Taller: Repensando la formación avanzada en física desde la práctica investigadora

Camilo Ruiz Méndez

Universidad de Salamanca

EL-BONGÓ physics

Co-funded by the European Union

EL-BONGÓ Physics in a nutshell

Proyecto ERASMUS+ de construcción de capacidades que busca:

Impulsar la transformación digital de la educación superior en Latinoamérica.

- Objetivos:
  - Crear una red de comunidades virtuales de investigación y aprendizaje en física en Centroamérica y la región andina.
  - Promover la educación digital y la ciencia abierta
  - Democratizar el acceso a herramientas, datos y formación científica
  - Impulsar habilidades prácticas mediante laboratorios de fabricación digital: FABLabs.
  - Construcción de comunidad de relaciones internacionales.

European Commission

Erasmus+

EU programme for education, training, youth and sport

Capacity building (higher education)

Aim

Capacity-building projects in the field of higher education are transnational cooperation projects, based on multilateral partnerships.

These partnerships are primarily between higher education institutions from "EU Member states or countries associated to the Programme" and "third countries not associated to the Programme". (Read about eligible countries for the difference between these).

The aim of these projects is to support eligible third countries not associated to the Programme to

- modernise, internationalise and increase access to higher education
- address the challenges facing their higher education institutions and systems
- increase cooperation with the EU
- voluntarily converge with EU development in higher education
- promote people to people contacts, intercultural awareness, and understanding

Opportunity

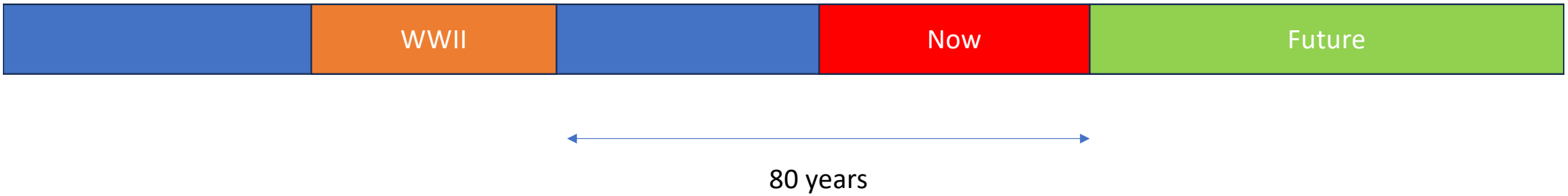
Erasmus+ provides the opportunity for organisations from eligible Partner Countries, mainly higher education institutions (HEIs), to promote cooperation through actions that:

- improve the quality of higher education and its alignment with labour market needs
- improve the level of skills in HEIs through new education programmes
- strengthen the capacity of management, governance, and innovation, as well as internationalisation
- build the capacity of national authorities to modernise their own higher education systems
- foster regional integration and cooperation across different regions of the world

Initial questions

- What lessons exists on education through research in physics?
- What are the future challenges in physics education?
- Reinhard Babel (DAAD) comment: Are these extraordinary times? Physicists have responded to extraordinay times.
- Can we bring a new (modest) perspective to physics education?

Timeline



Ideas at the end of the XIX century

Rutherford always gathered a group of bright young researchers around him. In this group photo of 1910 are Ernest Marsden and Hans Geiger. Front and center are Professors Schuster and Rutherford, and centered in the rear is William Kay, the talented and helpful laboratory steward. Credit: J.B. Birks, ed., Rutherford at

e young Henry G.J. Moseley, in the Balliol-Trinity Laboratory, C . Later that year, Moseley began research in Rutherford's Manc rilliant career was cut short in combat in World War I. Credit: U ford, Museum of the History of Science, courtesy AIP Emilio Seg Archives, Physics Today *Collection.*

J.J. Thomson, like many prominent physics professors in the late 19th century, gathered a group of bright young "research students" around him. Directly behind him is his protégé, Ernest Rutherford. Left of Rutherford is C.T.R. Wilson (known for his cloud chamber) and left of Thomson is Paul Langevin, who later worked with the Curies.

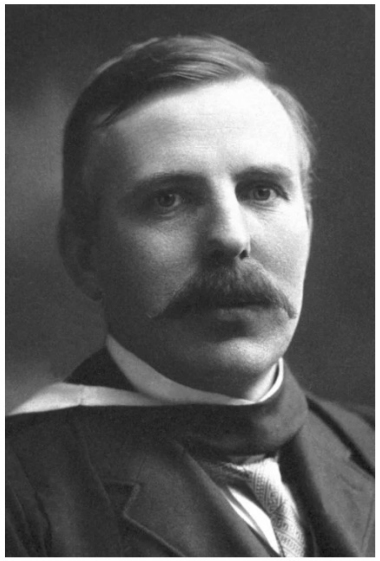


Photo from the Nobel Foundation archive.

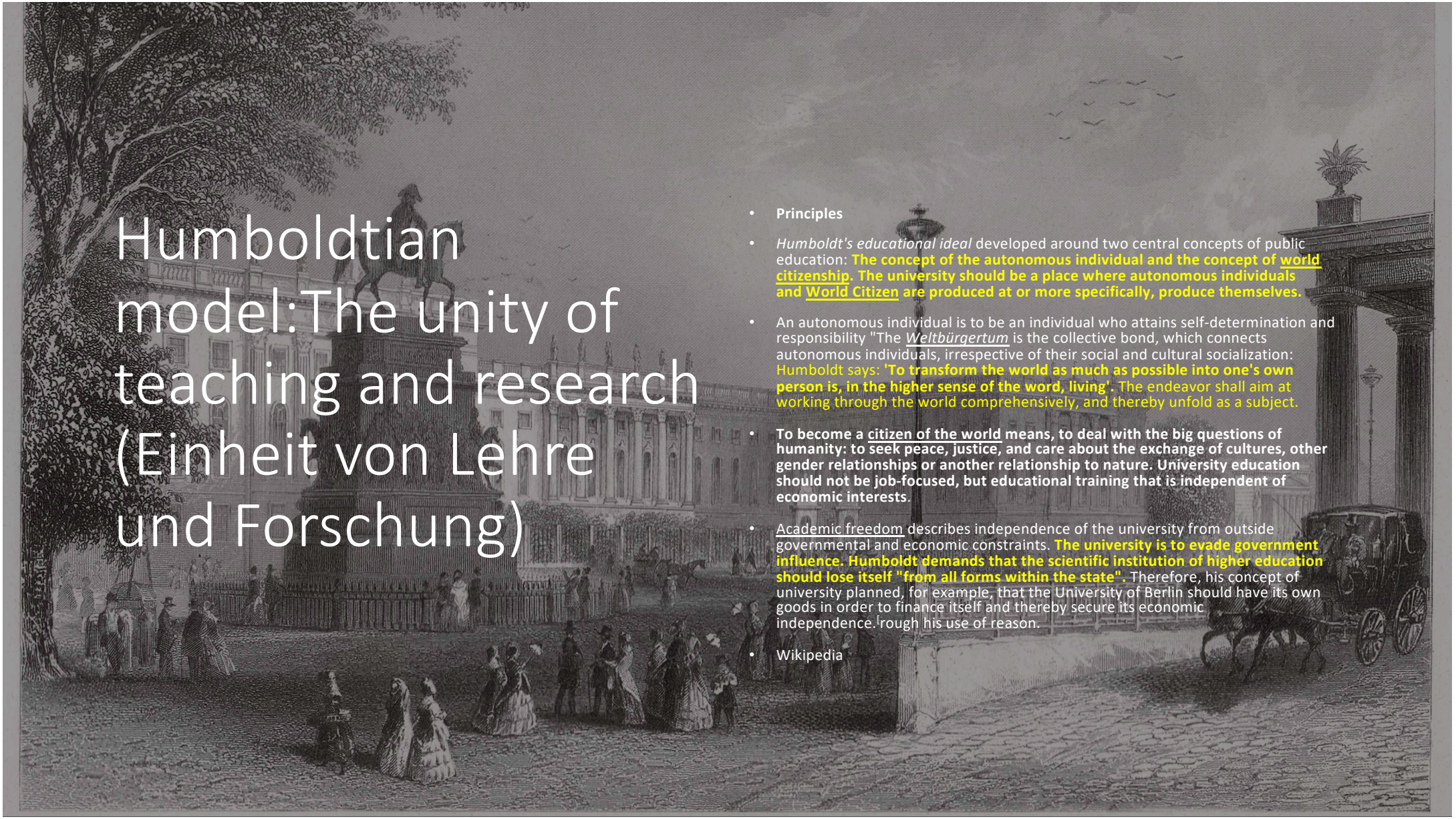
Ernest Rutherford

Collaborator	Major Contribution	Nobel Prize? 🏆
Frederick Soddy	Disintegration theory of radioactivity & the concept of isotopes.	Yes (Chemistry, 1921)
Hans Geiger	Co-developer of the gold foil experiment & invented the Geiger counter.	No
Ernest Marsden	Conducted the gold foil experiment, observing large-angle scattering.	No
Niels Bohr	Developed the Bohr model of the atom, incorporating quantum theory.	Yes (Physics, 1922)
James Chadwick	Discovered the neutron.	Yes (Physics, 1935)
Otto Hahn	Discovered nuclear fission.	Yes (Chemistry, 1944)
George de Hevesy	Developed the use of radioactive tracers.	Yes (Chemistry, 1943)


Piccard
Henriot
Ehrenfest
Herzen
de Donder
Schrödinger
Verschaffelt
Pauli
Heisenberg
Fowler
Brillouin
Debye
Knudsen
Bragg
Kramers
Dirac
Compton
de Broglie
Born
Bohr
Langmuir
Planck
Curie
Lorentz
Einstein
Langevin
Guye
Wilson
Richardson

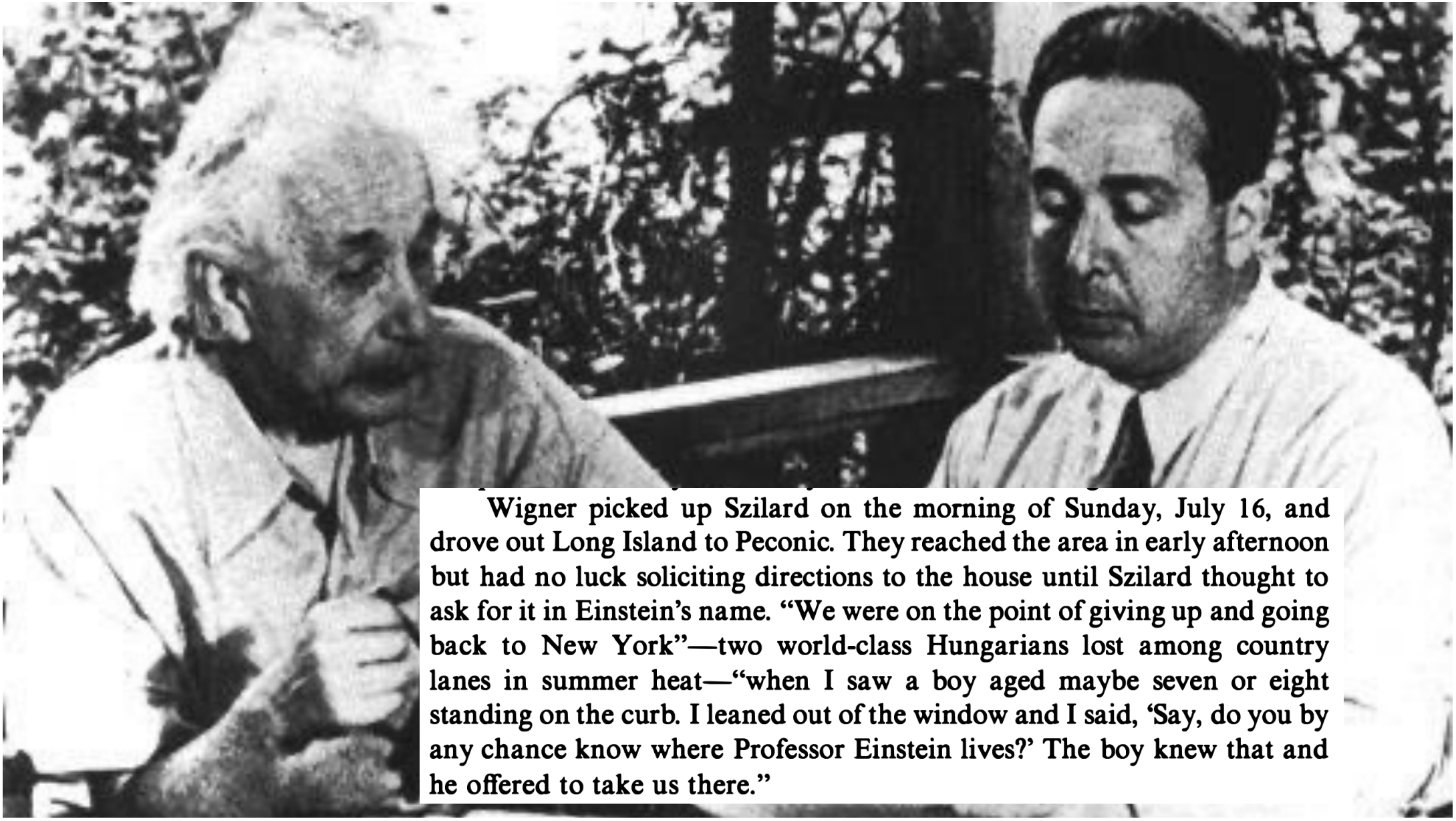
- Caricature of a Privatdozent from German satirical periodical *Fliegende Blätter* (1848): "A German Privatdozent who, wrapped up in his hopes, turns into a mummy."

To be granted the title Priv.-Doz. by a university, a recipient has to fulfill the criteria set by the university which **usually require excellence in research, teaching, and further education**. Wikipedia.



Humboldtian model:The unity of teaching and research (Einheit von Lehre und Forschung)

- **Principles**
- *Humboldt's educational ideal* developed around two central concepts of public education: **The concept of the autonomous individual and the concept of world citizenship. The university should be a place where autonomous individuals and World Citizen are produced at or more specifically, produce themselves.**
- An autonomous individual is to be an individual who attains self-determination and responsibility "The *Weltbürgertum* is the collective bond, which connects autonomous individuals, irrespective of their social and cultural socialization: Humboldt says: **'To transform the world as much as possible into one's own person is, in the higher sense of the word, living'.** The endeavor shall aim at working through the world comprehensively, and thereby unfold as a subject.
- **To become a citizen of the world means, to deal with the big questions of humanity: to seek peace, justice, and care about the exchange of cultures, other gender relationships or another relationship to nature. University education should not be job-focused, but educational training that is independent of economic interests**.
- Academic freedom describes independence of the university from outside governmental and economic constraints. **The university is to evade government influence. Humboldt demands that the scientific institution of higher education should lose itself "from all forms within the state".** Therefore, his concept of university planned, for example, that the University of Berlin should have its own goods in order to finance itself and thereby secure its economic independence.rough his use of reason.
- Wikipedia

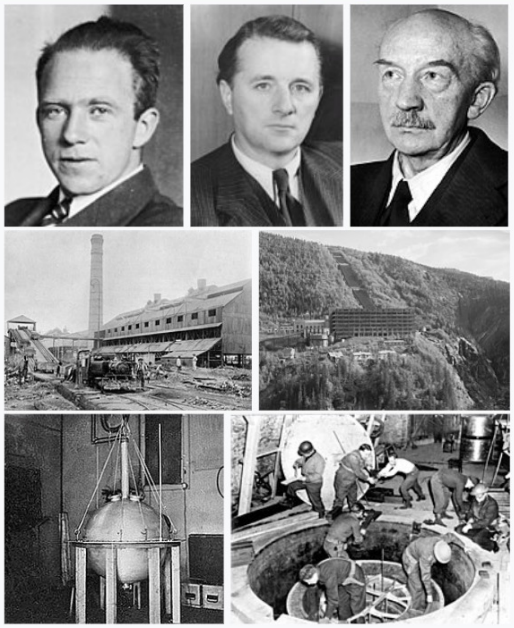


Wigner picked up Szilard on the morning of Sunday, July 16, and drove out Long Island to Peconic. They reached the area in early afternoon but had no luck soliciting directions to the house until Szilard thought to ask for it in Einstein's name. "We were on the point of giving up and going back to New York"—two world-class Hungarians lost among country lanes in summer heat—"when I saw a boy aged maybe seven or eight standing on the curb. I leaned out of the window and I said, 'Say, do you by any chance know where Professor Einstein lives?' The boy knew that and he offered to take us there."

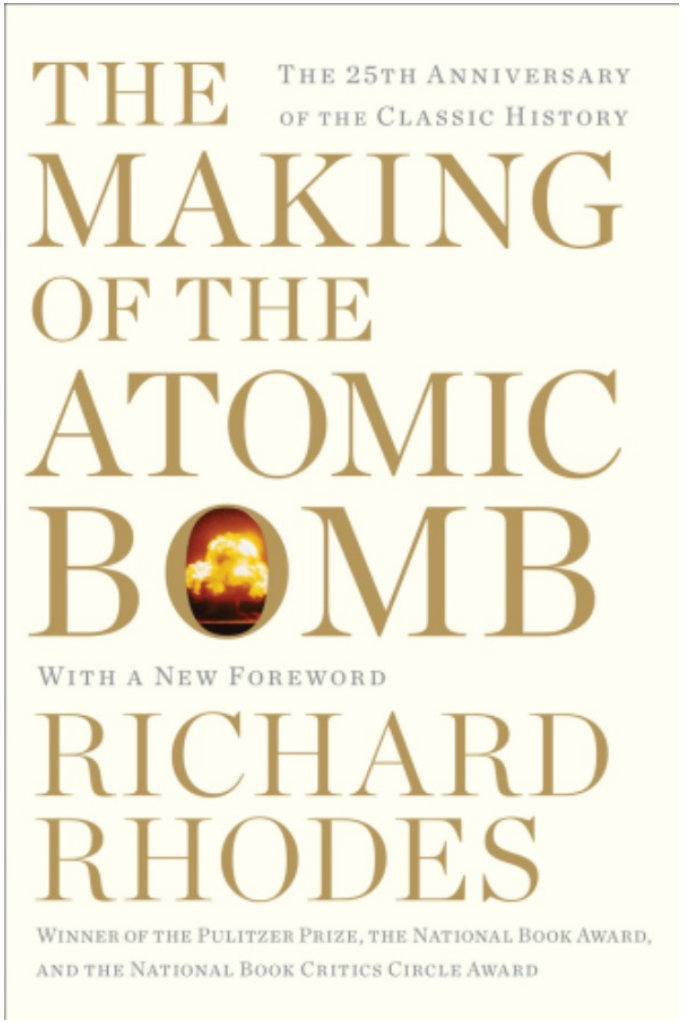
Manhattan District

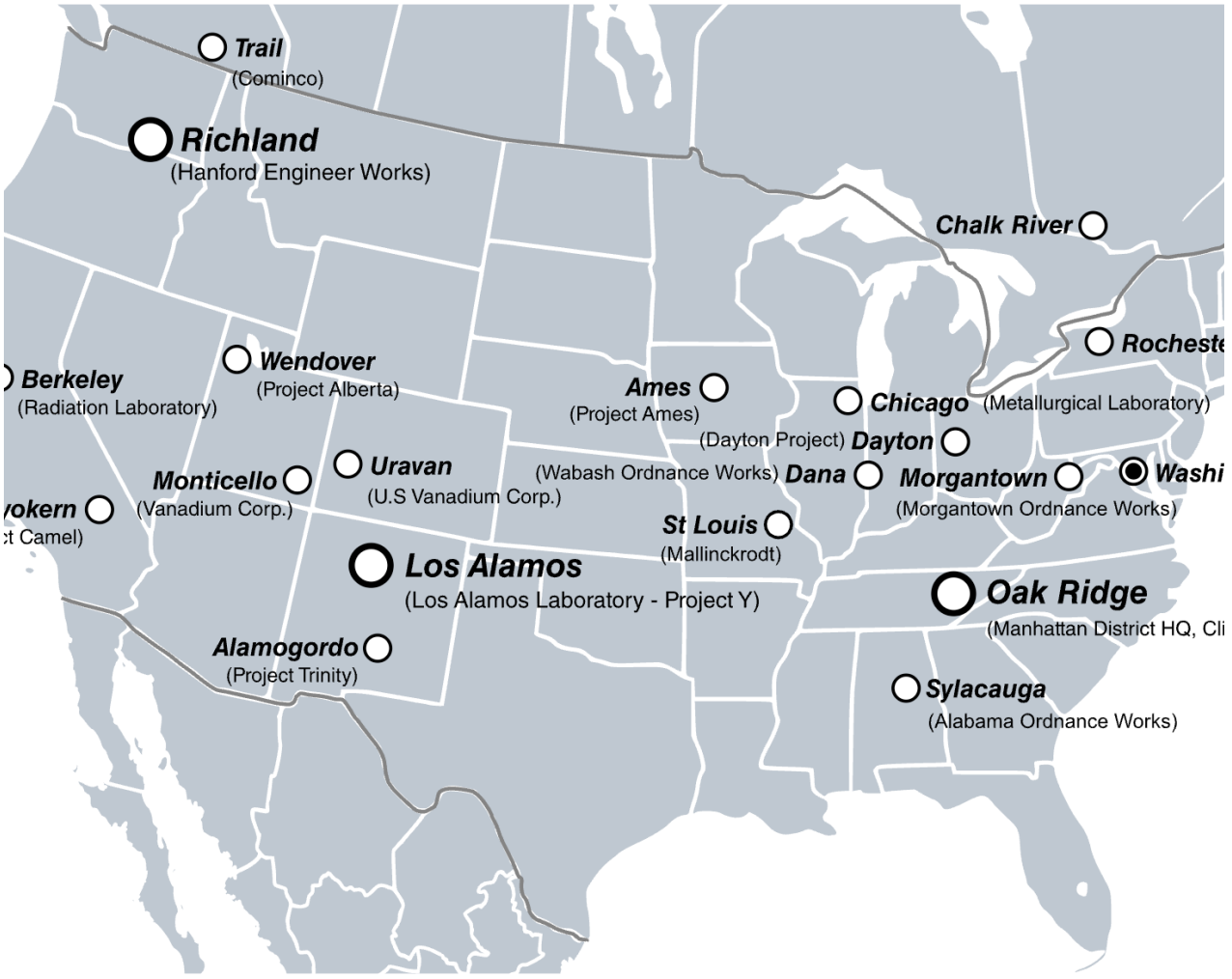
From top to bottom, left to right: Chicago Pile-1, the first nuclear reactor · K-25, the primary uranium enrichment site · The Hanford B Reactor used for plutonium production · The Gadget implosion device at Los Alamos · Alsos soldiers dismantle the Haigerloch pile of the German nuclear weapons program · The Trinity test, the first nuclear explosion · Atomic bombings of Hiroshima and Nagasaki, the only nuclear attacks in history

German nuclear program



From top to bottom, left to right: Werner Heisenberg, a theoretical physics leader of the project · Paul Harteck, an experimental leader · Walter Bothe, a leader on the project's cyclotrons · Uranium processing in Katanga, Belgian Congo · Vemork, the project's source of heavy water · Leipzig L-IV, an early nuclear experiment · Alsos Mission soldiers dismantle the Haigerloch atomic pile




Trail
(Cominco)
Richland
(Hanford Engineer Works)
Chalk River
Rocheste
Wendover
(Project Alberta)
Berkeley
(Radiation Laboratory)
Ames
(Project Ames)
Chicago
(Metallurgical Laboratory)
(Dayton Project)
Dayton
Uravan
(U.S Vanadium Corp.)
(Wabash Ordnance Works)
Dana
Morgantown
Washi
Monticello
(Vanadium Corp.)
(Morgantown Ordnance Works)
St Louis
(Mallinckrodt)
Los Alamos
(Los Alamos Laboratory - Project Y)
Oak Ridge
(Manhattan District HQ, Cli
Alamogordo
(Project Trinity)
Sylacauga
(Alabama Ordnance Works)

Lessons (a personal selection)

- Build on previous knowledge, simplify, organize. Nature seems to like simplicity
- Rutherford: Create a community, do experiments (DIY), open exchange of knowledge.

- Humboldian model of education. An international network of physicist, only interrupted by the implications of the bomb.
- Physics is essential to win the war. It ended the war. Winners shaped the architecture of the world.
- More?

After the war

Bohr, beyond physics

- When Nazism rose in Germany, many scientists (especially those of Jewish origin or who were politically vulnerable) sought refuge abroad. Bohr used his personal and institutional influence to assist them.
- Some of the scientists he helped included (among others) Lise Meitner, James Franck, Otto Frisch, Victor Weisskopf, George de Hevesy, Edward Teller, Stefan Rozental, Guido Beck, and Arthur von Hippel.
- In 1950 he published an **“Open Letter to the United Nations”**, calling for transparency, international cooperation, and control in the peaceful use of nuclear energy and in managing atomic weapons.
- Some aspects of later institutions—such as the International Atomic Energy Agency (IAEA) and postwar frameworks for scientific exchange—align with Bohr’s ethos of peaceful, restrained nuclear collaboration.

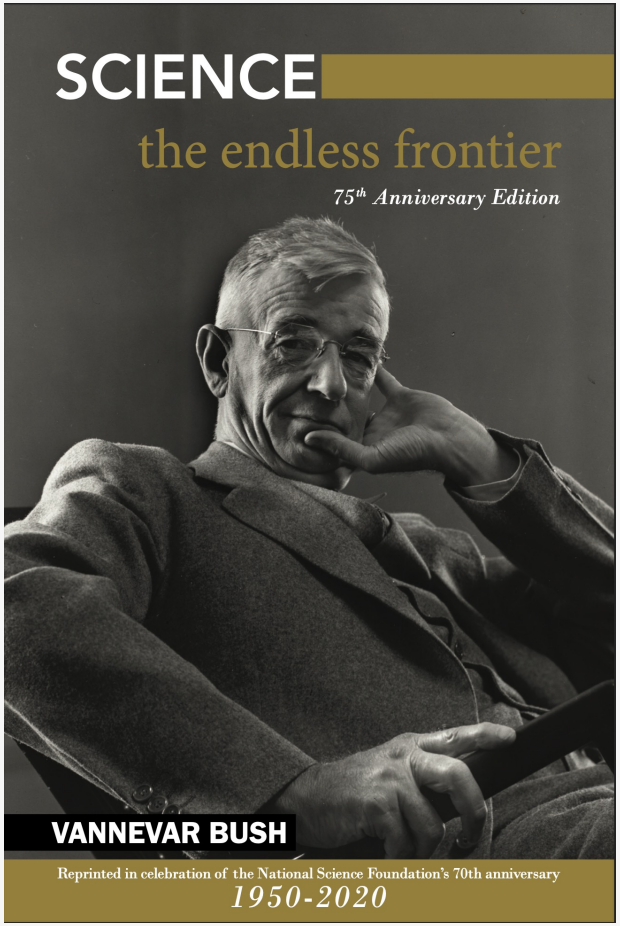
When Germany invaded Denmark on April 9th, 1940, Niels Bohr knew he had to hide the medals entrusted to him, or else the prizes would be seized. After discussing the option of burying them, Bohr and Hungarian chemist, George de Hevesy, decided instead to dissolve the gold medals in nitro-hydrochloric acid, also known as *aqua regia*. Both awards liquefied into an orange colored substance and were placed inside a flask stored on a laboratory shelf in the Niels Bohr Institute. De Hevesy fled Copenhagen for Sweden in 1943, leaving the flask behind.

Together after World War II, left to right are Niels Bohr, James Franck and George de Hevesy.

After the war, De Hevesy returned to find the solution of *aqua regia* undisturbed. He then precipitated the gold out of the acid. He sent the gold to the Nobel Society. The Nobel Society was able to recast the prize medals. These recast medals were presented to Franck and von Laue in 1952.

Post-War Paradigms (c. 1945–1990). The carrot

- The Second World War not only redrew the geopolitical map but also redefined the relationship between science, the state, and society.
- *The Endless Frontier*. This report, established the foundational ideology of American science policy for the next several decades**. Basic research is the pacemaker of technological progress and strategic advantage**. NSF was funded in 1950.
- This new social contract promised scientists generous funding and academic freedom. In return, science was expected to provide a steady stream of knowledge and innovations that would ensure national security, public health, and economic prosperity



McCarthy and the red scare: The stick

- During 1945–1960, the anti-Communist climate led to pressure on scientists who were seen as internationalist or politically left-leaning.
- "Paradoxically, the enormous successes of science in this period stirred great fear that the geese who laid such golden eggs might choose also to fill a nest in the Kremlin. **Triumphs of science and engineering included thermonuclear warheads, intercontinental ballistic missiles, satellites, expensive accelerators at Stanford, Berkeley, and Brookhaven, and much more. However, instead of carrots as rewards for such achievements, scientists were too frequently shown the stick.** This approach took a variety of forms: American scientists wishing to travel abroad were at times **denied their passports, foreign scientists planning to visit this country experienced visa denials, there was interference with constitutionally guaranteed freedom of speech and beliefs, loyalty oaths were imposed, the exchange of scientific information was sometimes blocked, jobs were lost, loyalty investigations were required for employment, grants, and fellowships that involved no classified matter.**

These barriers to the normal flow of scientific activity popped up so often that a fog of uncertainty settled over the profession. But it is refreshing to see that, very often, scientists fought back."

The repressive political climate of the McCarthy era shaped not only the careers of individual scientists, but also the broader relation between science and public life.

The challenges of that era pushed scientists to develop new modes of engagement as public citizens—something that shaped later scientific activism and policy involvement.

The Pauling case is an example for understanding how academic institutions, political fears, and individual agency interacted.

The Physical Science Study Comitee (PSSC)

ComPADRE
Resources and Services for Physics Education

Find a Resource...

AAPT ComPADRE | Events | Collaborate | About | Contact Us

home » *PSSC: 50 Years Later*

AAPT Celebrates PSSC's 50th Birthday

PSSC: 50 Years Later

In 1956 MIT physics professor Jerrold Zacharias formed PSSC, the Physical Sciences Study Committee, and launched what became America's largest effort ever to reshape how physics was taught in high schools.

The impact of PSSC was world wide. By the early 1960s more than twenty percent of all high school teachers of physics were involved in this project. PSSC produced a major new text book, more than fifty extraordinary movies, a sequence of lab materials that has not been equaled, and a series of short books describing in an engaging and insightful way many different aspects of physics -- crystal growing, waves and beaches, how a TV works, neutrons, electrons, the universe, and the physicists who led the way to deeper understanding of a fascinating variety of phenomena.

As you read any piece of this collection, you will see that PSSC had enormous impact on physics teaching, not just in high school but at all levels, and not just in America, but all over the world.

Many questions you might ask about PSSC are answered by the analyses, reflections, and recollections of the authors of this AAPT on-line publication assembled to celebrate PSSC's fiftieth birthday.

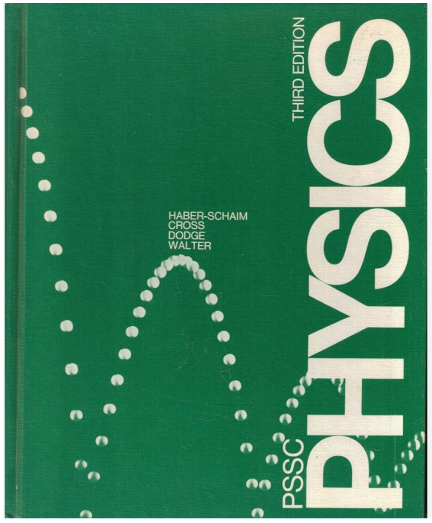
PSSC Analyses, Reflections, Recollections

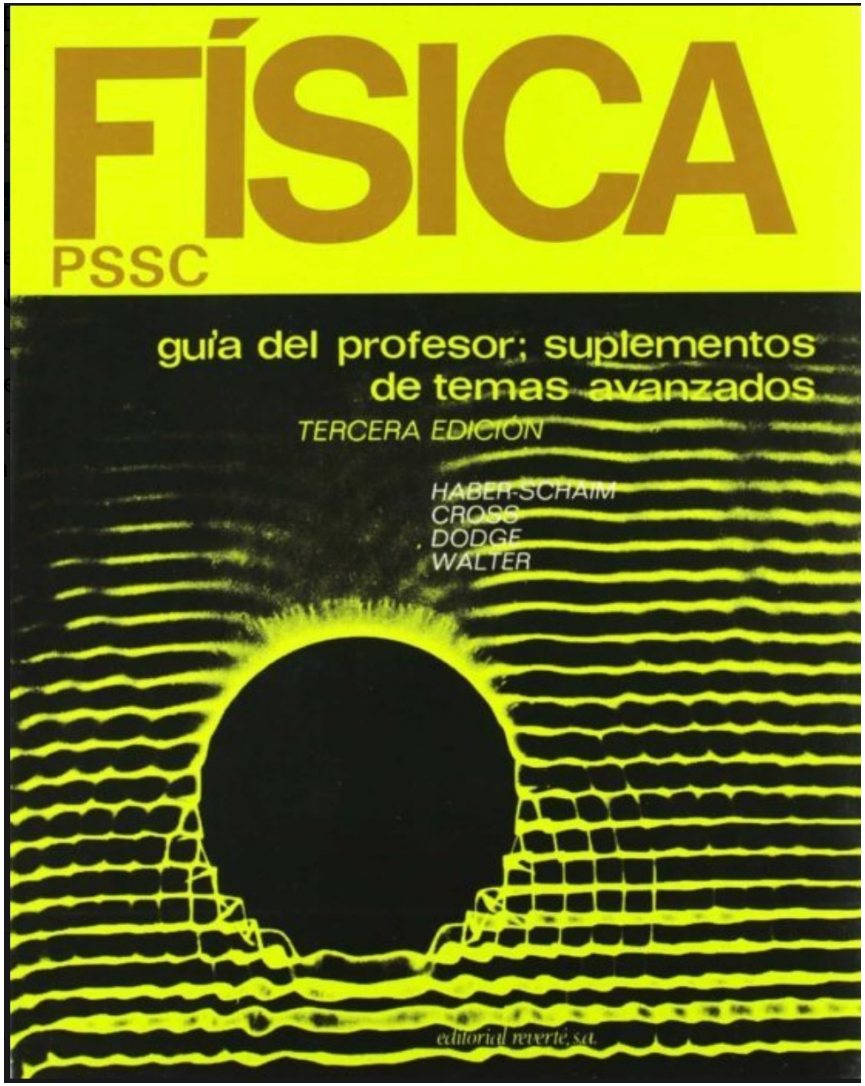
The reason behind the PSSC.

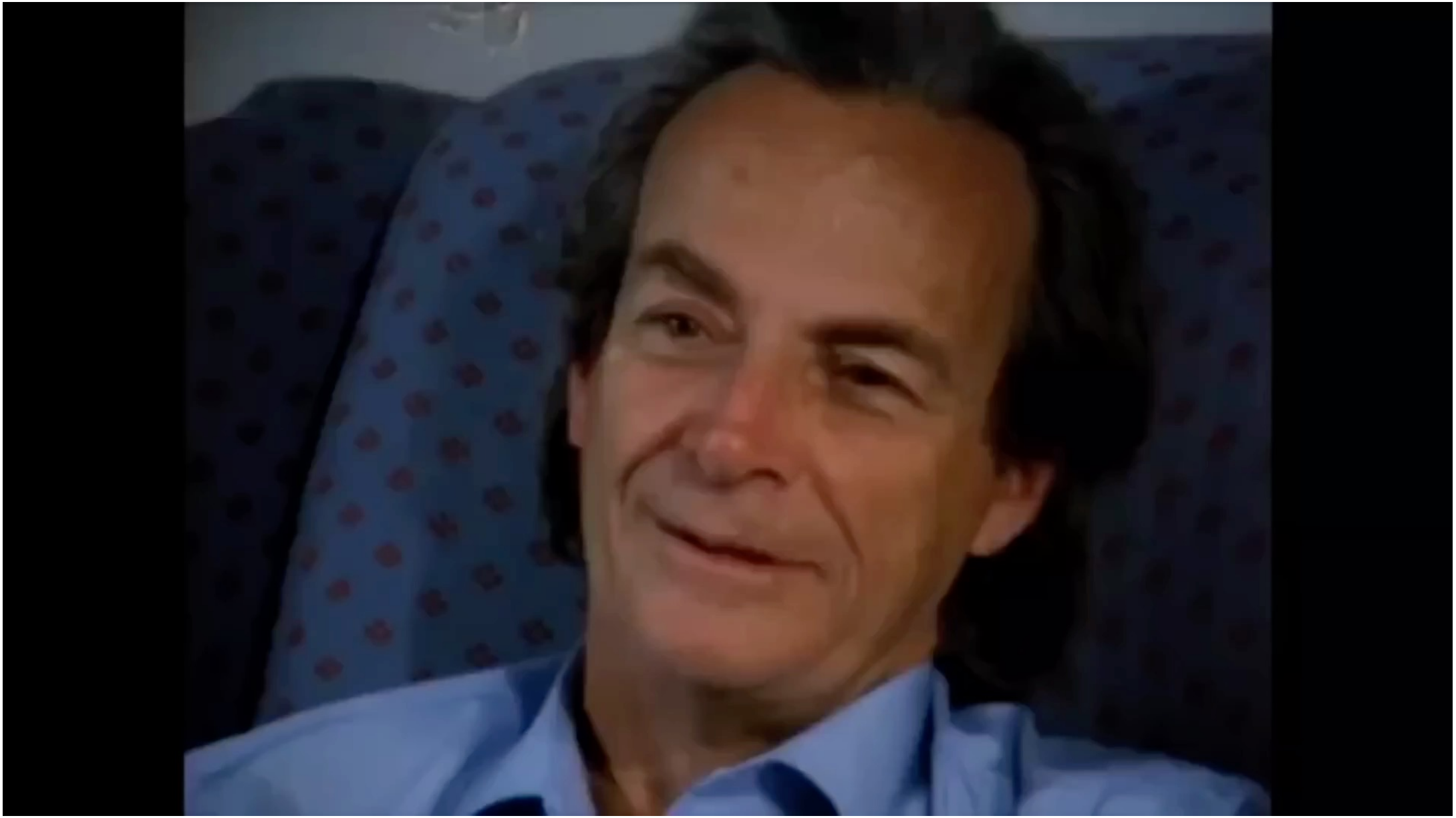
In later years, Morrison described the reasons he got involved in PSSC: "I was oppressed by the feeling of the early fifties that science and intellectual reason itself were not being given a fair chance in the schools and in public life." The need for a more rational citizenry was apparent to Zacharias as well. His decision to lead the project was based, in his words, on "*deep* political reasons," which were tied directly to the "Joe McCarthy era." This was the ultimate justification of the course. Based on his experience during the war, and after seeing "the American public…being *molded* by Joe McCarthy," it was clear to him that "to get people to be decent in this world, they have to have some kind of intellectual training that involves…observation, evidence, and basis for belief." This was what PSSC was created to provide.

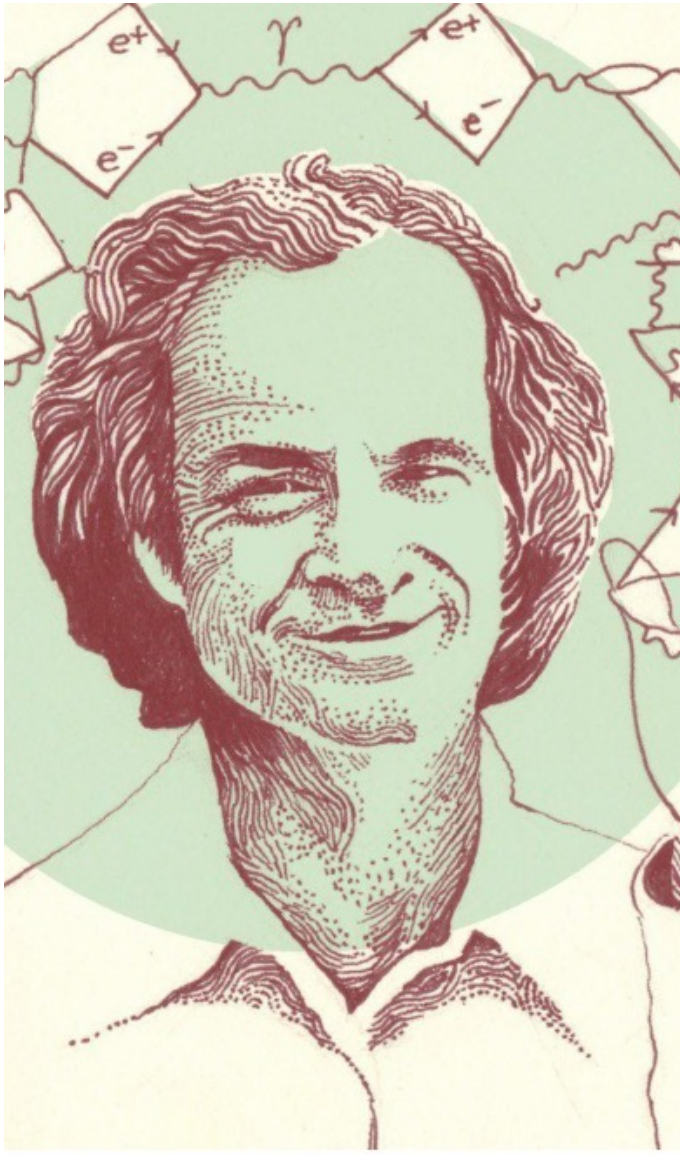
Science Foundation in July of 1956, Zacharias began to assemble the key players who would eventually make up the PSSC group, individuals such as Fran Friedman from MIT, Philip Morrison of Cornell, Ed Purcell of Harvard, MIT president James Killian, Polaroid founder Edwin Land, and Educational Testing Service president Henry Chauncey.

https://www.compadre.org/portal/pssc/docs/Rudolph.pdf


THIRD EDITION
HABER-SCHAIM
CROSS
DODGE
WALTER
PSSC
PHYSICS


FÍSICA
PSSC
guía del profesor; suplementos de temas avanzados
TERCERA EDICIÓN
HABER-SCHAIM
CROSS
DODGE
WALTER
editorial reverté, s.a.





nomy and The Feynman Lectures W

Feynman

LECTURE

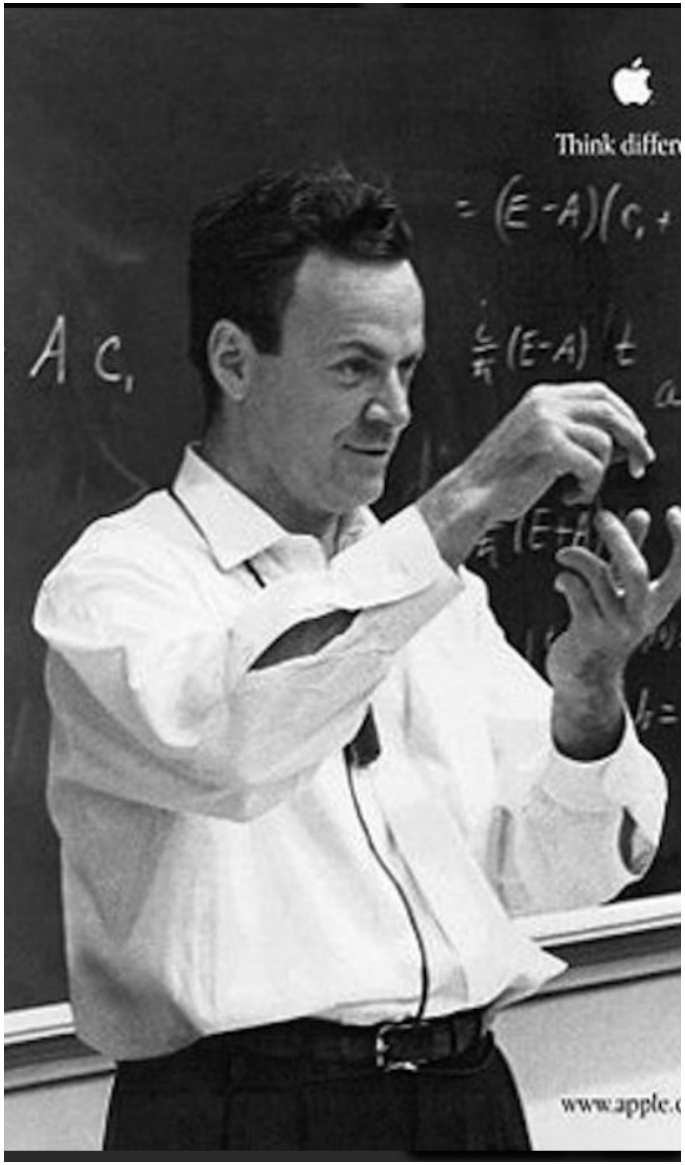
PHYS

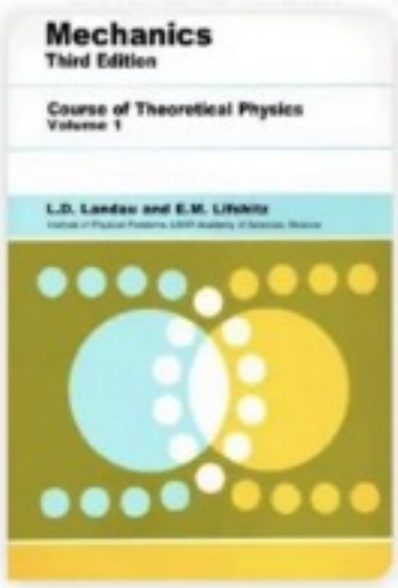
Feynman • Leighton • Sands

Restore my view [1]

er can enjoy **reading**[2] a high quality up-

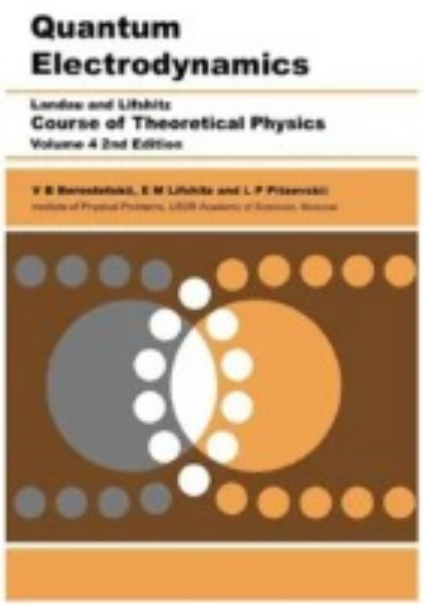
ices of any size or shape; text, figures and

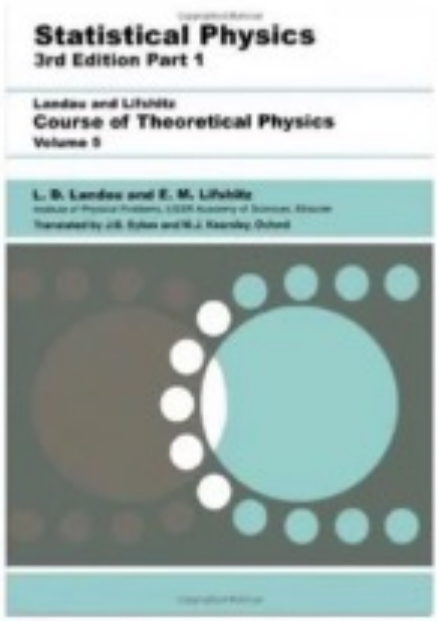


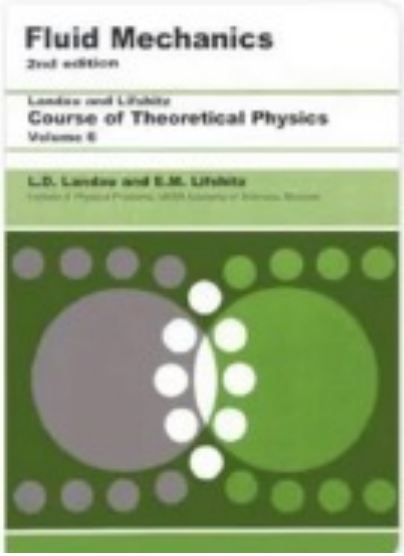

Mechanics
Third Edition
Course of Theoretical Physics
Volume 1
L.D. Landau and E.M. Lifshitz

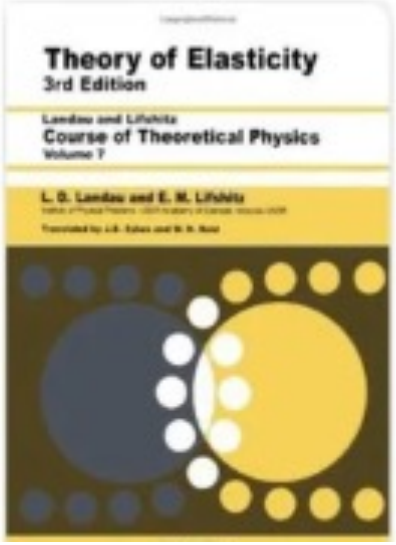

The Classical
Theory of Fields
Fourth Revised English Edition
Course of Theoretical Physics
Volume 2
L.D. Landau and E.M. Lifshitz


Quantum Mechanics
(Non-relativistic Theory)
Course of Theoretical Physics
Volume 3 Third Edition

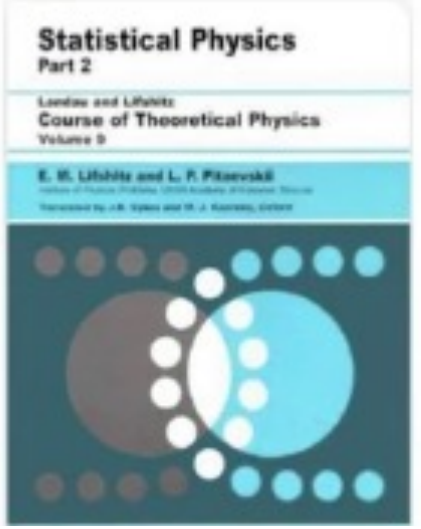

Quantum
Electrodynamics
Landau and Lifshitz
Course of Theoretical Physics
Volume 4 2nd Edition

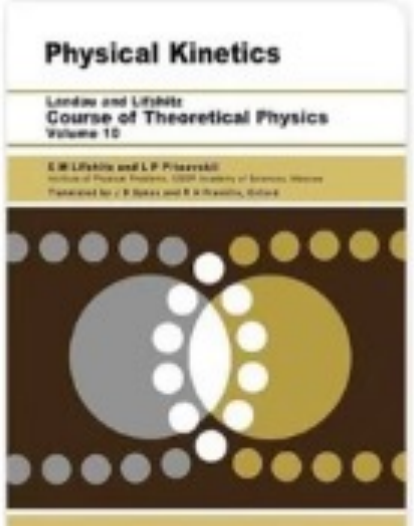

Statistical Physics
3rd Edition Part 1
Landau and Lifshitz
Course of Theoretical Physics
Volume 5


Fluid Mechanics
2nd edition
Landau and Lifshitz
Course of Theoretical Physics
Volume 6
L.D. Landau and E.M. Lifshitz


Theory of Elasticity
3rd Edition
Landau and Lifshitz
Course of Theoretical Physics
Volume 7
L. D. Landau and E. M. Lifshitz


Electrodynamics of
Continuous Media
2nd edition
Landau and Lifshitz Course of Theoretical Physics
Volume 8


Statistical Physics
Part 2
Landau and Lifshitz
Course of Theoretical Physics
Volume 9


Physical Kinetics
Landau and Lifshitz
Course of Theoretical Physics
Volume 10

Democratization of physics

Year	Milestone	Country/ Region
1938	The Institute of Physics at the National Autonomous University of Mexico (UNAM) is founded, becoming the first professional physics research center in the country.[1]	Mexico
1952	Experimental physics begins in earnest at UNAM with the acquisition of a 2 MeV Van de Graaff particle accelerator.[1]	Mexico
1958	The National Scientific and Technical Research Council (CONICET) is established to foster and coordinate scientific and technological research.[3]	Argentina
1959	The Latin American School of Physics is founded by physicists from Mexico, Brazil, and Argentina to create a regional collaboration network.[1]	Latin America
1959	Fernando Alba becomes the first person to earn a Ph.D. in physics in Mexico.[1]	Mexico
1962	The School of Physics is founded at the University of Havana.[5]	Cuba
1965	The Pontifical Catholic University of Rio de Janeiro (PUC-Rio) establishes its master's program in physics.[6]	Brazil
1968	PUC-Rio expands its graduate program to include a doctoral course in physics.[6]	Brazil
c. 1975	Recognizing the high cost of building their own facilities, UNAM's nuclear physics group pioneers a strategy of becoming users of large international facilities in the U.S..[1]	Mexico
c. 1980	The first Panamerican Workshop on High-Energy Physics is held, fostering collaboration between Latin American physicists and international institutions like Fermilab.[1]	Latin America
2001	The first biennial CERN – Latin-American School of High-Energy Physics is held, designed to integrate young Latin American physicists into the global research community.[7]	Brazil / Latin America

RESEARCH ARTICLE | AUGUST 30 2000

Origin of experimental high-energy physics at UNAM

Jorge Flores

+ Author & Article Information

AIP Conf. Proc. 531, 252–254 (2000)

https://doi.org/10.1063/1.1315042

PHYSICS TODAY LATEST CURRENT ISSUE

SHARE

One million physicists FREE

17 April 2015

Economic development could dramatically boost the number of physicists worldwide.
Charles Day

DOI: https://doi.org/10.1063/PT.5.010310

The era of big science

Global Collaboration as a Model: The scale of projects at places like CERN necessitates global collaboration. It teaches students about teamwork, perseverance, and how science can act as a bridge between nations, promoting peace.

Countering Misinformation: Science education rooted in the methods of Big Science—observation, measurement, analysis, and transparent reporting—equips students with the critical thinking skills.

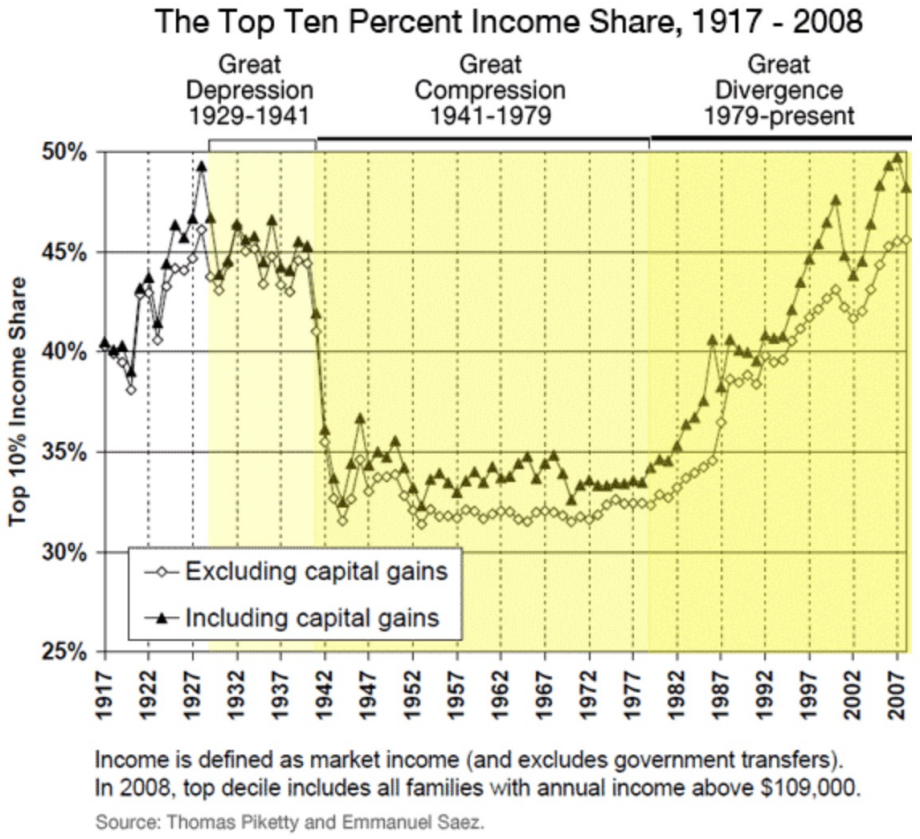
Inspiring the Next Generation: A stairway to heaven

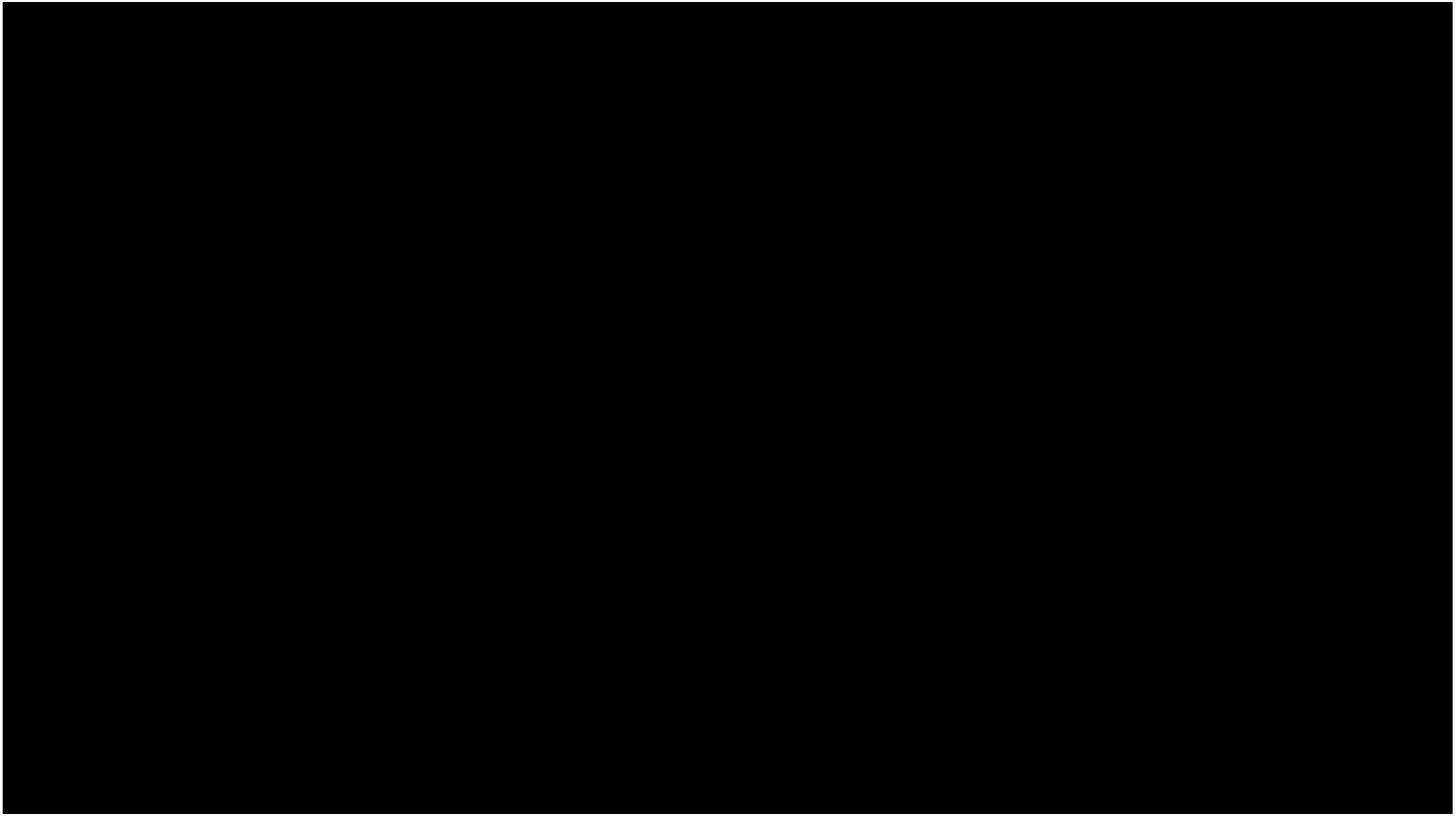
eli

L2 A2

CLPU
CENTRO DE LÁSERES PULSADOS

Space race


The Top Ten Percent Income Share, 1917 - 2008
Great Depression 1929-1941
Great Compression 1941-1979
Great Divergence 1979-present
Top 10% Income Share
50%
45%
40%
35%
30%
25%
1917
1922
1927
1932
1937
1942
1947
1952
1957
1962
1967
1972
1977
1982
1987
1992
1997
2002
2007
Excluding capital gains
Including capital gains
Income is defined as market income (and excludes government transfers).
In 2008, top decile includes all families with annual income above $109,000.
Source: Thomas Piketty and Emmanuel Saez.



Lessons (again arbitrary)

- Physics is essential for strategic advantage, wealth and well-being.
- You (anybody, anywhere) can be physicist but hard work is essential.
- The universe is ours to explore, collaboration is key
- In dark times, physics is needed to create citizens
- A visión of our common house, the planet earth.

1990-today

Open source software & hardware

GNU Operating System

Supported by the Free Software Foundation

ABOUT GNU | PHILOSOPHY | LICENSES | EDUCATION | SOFTWARE | DISTROS | »

Essays & articles | Speeches & interviews | Third party ideas | Latest articles | Recordings

Philosophy of the GNU Project

Free software means that the software's users have freedom. (The issue is not about price.) We developed the GNU operating system so that users can have freedom in their computing.

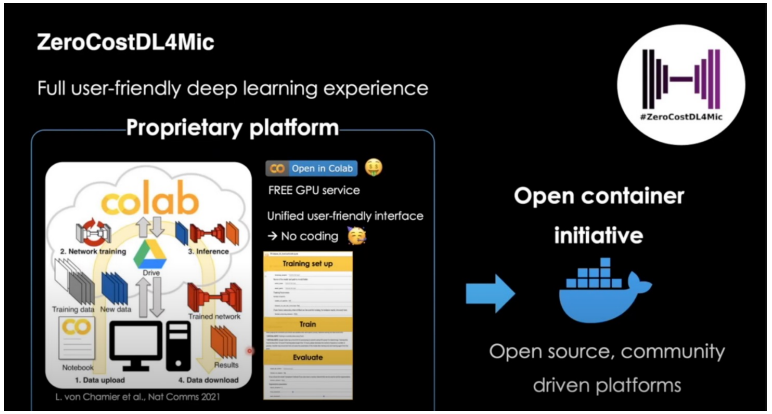
Specifically, free software means users have the four essential freedoms: (0) to run the program, (1) to study and change the program in source code form, (2) to redistribute exact copies, and (3) to distribute modified versions.

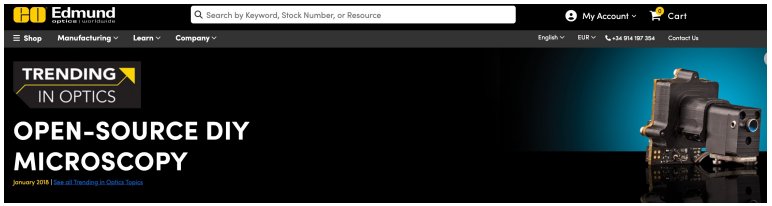
Software differs from material objects—such as chairs, sandwiches, and gasoline—in that it can be copied and changed much more easily. These facilities are why software is useful; we believe a program's users should be free to take advantage of them, not solely its developer.

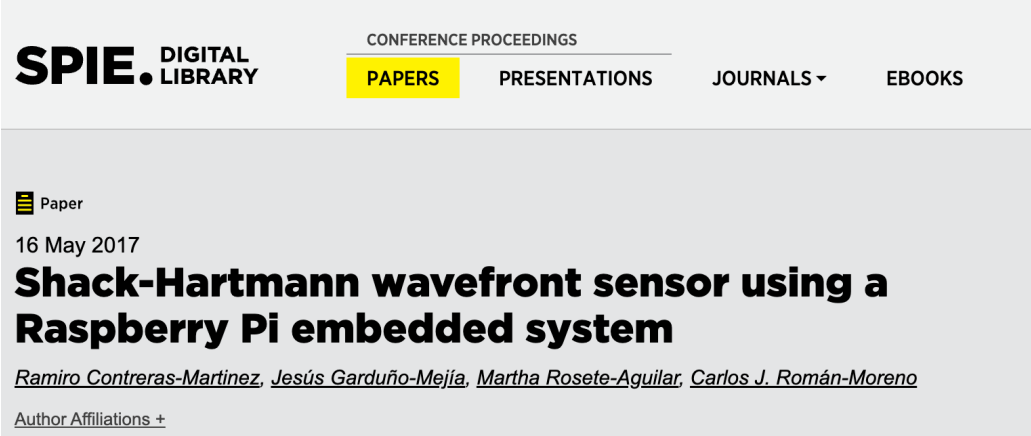
Make:
makezine.com

DIY & FabLabs

Examples



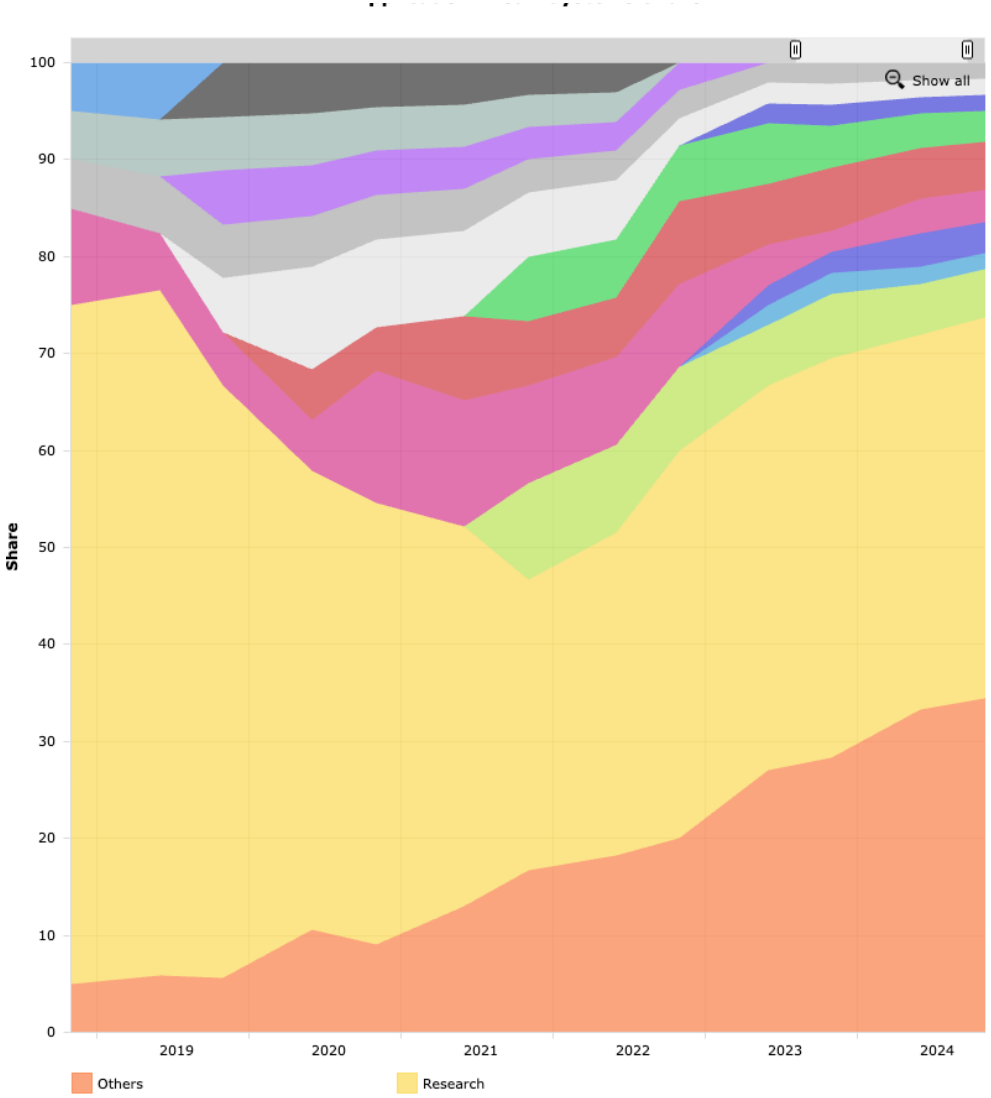


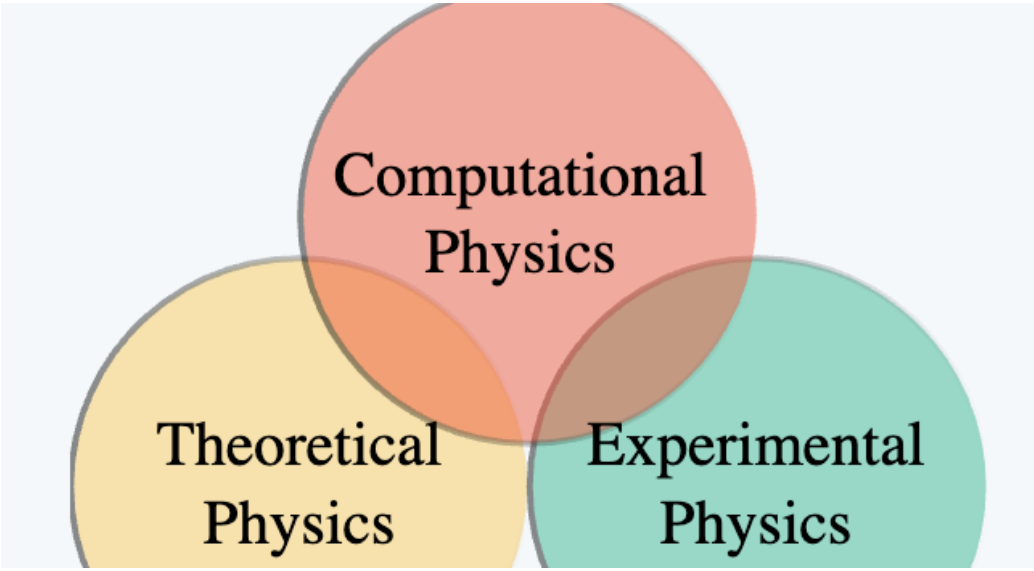


The Philosophy of Life Based on Tim Berners-Lee: Connectivity, Openness, and Digital Empowerment

Codelamps.inc Follow 3 min read · Aug 29, 2023

1. Embrace the Power of Connectivity:
He believed in the potential of the internet to bring people together, transcend barriers, and foster global communication.
2. Champion Openness and Accessibility:
He believed that information should be accessible to all, without discrimination or restrictions.
3. Promote Digital Empowerment and Inclusion:
He believed that the internet should empower individuals to create, share, and engage in ways that enrich their lives.
4. Embrace Innovation and Collaboration:
He believed in the potential of technological advancements to drive positive change and improve human experiences.
5. Value Ethical Use of Technology:
He believed that the internet should be a force for good, promoting positive interactions and respecting individual privacy.
6. Foster Digital Literacy and Education:
He believed that individuals should have the skills and knowledge to navigate the digital landscape responsibly.





The third pillar

Benjamin Skuse

Physics World, Volume 32, Number 3

Citation Benjamin Skuse 2019 *Phys. World* **32** (3) 40

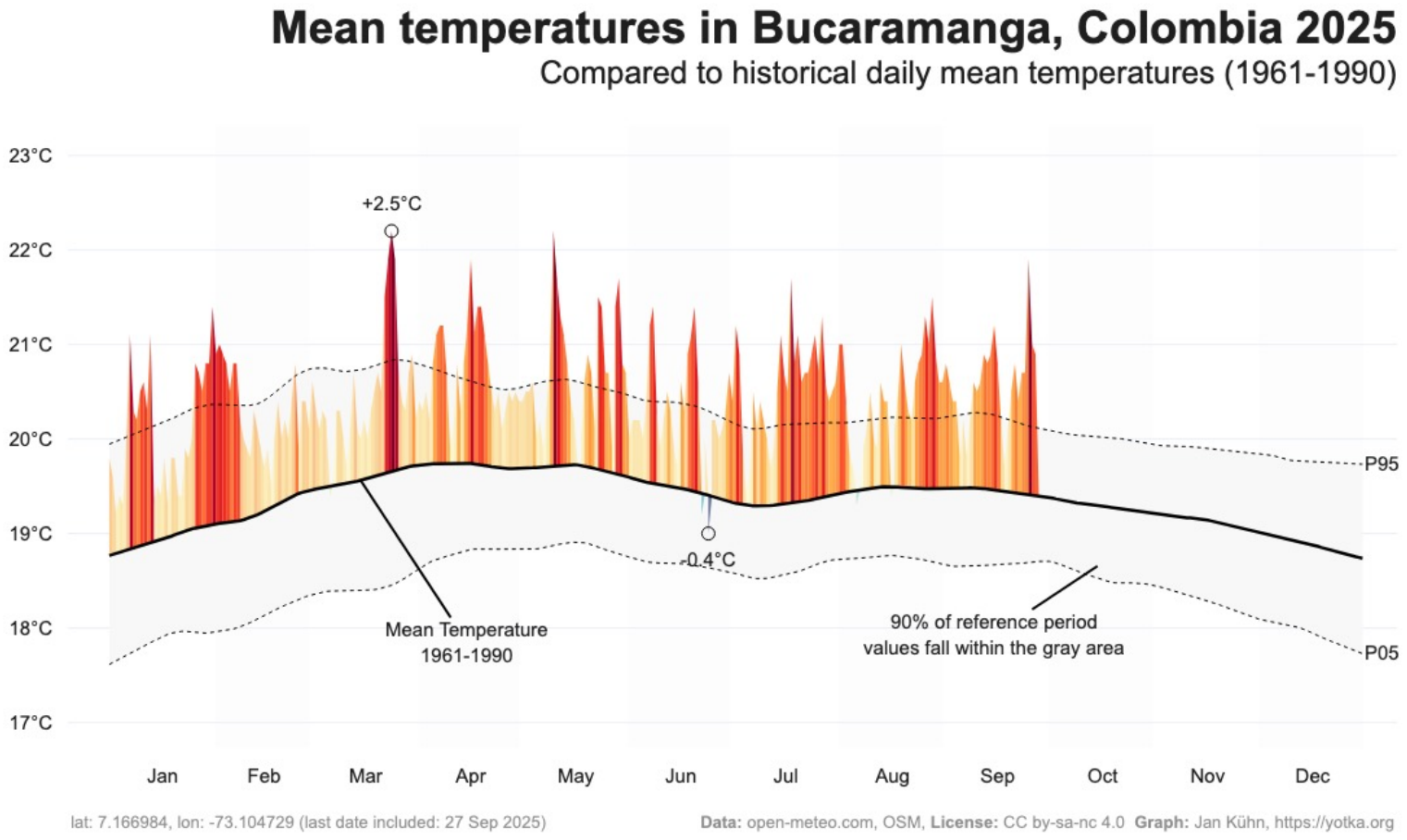
DOI 10.1088/2058-7058/32/3/33

Lessons (arbitrary)

- Openness accelerates science
- Technology as an enabler and a driver of globalization
- From competition to cooperation
- Physics must serve global challenges. (Example: IPCC)
- Available computing is the new pencil & paper
- Inequalities persist.

Future challenges (some)

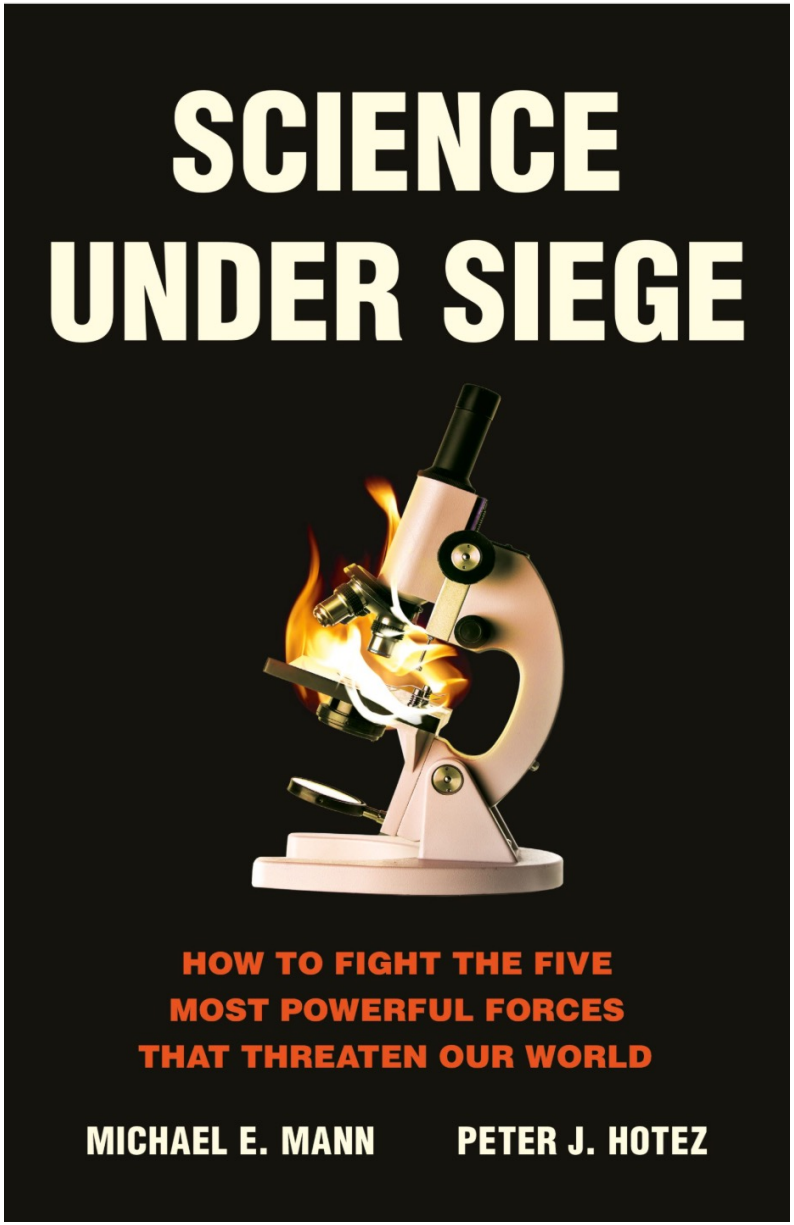
Climate change



Science under siege

In Game-Changing Climate Rollback, E.P.A. Aims to Kill a Bedrock Scientific Finding

The proposal is President Trump's most consequential step yet to derail federal climate efforts and appears to represent a shift toward outright denial of the scientific consensus.



Sustainability should be embeded in education.

nature portfolio

nature > series

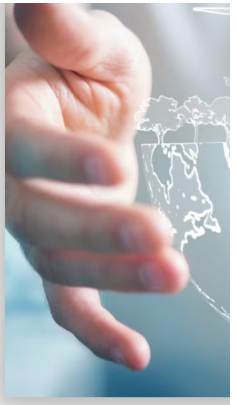
Series | **07 March 2023**

Physics and sustainability

Physics research comes with an environmental cost. It can also have many benefits. This ongoing collection brings together articles from Nature Reviews journals about how physicists can contribute to environmental sustainability – both by working on questions that have direct relevance to sustainability goals and understanding Earth's climate, but also by changing the ways physicists work.

Sustainability at APS

APS is committed to sustainability, from supporting scientists seeking climate solutions to ensuring quality physics education that advances the next generation's involvement in the field.



Interdisciplinarity and applications in real-world problems
Expansion of physics education into areas such as sustainability, climate science, biophysics, and quantum technologies.
Stronger connections between physics and global challenges such as the energy transition and climate change.

Support for U. N. Sustainable Development Goals

APS supports the United Nations' Sustainable Development Goals (SDG) and the SDG Publisher's Compact. APS Chief Publications Officer Rachel Burley was named an SDG Fellow in 2023, demonstrating a dedication to sustainable practices and disseminating research on sustainability, including:

- Quality education, presented in our *Physical Review Physics Education Research* journal
- Affordable and clean energy, showcased in *PRX Energy*, which publishes research toward sustainable energy targets
- Industry, innovation, and infrastructure, explored in *Physical Review Applied*, which bridges the gaps between engineering and physics as well as academia and industry

Inclusion and diversity

PHYSICS TODAY

Volume 78, Issue 2
1 February 2025

Previous Article Next Article

UNESCO details the STEM gender gap and efforts to close it

FREE

Tonya Gary

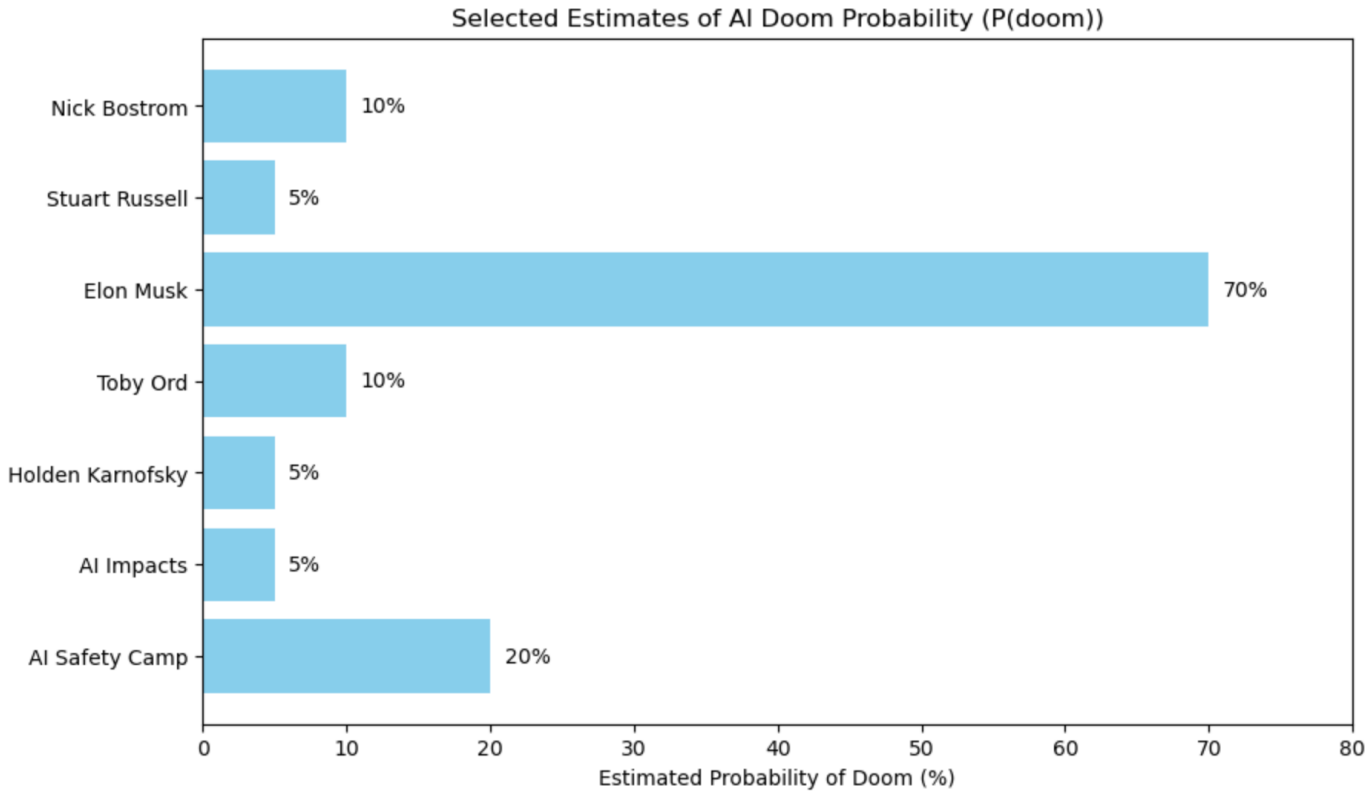
Physics Today **78** (2), 23 (2025);
https://doi.org/10.1063/pt.vosq.gvoi

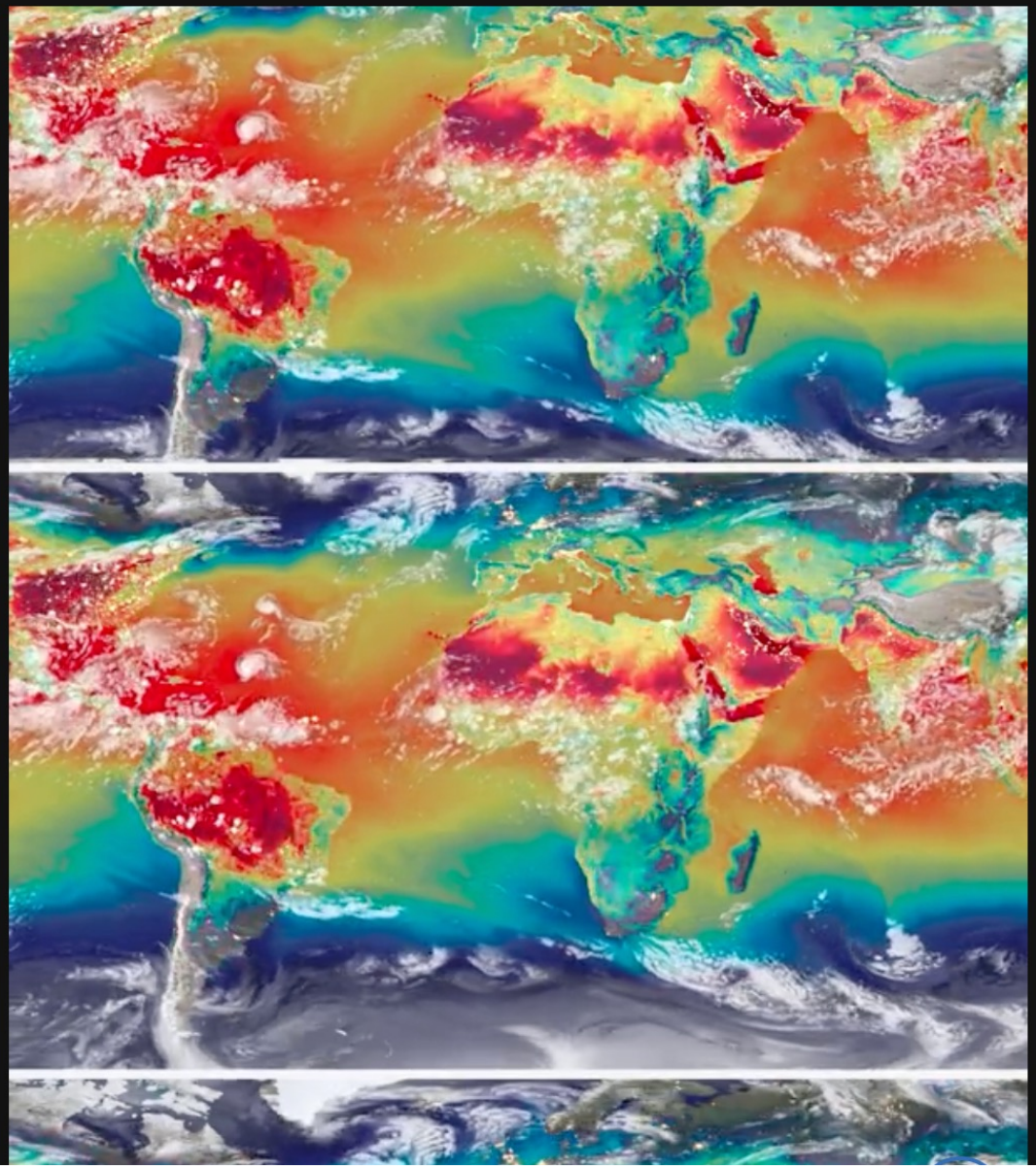
Topics
Policy issues, Social issues, Education, Careers and professions, Diversity in science, Scientific society and organization

Using two decades of data, a recent UNESCO report enumerates disparities between women and men in STEM in the G20 countries, considers the reasons for those disparities, and recommends measures to address them. Titled *Changing the Equation: Securing STEM Futures for Women*, it was published last November.

Women are underrepresented in STEM education and employment in all G20 countries, with no statistically discernible progress in the past decade, according to the report. In 2023, women in those countries made up about 35% of college graduates in STEM fields and 22% of the STEM workforce. South Africa and India had the highest proportion of women graduates in STEM, with 47% and 45%, respectively.

The risks of AI





Kevin Roose

Yeah. I mean, the comparison I've been trying to use to illustrate the scale of investment that's happening now is with the interstate highway system, which was built over a 36-year period at a cost of roughly $300 billion, adjusted for inflation. That's today's dollars.

On a recent earnings call, Jensen Huang, the CEO of NVIDIA, estimated that this year alone, US companies would spend about $600 billion on AI data centers. So in other words, this year, the AI industry is projecting to spend basically twice as much as the cost of the entire interstate highway system in one year.

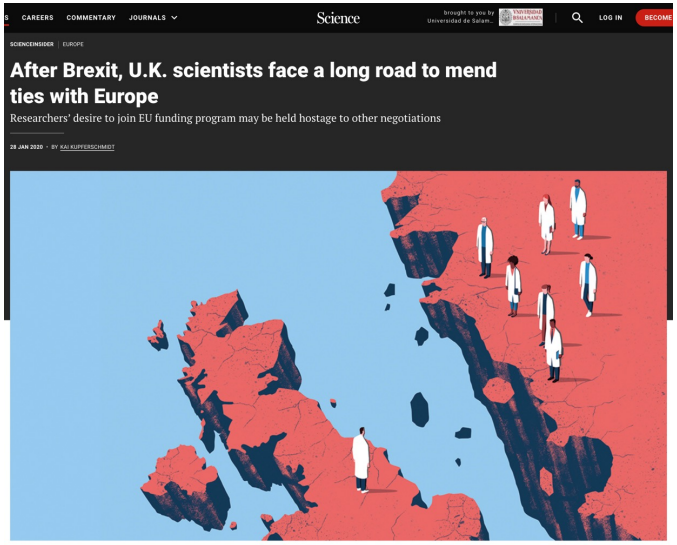
I Witnessed A.I. Collide with Climate

This town's minerals make A.I. possible. Then came Hurricane Helene. Kate Crawford is a professor at the University of Southern California, a senior principal researcher at Microsoft Research and the author of "Atlas of A.I."

By Kate Crawford, Ryan S. Jeffery and Adam Westbrook

September 26, 2025

Artificial intelligence vs natural stupidity



nature

Explore content | About the journal | Publish with us | Subscribe

nature > news > article

NEWS | 20 February 2025

Trump's siege of science: how the first 30 days unfolded and what's next

The breakneck pace and devastating impact of the administration's policy changes has shocked researchers.

By Jeff Tollefson, Max Kozlov, Alexandra Witze & Dan Garisto

The New York Times

Affirmative Action Was Banned. What Happened Next Was Confusing.

Here is what we know about the effects of the Supreme Court's decision curtailing race-based admissions at selective universities. And why many experts and administrators are baffled.

End of the globalization and the post war architecture

The New York Times

$100,000 Per Employee: How the H-1B Visa Fee Could Reshape Work Forces

By Keith Collins, Aaron Krolik and Robert Gebeloff Sept. 25, 2025

Share full article 619

The New York Times

As Trump Tightens Visas, China Woos World's Science Graduates

A new visa for science and engineering graduates is part of China's effort to establish itself as the world leader in science and technology.

Listen to this article · 5:57 min Learn more Share full article 149

A display in the main academic building showing the portraits of world-class scientists — all of whom were recruited to the campus from overseas, at the Westlake University in Hangzhou, China, in April. China is trying to attract the best scientific minds, to displace the United States at the global forefront of scientific and technological advancements. Vivian Wang/The New York Times

By Vivian Wang
Reporting from Beijing

Sept. 26, 2025

WIRED SECURITY POLITICS THE BIG STORY BUSINESS SCIENCE CULTURE REVIEWS NEW

FERNANDA GONZÁLEZ SCIENCE MAY 8, 2025 5:00 AM

As the US Cuts Scientific Talent, Europe Launches an Initiative to Attract It

The Choose Europe for Science program will invest more than half a billion dollars between 2025 and 2027 to recruit researchers and scientists—from the United States.

French president Emmanuel Macron welcomes European Commission president Ursula von der Leyen at the Élysée Palace on May 5, 2025, ahead of the launch of the Choose Europe for Science program. PHOTOGRAPH: PIERRE SUU/GETTY IMAGES

Conclusions

- The recent history of physics provide key principles to think about how to integrate research and science.
- In extraordinary times, physicist have risen to the challenge. I argue that we are in extraordinary times and we must contribute. Education is one of many ways to do it.
- We need to provide tools to students to understand the current challenges, many of them global and contribute to the solutions.
- We (El bongó) can contribute a unique perspective on how to build capacities to the new generations of scientist.

Thanks !

- Camilo Ruiz
- EMC3 Research group. Universidad de Salamanca
- camilo@usal.es