materials Science
University of Bridgeport, MS, Mechanical Engineering

The Marietta College Physics Department provided opportunities for me to thrive academically and professionally. The program was very student-centered which had a huge impact on my studies and my self-confidence. By sponsoring me to go to regional conferences, I was more than prepared to join a graduate program and to feel confident in presenting myself as a professional member of the physics community.
-- Elisabeth Kager (Class of 2008),MS, Physics, Bowling Green State University, PhD student in Education (Curriculum and Instruction, specializing in Science and Mathematics Education) at Ohio University

I was very well prepared to go into mechanical engineering. I feel as though I had a stronger background in both theory and mathematical rigor, than most students.
-- Seth Avery (Class of 2005), PhD student in Mechanical Engineering at the University of Wisconsin-Madison

My first year at Rice, I realized many of the strengths of a liberal arts school science education. In my classes with other physics students, I found that I often had better physics awareness - broader understanding and exposure. .... I found that in comparison to many other students who attended large schools, my knowledge of mathematical methods and problem solving techniques was much greater. This really paid off in my classes. Aside from direct performance, I found that my opinion, stories, and memories of my physics education differed from many of my peers....I came out of Marietta with a passion for learning about nature, the skills to solve actual problems, and a sound knowledge base that made learning other fields and further study in physics enjoyable. I believe that the most important thing that I took away from Marietta College was a way of thinking - a way of approaching problems.
--Chad Byers (Class of 2009), PhD student in Physics (Surface Plasmon Spectroscopy), Rice University

How It Works

Under this program you major in an area of science, mathematics, or computer science at Marietta College for three years and then go on to the engineering school for two more years. In the end, you receive two degrees; a B.S. degree in science from Marietta College and a B.S. degree in engineering from the university you chose.

The Applied Physics major at Marietta is specifically designed to have the flexibility to enable students to meet all of the Marietta requirements in three years, and most Binary Engineering students choose this major.

Recent Degrees Received

Recent graduates of this program have received degrees in the following fields of engineering:

- biomedical
- chemical
- civil
- electrical
- environmental
- mechanical
- structural
- and more…

Benefits of the Program

Many companies are looking for hard-working people who are team players, have good oral and written communication skills, a solid background in engineering, and good grades. That's where the benefits of a Marietta College education come in. Your interpersonal, problem solving, critical thinking, and communication skills will be better developed in a small liberal arts college environment.

Our staff is solely devoted to teaching undergraduate students. Class sizes are also typically much smaller than those at large schools, thus affording you much more personal contact with your professors.

Thanks to its world-renowned program in Petroleum Engineering, Marietta can offer general engineering and science courses that other liberal arts colleges cannot. You can even play NCAA Division III sports for your full four years of eligibility through a flexible program we have with one of our partner schools.

For More Information…

Feel free to contact the following people for more information about how Marietta College can help prepare you for an exciting and financially rewarding career in engineering.

Dr. Cavendish McKay
Chair, Physics Department
740-376-4871
Cavnedish.mckay@marietta.edu

Dr. Paul Daniell
Binary Engineering Coordinator
740-376-4780
mailto:ptd001@marietta.edu

Why Choose this Program?

If you are interested in a profession that offers excellent starting salaries, fringe benefits, and travel, then our Binary Engineering Program may be the right choice for you.

This program combines the benefits of a liberal arts college with a top engineering school.

Many graduates have become very successful. In fact, a graduate of our Binary Engineering Program recently donated more than $13 million to the college----making him the single largest donor in a history that dates back to 1835!

You will receive a quality education in science and engineering through this program.

Our Partners

Marietta has cooperative agreements with engineering programs at three well-known universities:

- Case Western Reserve University
- Columbia University
- Ohio University

The Binary Engineering Program at Marietta College

Your pathway to engineering options…