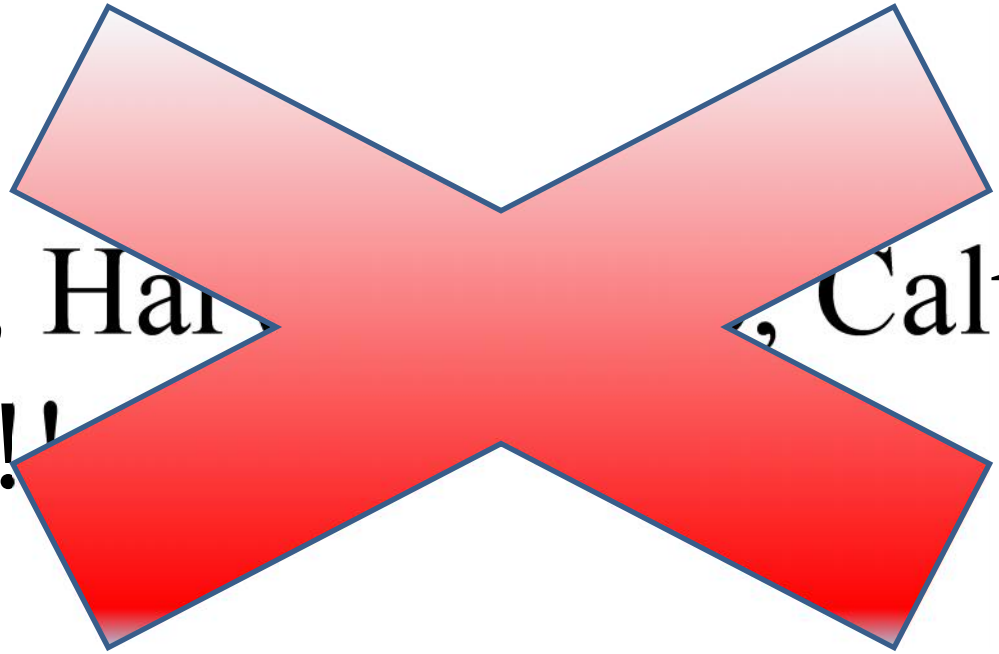
Relato sobre duas conferências de educação em Física da American Physical Society: 2015 Physics Teacher Education Coalition Conference e Building a Thriving Undergraduate Physics Program.

L. G. Marcassa
CG - IFSC

US:

MIT, Har[illegible], Caltech,

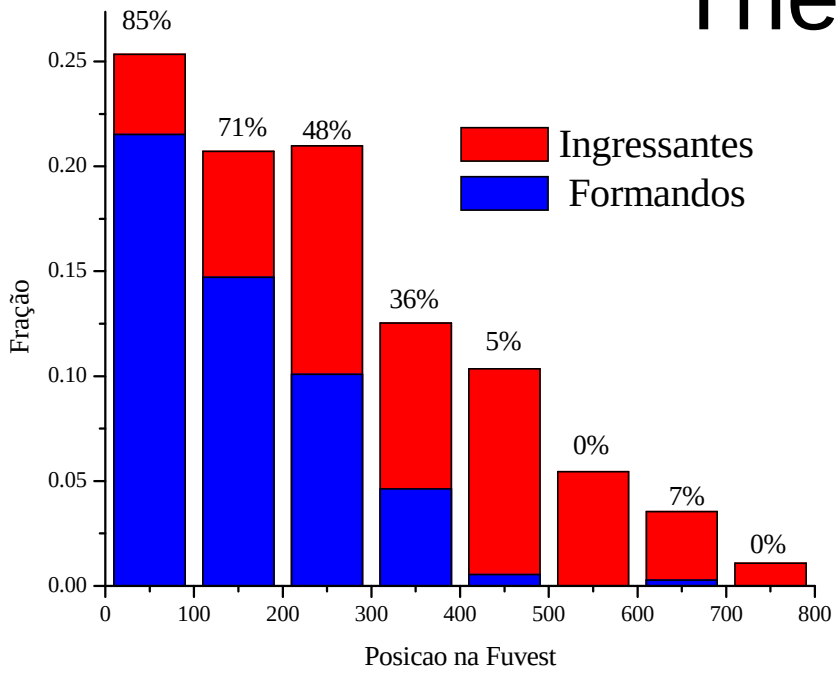
etc!!!!



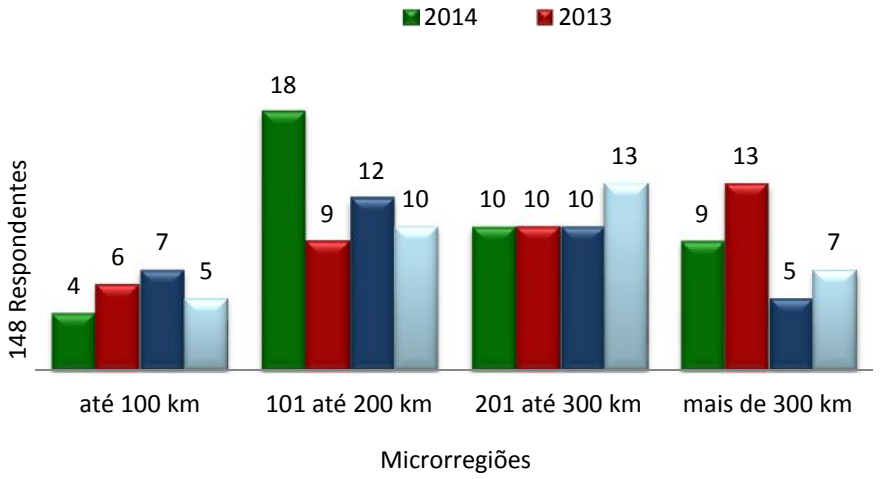
Você esta na palestra errada!

The True!

Bacharelado Física



Somos Caipiras!

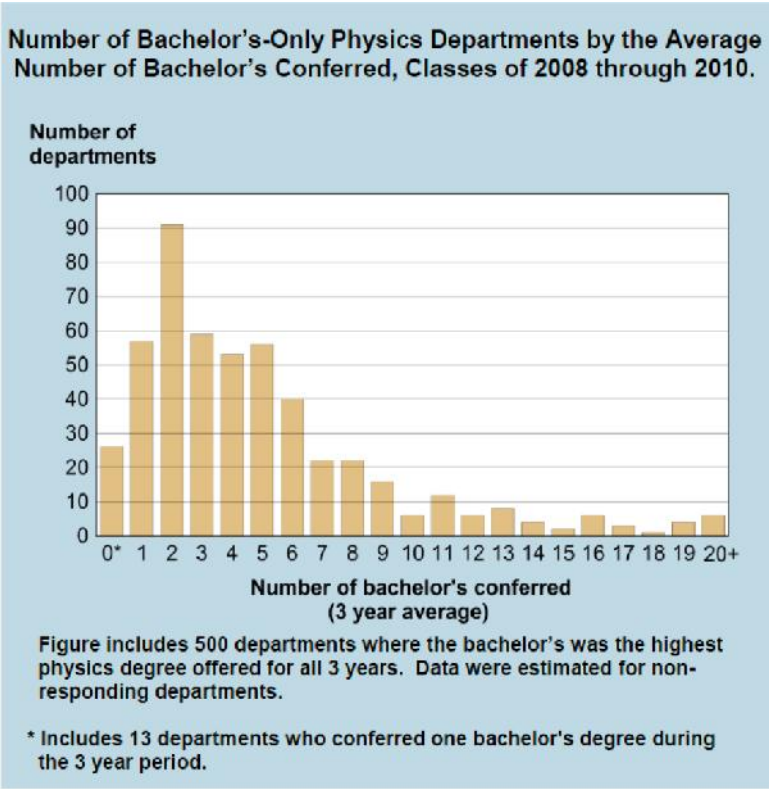


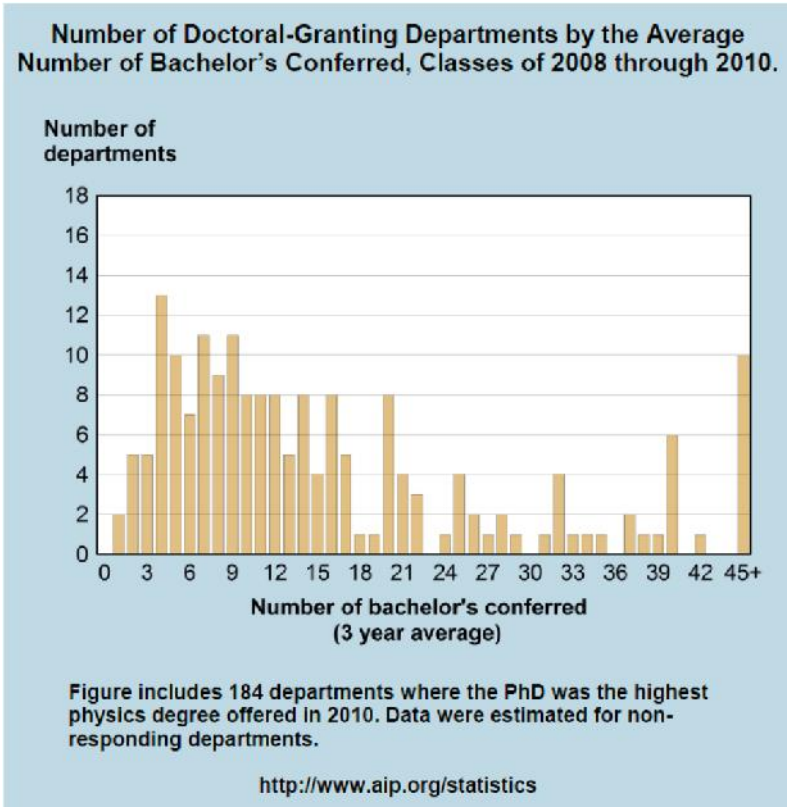
2015 Physics Teacher Education Coalition Conference 5,6 e 7 Fev.
Building a Thriving Undergraduate Physics Program 7 e 8 com sessões de discussão

1) Porque o workshop foi feito?
2) Porque a APS está preocupada com os departamentos de Física e seus cursos de Física?
3) Porque poucos graduados/licenciados são formados?
4) Como seguir uma carreira não acadêmica após um bacharelado em Física.
5) Como fazer uma graduação em Física ser moderna e emocionante.

1) Porque o workshop foi feito?

1) Os EUA têm aproximadamente 750 departamentos de Física. A grande maioria destes departamentos formam poucos alunos (Bacharéis e Licenciados); no máximo 3-4 alunos por ano. São locais, ou seja atraem estudantes em um raio de 300 Km. Em geral os estudantes são a primeira geração na universidade e não tiveram cursos de pré-calculo no High school. **Isso lembra alguma coisa?**

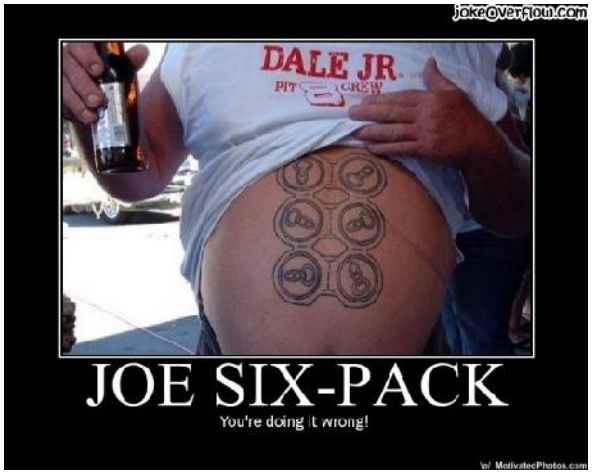




1) Em geral, estes departamentos estão em instituições públicas e têm sido ameaçados com cortes no orçamento ou mesmo de extinção dos cursos. Como exemplo, o Estado do Texas decidiu, há alguns anos, atrás que cursos que formam menos de 5 alunos/ano (em uma média de 5 anos) em instituições públicas estaduais deveriam ser extintos. Decisões similares há em outros estados.

- 49% of all public institutions
- 58% of all institutions
- 100% of all public Historically Black Colleges and Universities (HBCUs) (and all but two of the private HBCUs)

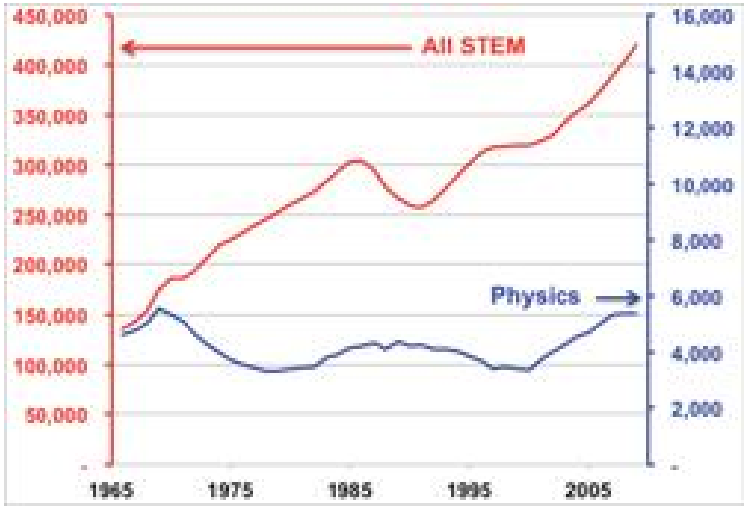
Não conte para o Reitor/Governador/Deputados!

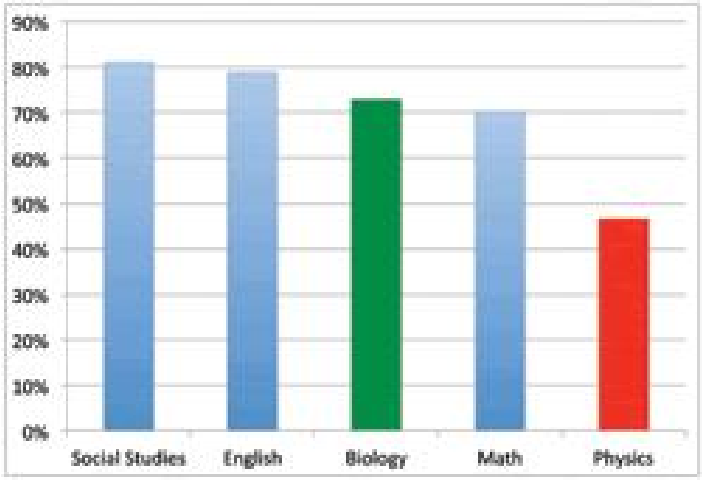


2) Porque a APS está preocupada com estes departamentos de Física e seus cursos de Física?

São destes departamentos que se originam os licenciados em Física. Atualmente, os EUA precisam de aproximadamente 700 novos licenciados em Física por ano, e só se formam aproximadamente 300/ano. A APS acredita que não é possível manter o país na vanguarda da ciência e tecnologia se eles não formarem mais professores de ensino médio. Afinal, menos professores de Física, menos alunos em Hard Science na Graduação (Física, Química, Matemática, Engenharia). Note que há empregos onde apenas americanos podem aplicar (defesa, etc)

Também acreditam que a formação de licenciado pode ser usada como justificativa para a existência destes departamentos junto ao público em geral. Joe six pack!!





3) Porque poucos graduados/licenciados são formados nestes departamentos?

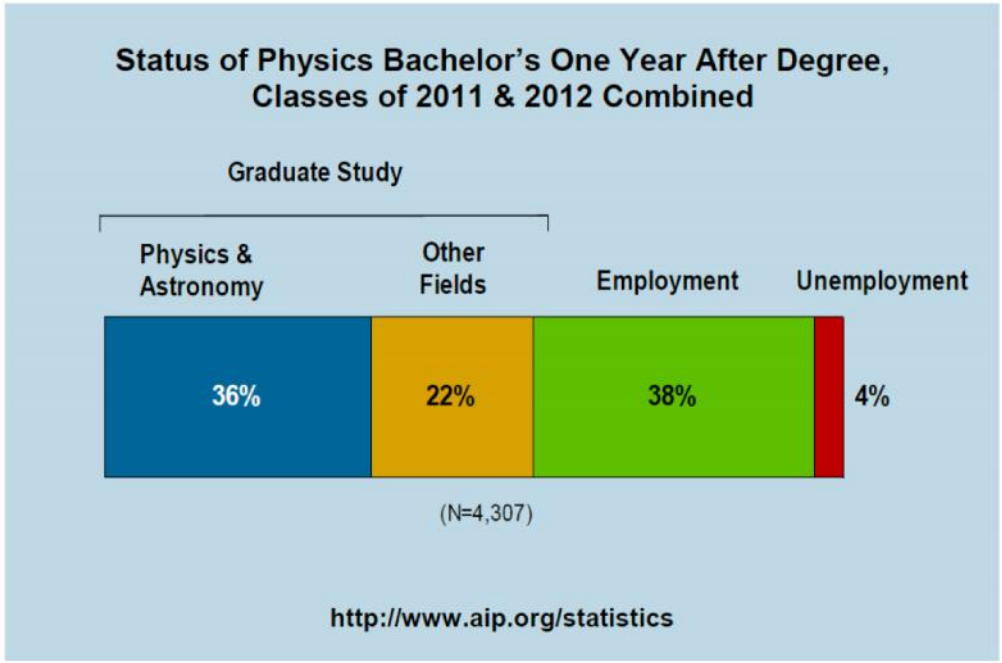
Como no Brasil, os motivos são vários.

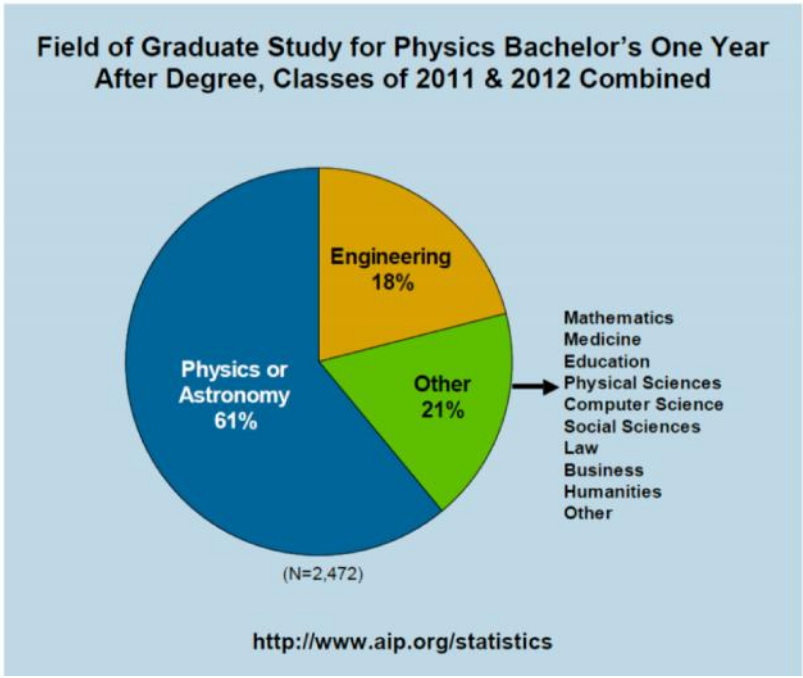
Bacharelado: as famílias preferem que o aluno faça engenharia; desinformação das opções de emprego após o curso, etc

Licenciatura: a profissão não é valorizada, baixos salários, más condições de trabalho, falta de status social, etc. A APS convenceu a NSF sobre a necessidade de um programa nacional de valorização dos professores e dos programas de licenciatura.

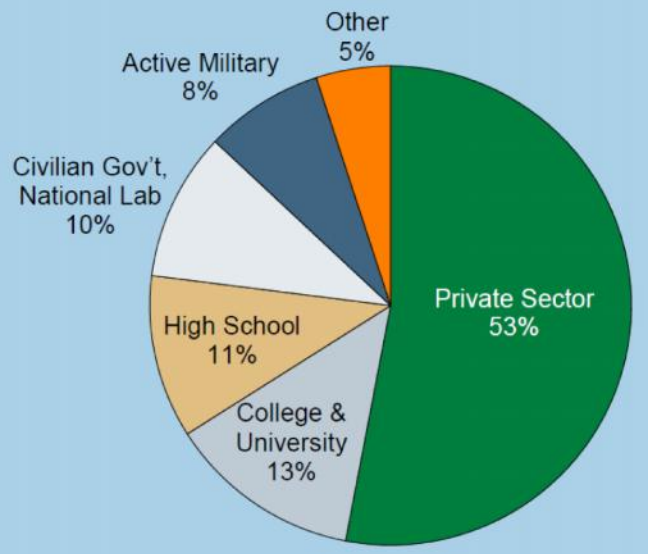
4) Como seguir uma carreira não acadêmica após um bacharelado em Física.

Aproximadamente 7000 bacharéis/licenciados são formados em Física
Todos os anos no EUA



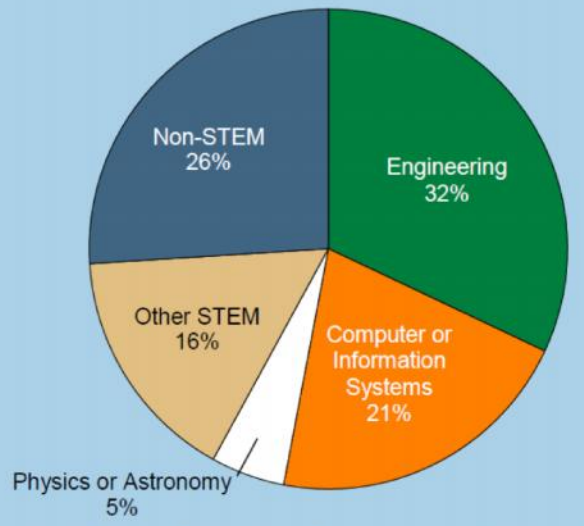


Initial Employment Sectors of Physics Bachelor's, Classes of 2009 & 2010 Combined



http://www.aip.org/statistics

Field of Employment for Physics Bachelor's in the Private Sector, Classes of 2009 & 2010 Combined



STEM refers to natural Science, Technology, Engineering, and Mathematics.

http://www.aip.org/statistics

1) 40% dos alunos formados em Física entram na força de trabalho
2) Dos 7000 alunos formados por ano, apenas menos de 300 conseguirão uma posição como professor universitário. Assim, para que mais alunos possam se formar em Fisica, é preciso investir na empregabilidade dos alunos após o bacharelado fora da academia.

Quem é o maior problema?

Docentes!!

Não incentivamos a carreira fora da academia.

Ex: Mas voce não vai fazer pós-graduação?

Estudos da APS mostram quem mesmo alunos médios no bacharelado em Física podem se dar tão bem ou melhor que alunos de engenharia no Mercado.

5) Como fazer uma graduação em Física ser moderna e emocionante.

Is this group aware of careers in physics?
high school students high school teachers
college students who dislike physics
college students majoring in physics
college physics faculty

Habilidades sociais e de comunicação são excepcionais em Físicos!

careers TOOLBOX

FOR UNDERGRADUATE PHYSICS STUDENTS

American Institute of Physics Career Pathways Project
AIP Statistical Research Center
Society of Physics Students
www.spsnational.org/cup/careerpathways/

NSF Award Number: 1011829

Pesquisa da APS mostra que entre os 40% que entram na força de trabalho, a maioria espera ficar apenas alguns anos no primeiro emprego.

5) Como fazer uma graduação em Física ser moderna e emocionante.

i) Laboratórios de alta qualidade – programas Labview, estatisticas, simulações
ii) TCC – pesquisa durante a graduação, e se possível com empresas locais
iii) Flexibilidade do curriculo: minor or major em economia, administração, biologia, computação, etc. Programas de diploma duplo com a engenharia e computação/matémática.

130 créditos (todas com 4 créditos ou menos)
Nosso Bacharelado 192 (160)

iv) Incorporar apresentações orais no curriculo
v) Ter palestras de alumni de fora da academia no “Panoramas”
vi) Estudo dirigidos, monitoria valendo crédito
vii) Licenciados devem ir pra sala de aula desde o primeiro dia
viii) Licenciados devem ter a opção de major em duas área

We C.A.R.E.!

• Curriculum
– Fixed & Flexible course availability based on student input
– Refresh physics major to reflect viable & known career paths
– Expand offerings with tracks – Computational, Astronomy, etc.
• Advisement
– Career mentoring (academic, life skills, pipeline guidance, etc.)
• Recruitment / Retention / Research / Rewards
– Pre-collegiate summer programs / Faculty high school visits
– Saturday Academy / Summer Placements (REUs, Interns, etc.)
• Extras
– Graduate School Tours / Special Speakers
– Town Hall meetings by SPS / Scientific leadership & citizenship

Marketing: Old Brochure

What Physics Can Do For You...

Whether you intend to make physics a life-long career or simply a vehicle for a rigorous undergraduate education, a degree in physics lets people know you are a serious, motivated, and hard-working individual --- characteristics that look good on any resume. Although most students graduating with a degree in physics go on to science-oriented careers, a major in physics coupled with a major or minor in chemistry, biology, economics, or business administration has led many students into very competitive medical schools, veterinary schools, MBA programs, and management positions. Simply put, a degree in physics commands respect from anyone who has had even a glancing exposure to the field. A physics degree will set you apart from the rest!

What About Our Graduates?

MTSU physics graduates include research and industrial physicists, professors, astrophysicists, physicians, and computer scientists. Our students have been admitted to graduate schools across the nation, including highly-regarded programs at Harvard, Florida State University, and the University of Texas. Medical physics students have continued their training at institutions such as Vanderbilt and M.D. Anderson Cancer Center. Other physics graduates have moved directly into one of the employment sectors previously mentioned. Regardless of their ultimate career path, all of our students benefit from the close associations with our faculty and with each other during their time at MTSU.

Student Organizations

The Society of Physics Students (SPS) – National association of physicists and physics students

Sigma Pi Sigma ΣΠΣ -- National physics honorary society

Student Awards and Scholarships

MTSU Physics Scholarship

Physics Faculty Scholarship

SPS Physics Achievement Award

Faculty Achievement Award in P

SPS Service Award

Award for Excellence in Mod Theoretical Physics

Wade Gilbert Scholarship

These scholarships and awards are based student performance and are not a incoming freshmen and transfer students.

Student and Faculty Research

PHYSICS

- Optics, acoustics, and sensors
- Neutron-capture physics
- Scattering, surface, and thin-fil
- Optical properties of semicondu polymers
- Materials physics

ASTROPHYSICS

- Asteroseismology (starquakes)
- Astronomical instrumentation
- Planetary radio astronomy and spacecraft data analysis

MIDDLE TENNESSEE

STATE UNIVERSITY

Why Study Physics?

The study of physics is an invitation to wonder. How do boats float and airplanes fly? What is inside my tiny cell phone that lets me talk to someone on the other side of the world? If we can design microscopes that "see" individual atoms, why can't we design microscopes that see the parts of the individual atoms? What's inside the atom anyway? And then what's inside that? Why is the sky blue in the daytime and black at night? Why do some galaxies look like ours and some don't? What is the universe made of? How did it begin? What...? How...? Why...?

Physics doesn't stop with asking questions though. The study of physics teaches us a new way to find answers. Systematic experimental investigations combined with the understanding and application of tested natural laws and principles allow us to develop our understanding of the world around us and to predict the outcome of future experiments. This process has applications in all of the sciences as well as other disciplines such as law, business, and medicine. The study of physics opens a window into a vast array of career paths while satisfying an innate human need to inquire.

What is a Physicist?

Simply put, a physicist is someone who advances our knowledge of the universe at any level by building on our existing understanding of the universe. Some physicists design and carry out experiments aimed at either answering specific questions about natural processes or obtaining specific data that helps to define patterns in nature. Others use mathematics and computers to apply existing rules and relationships to predict the behavior of nature in new or unexplored environments. Working together, often in collaboration with scientists in other fields, physicists build a more complete understanding of our environment and often use that understanding as a basis for the development of new instruments and devices from which all of us can benefit.

What Physicists Do...

Physics graduates can be found almost anywhere: from government and commercial laboratories to the floors of Congress, instructing university classes or developing market strategies. Physicists are analytical, creative, persistent, and experts at solving problems – any type of problem! As a result, physicists are a valued commodity in our technological future.

Why Physics at MTSU?

In the MTSU Department of Physics and Astronomy, the emphasis is on the student. While many universities still offer large introductory physics courses, our faculty are dedicated to providing the most effective teaching possible at this level, with small sections and a focus on hands-on, collaborative learning. This focus continues throughout our program. An atmosphere of camaraderie pervades the department as students work together through advanced course work and faculty are always available for discussions or help. Our curriculum provides a balance between essential foundational knowledge in physics and current areas of interest in the discipline. Unique at MTSU and unusual among universities, we require a research experience and thesis for our majors. Students are often meaningfully involved in cutting-edge research as early as their sophomore year. Research opportunities on campus range from biophysics to optics to astronomy. Our students also compete successfully for summer research fellowships at other locations in the US and abroad. Many students publish their first research article before graduation, making them desirable candidates for graduate school or employment. Our medical physics concentration prepares students for a two-year MS degree program at Vanderbilt or other similar institutions, and can result in employment in the health care industry as a medical physicist. The concentration in astronomy provides excellent preparation for graduate work in astronomy or astrophysics.

Physics and Astronomy

STATE UNIVERSITY

Marketing: New Brochure

SEEING IS BELIEVING.

The best way to decide if MTSU physics is for you is to come and experience it. We'd be glad to schedule a visit and connect you with professors, current physics majors, and alumni who can answer your questions. To get more information, call Dr. Ron Henderson at (615) 898-2130 or email him at Ron.Henderson@mtsu.edu. You can also get more information at www.mtsu.edu/physics.

MIDDLE TENNESSEE STATE UNIVERSITY

MIDDLE TENNESSEE STATE UNIVERSITY

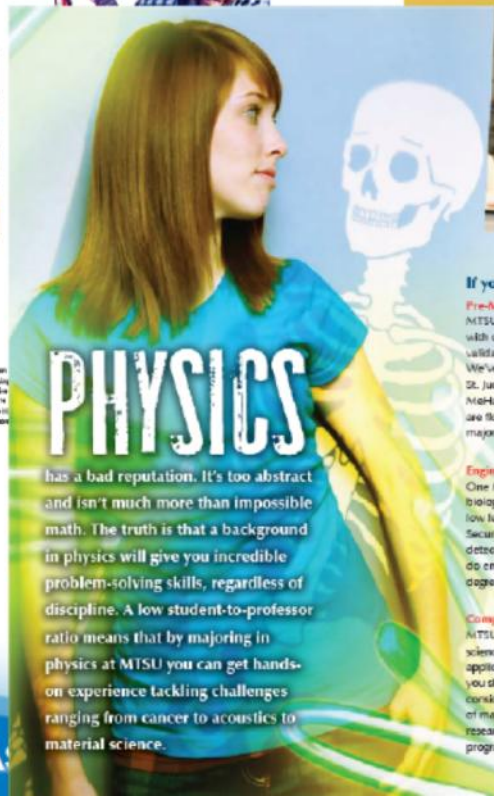
Physics and Astronomy

You can't do anything with a physics degree... YOU CAN DO EVERYTHING.

Here are some of the professions and fields you can pursue with a physics degree:

- Video game developer
- Medical physicist
- Naval mine warfare analyst
- High school physics teacher
- Software developer
- Acoustics researcher
- Material science researcher
- Astrophysicist
- Radio frequency (RF) specialist
- Pilot
- Doctor
- Engineer
- Astronomer
- Renewable energy researcher
- Architect
- Spacecraft designer
- Patent attorney

"We went to the hardware store and bought some PVC pipe, and we joined it together and got a speaker and a microphone and took measurements. It was great to see that you could have an idea and then do an experiment and get results about something that wasn't so technical that it was incomprehensible."



PHYSICS

has a bad reputation. It's too abstract and isn't much more than impossible math. The truth is that a background in physics will give you incredible problem-solving skills, regardless of discipline. A low student-to-professor ratio means that by majoring in physics at MTSU you can get hands-on experience tackling challenges ranging from cancer to acoustics to material science.

If you're considering...

Pre-Medicine
MTSU physics students perform research with optical tweezers that could help validate a cure for sickle cell anemia. We've worked with the hematologists at St. Jude Children's Research Hospital and McHarry Medical College. Medical schools are flooded with applications from biology majors. Get a physics degree and stand out.

Engineering
One MTSU physics professor is building a biological sensor that detects DNA at very low levels. We're working with Homeland Security so the sensor can be used to detect TNT. If you can do physics, you can do engineering. If you have an engineering degree, you can't necessarily do physics.

Computational Science
MTSU has a program in computational science. If you're leaning toward applications of computers to science, you should give this option serious consideration. One of the advantages of majoring in physics and conducting research is that you will learn how to program.

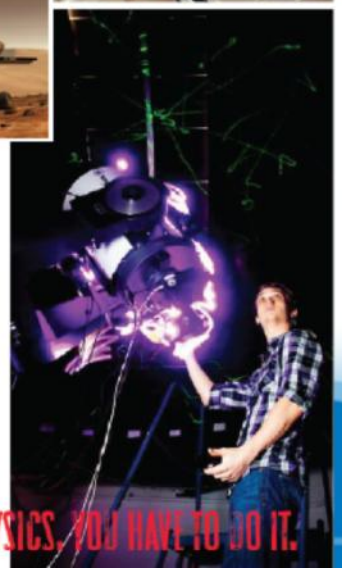
We don't just study physics, we do physics.

Our low student-to-teacher ratio means our professors can take the time to help you really understand what you are learning. And once you learn it, they expect you to apply it. MTSU professors know that when you use what you've learned, it sticks with you. Unlike many other undergraduate physics programs, at MTSU our students will conduct research. What better way to find out what interests you?

Haven't heard of MTSU Physics? That's OK. Duke, Cal Tech, and Harvard have.

So, where's all that research going to get you? Wherever you want. MTSU physics undergraduates conduct research right alongside physics professors and get their names on published research papers. It's unusual for undergraduate students to do research, and it's even rarer for them to be published. But it's not that rare at MTSU. That makes a strong impression on prospective employers and graduate school admissions directors.

We pester our undergraduates to do research because that's how they'll get the experience and problem-solving skills that will help them excel in business and industry or graduate school. Because if you want to succeed...



YOU CAN'T JUST STUDY PHYSICS. YOU HAVE TO DO IT.

Physics and A

SPIN-UP Report

- Departmental Leadership
- Mission and Vision
- Substantial Majority of Engaged Faculty
- Administrative Support
- Supportive, Encouraging and Challenging Environment and Recruitment
- Advising
- Career Mentoring
- Introductory Physics Courses
- Flexible Majors' Program
- 3/2 Dual-Degree Engineering Programs
- Undergraduate Research
- Physics Clubs and Commons Room
- Mentoring for New Faculty
- Informal Student/Faculty Interactions
- Alumni Relations

* Panepucci Hall!!