Title: Science Superheroes - Richard

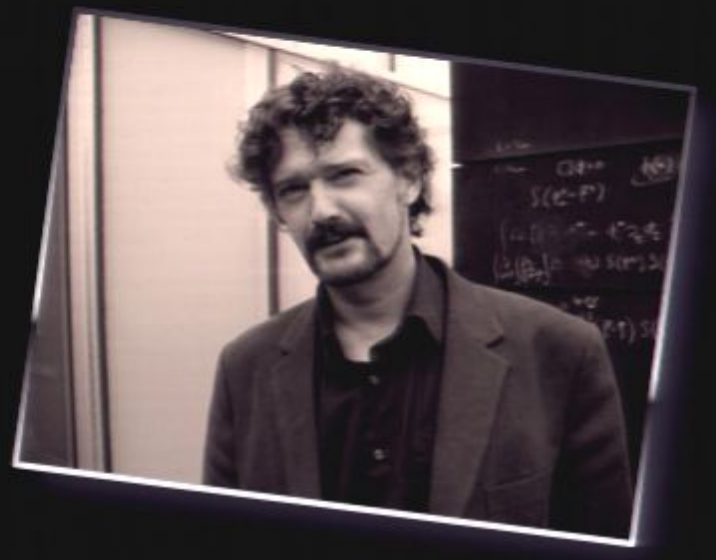
Date: Apr 08, 2009 03:30 PM

URL: http://www.pirsa.org/09040064

Abstract:

The Physics of Innovation

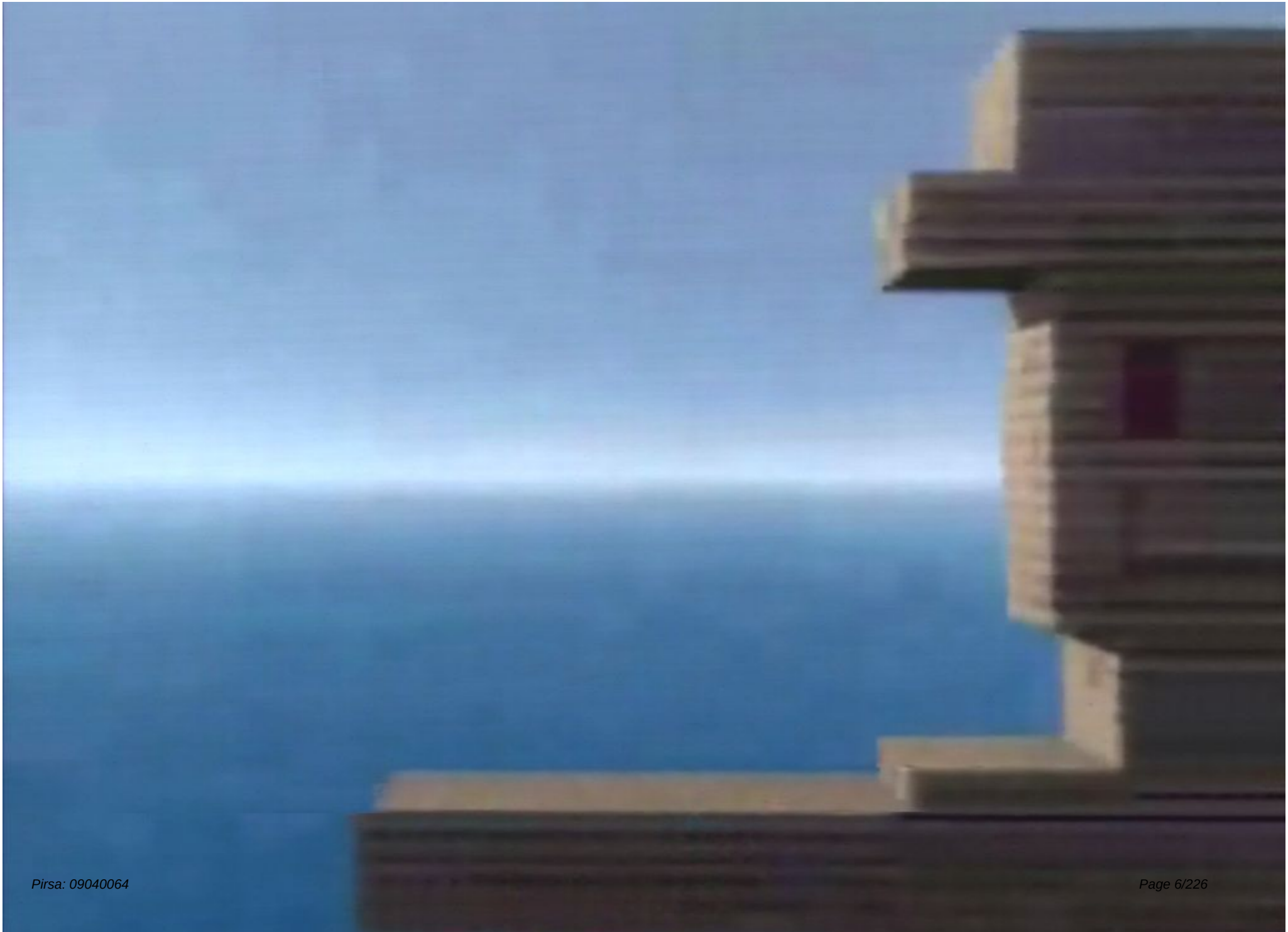
Dr. Richard Epp
Outreach Manager, PI

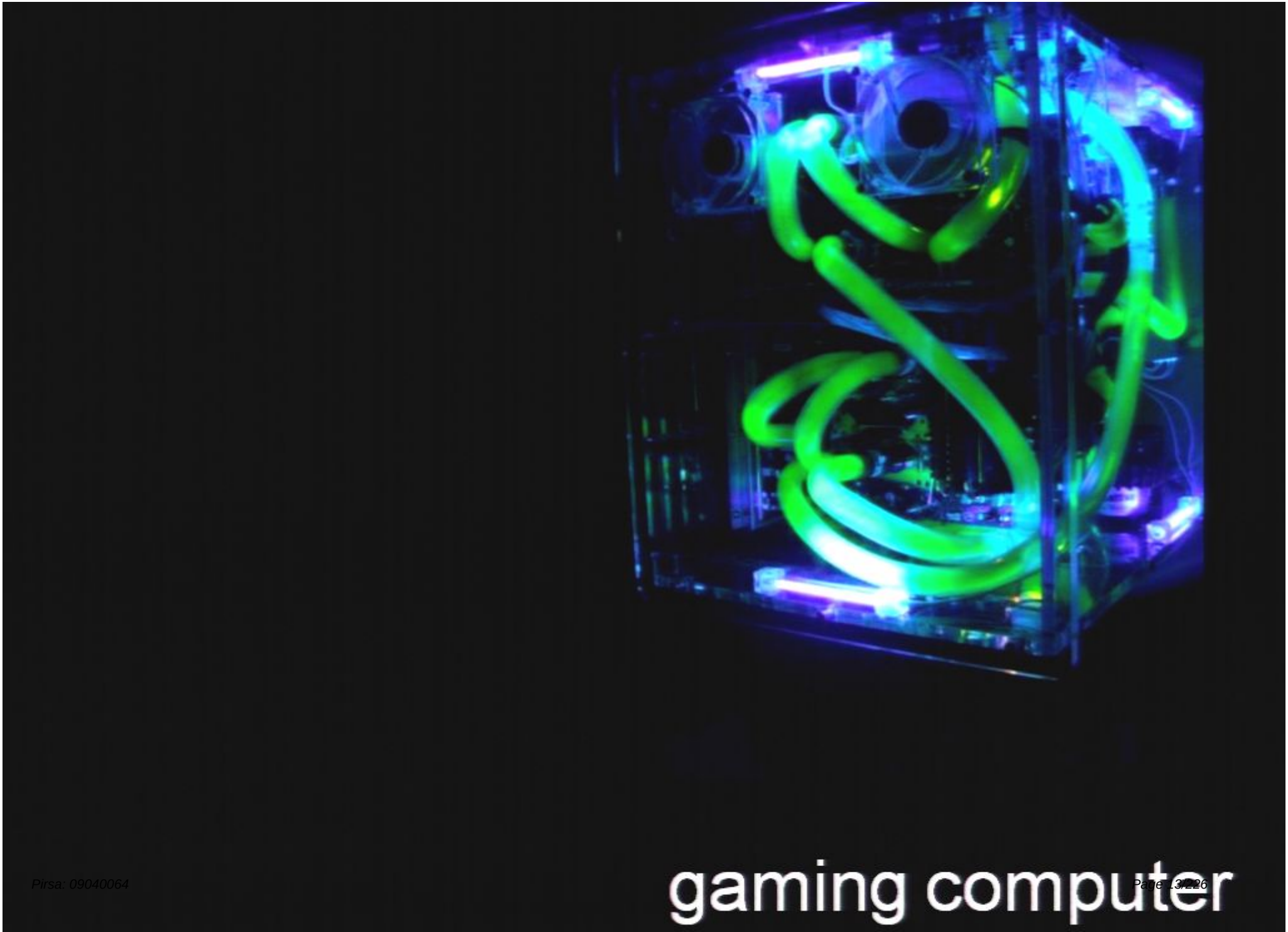


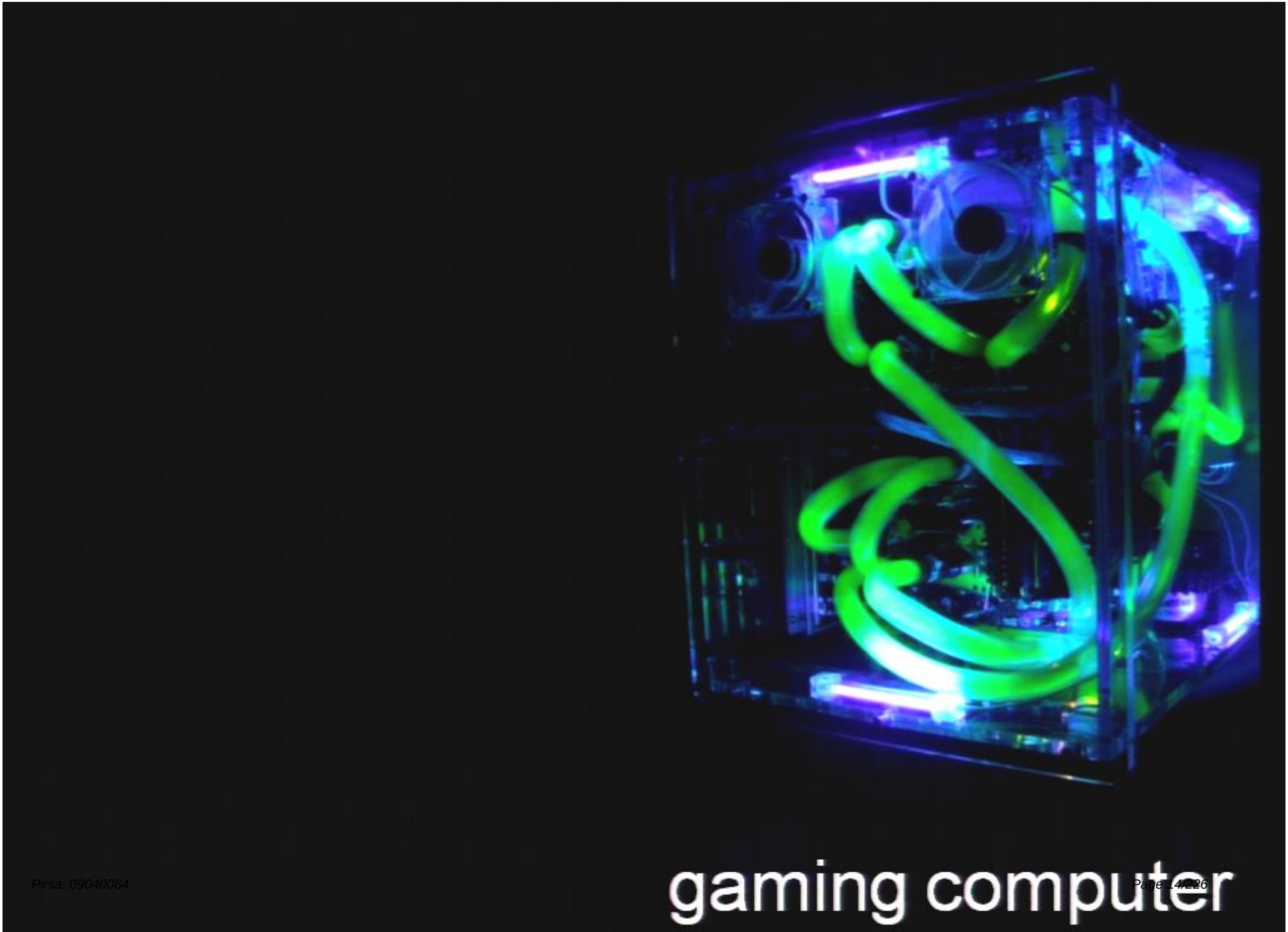
PERIMETER INSTITUTE FOR THEORETICAL PHYSICS

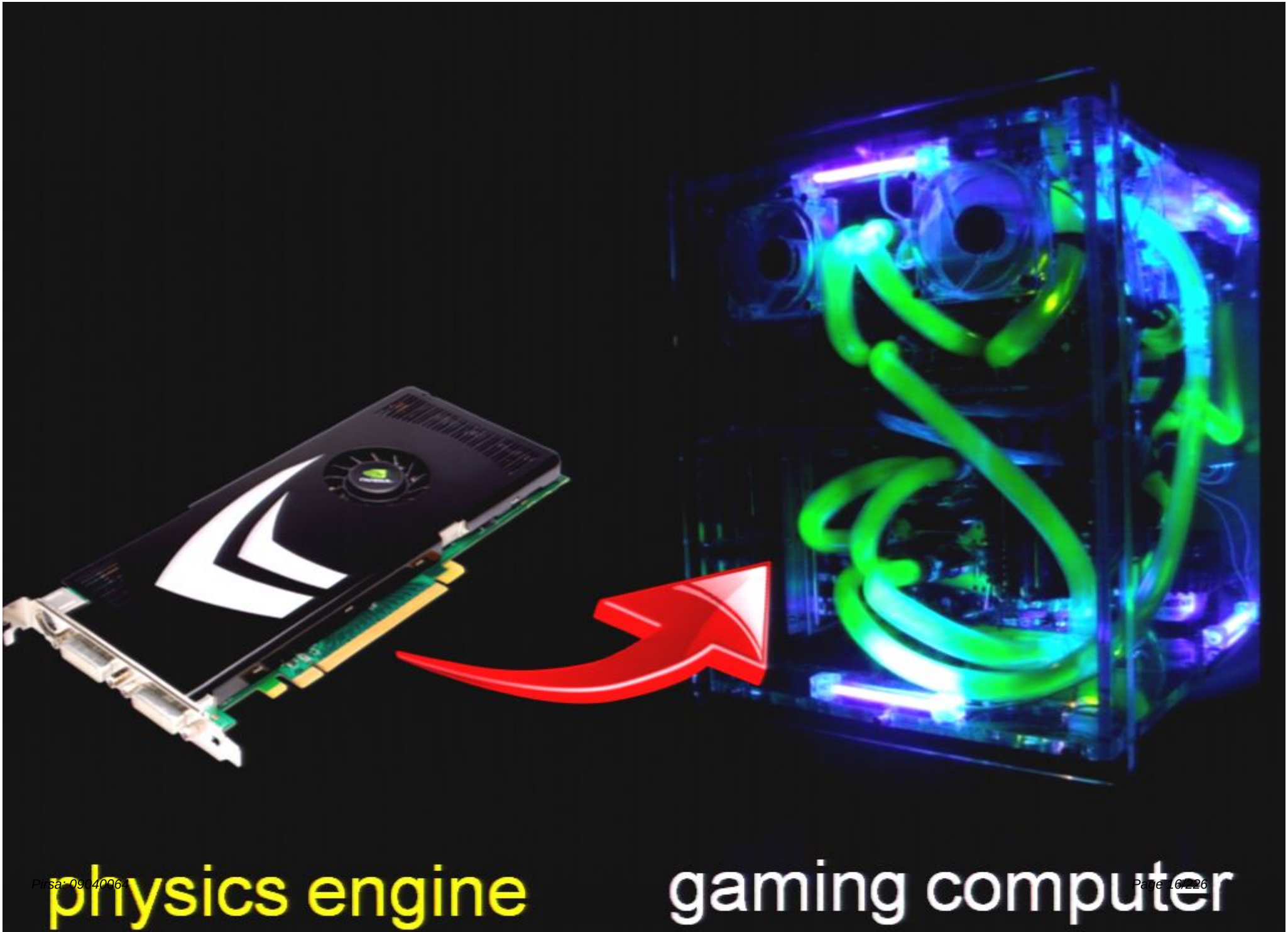

what is reality?

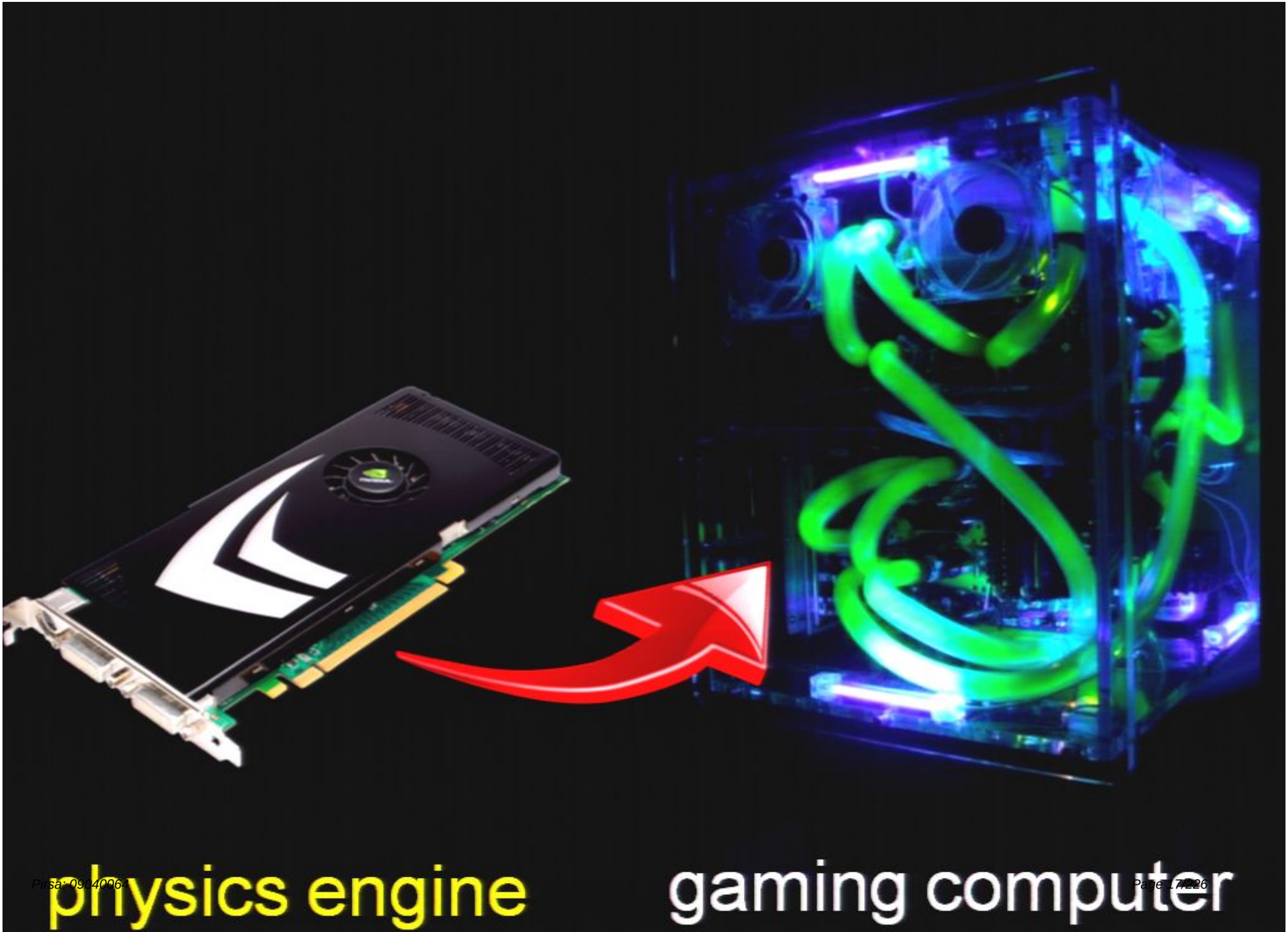
Simulated Reality

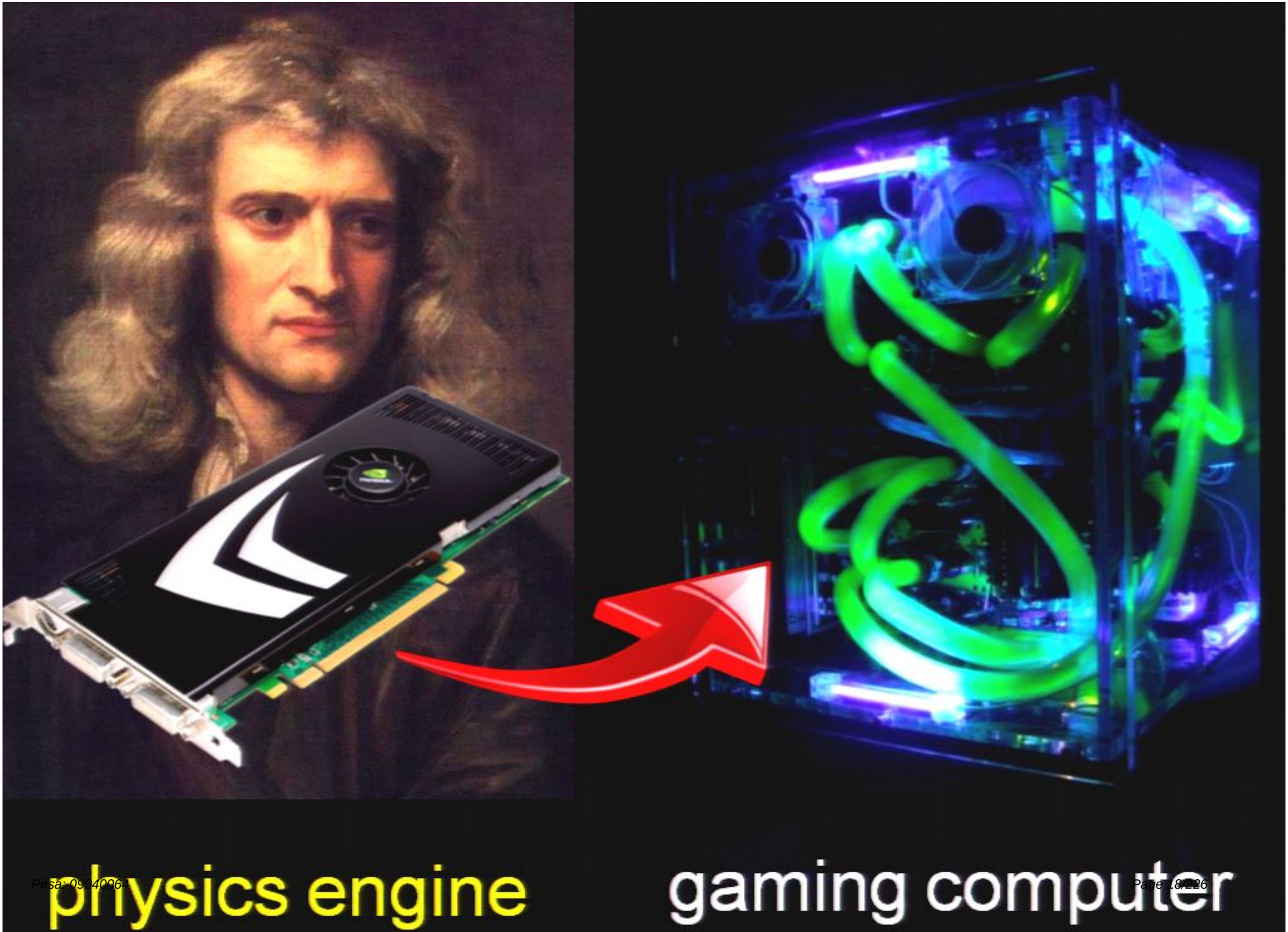


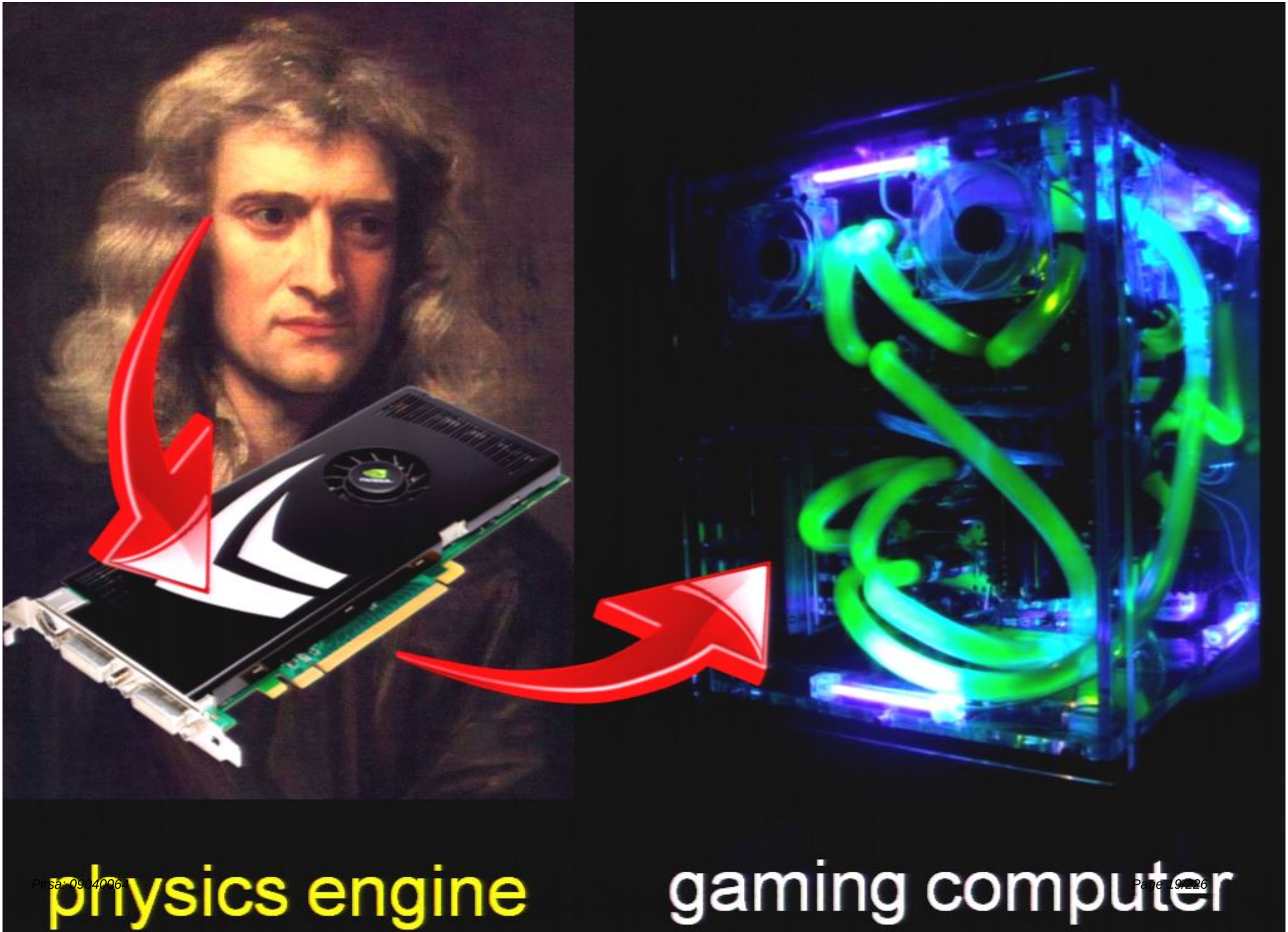

gaming computer


gaming computer



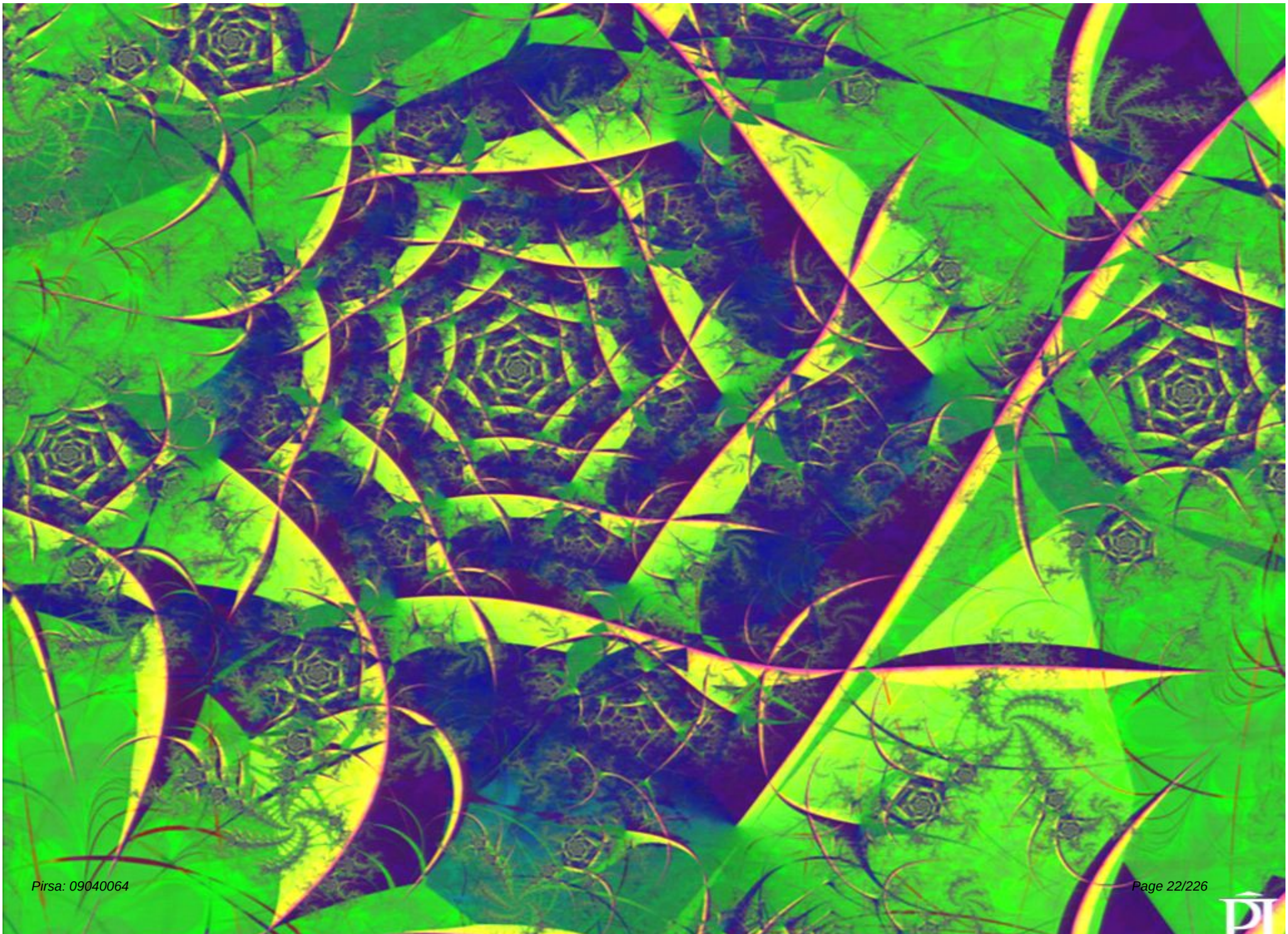






reality goes deeper


reality goes deeper



reality

understanding
reality

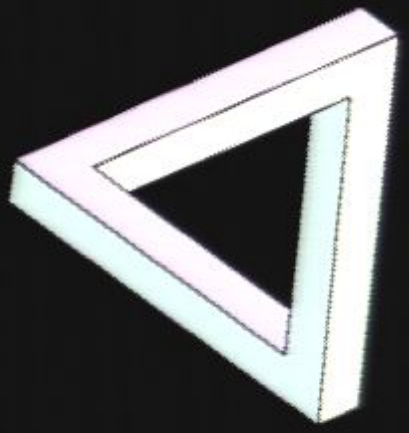
understanding

reality


...empowers us to innovate

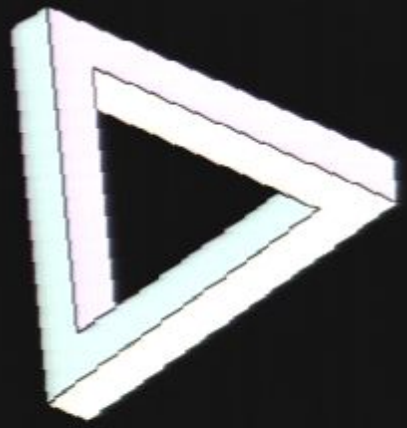

...empowers us to innovate

explore mystery

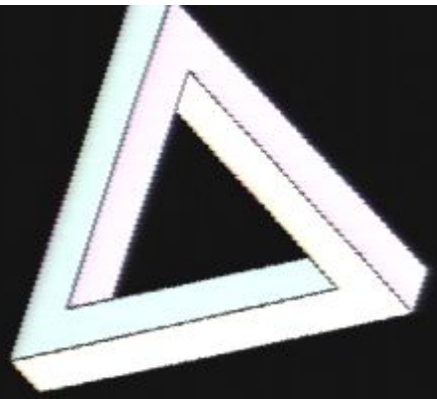


explore mystery

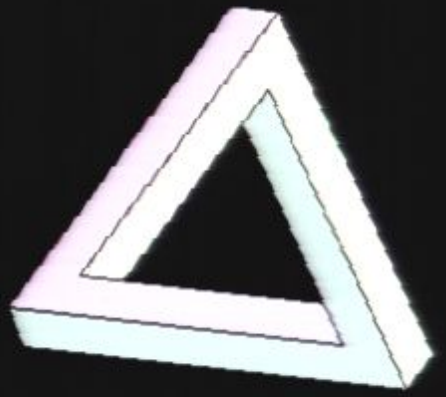
explore mystery



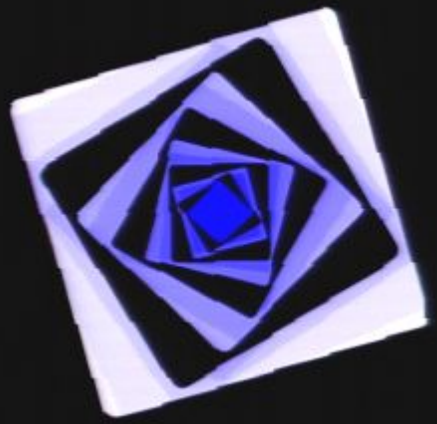
explore mystery



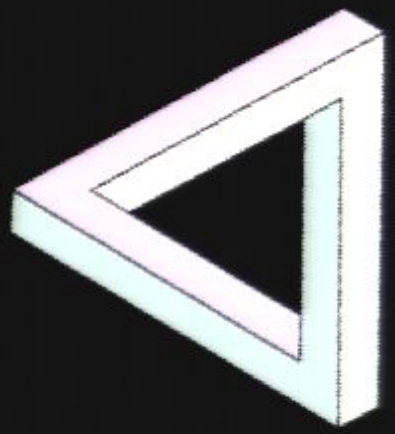
explore mystery



explore mystery



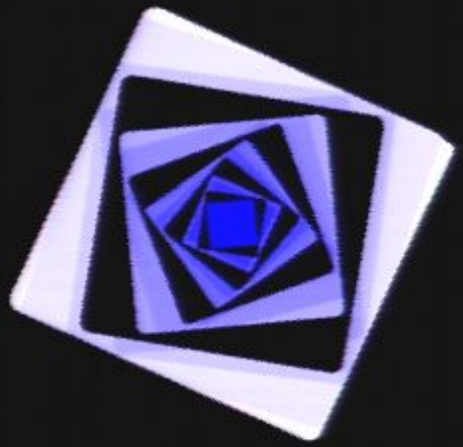
understa



explore mystery

understand reality

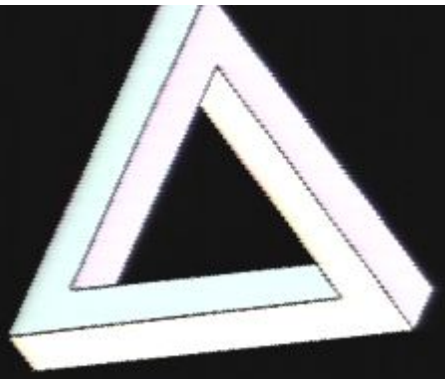
explore mystery



understand reality

explore mystery

understand reality



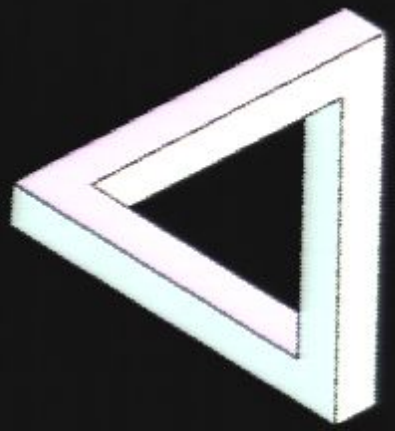
explore mystery

understand reality

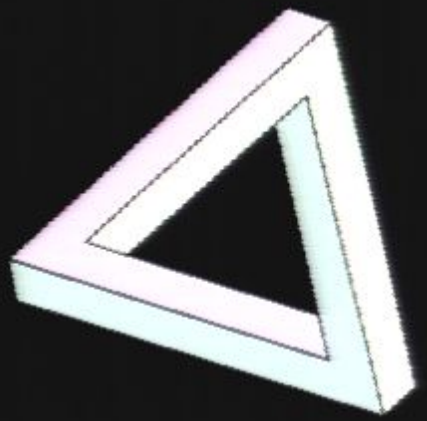
build cool stuff

where does this come from?

explore mystery:



explore mystery:



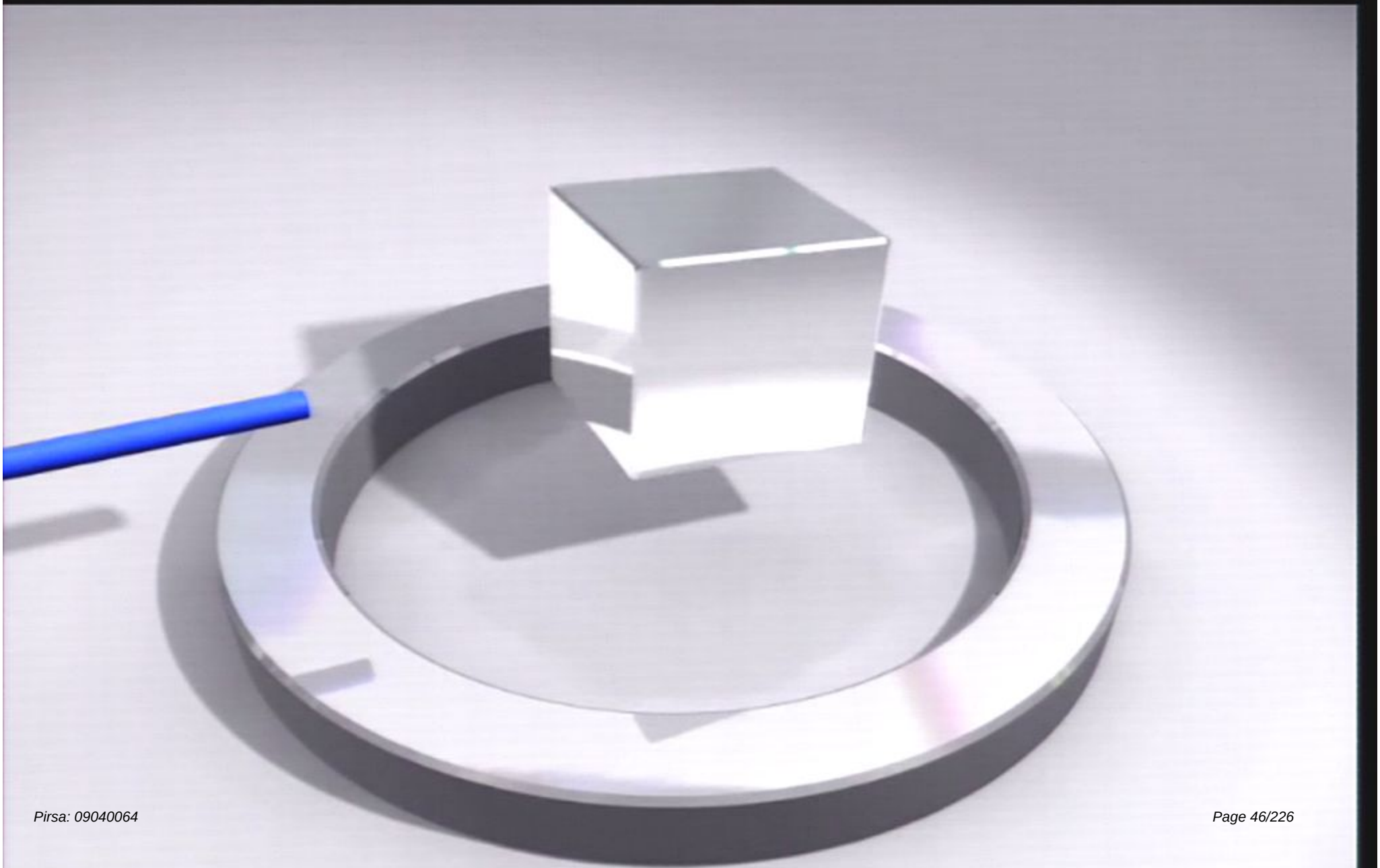
explore mystery:
magnetism

explore: magnetism

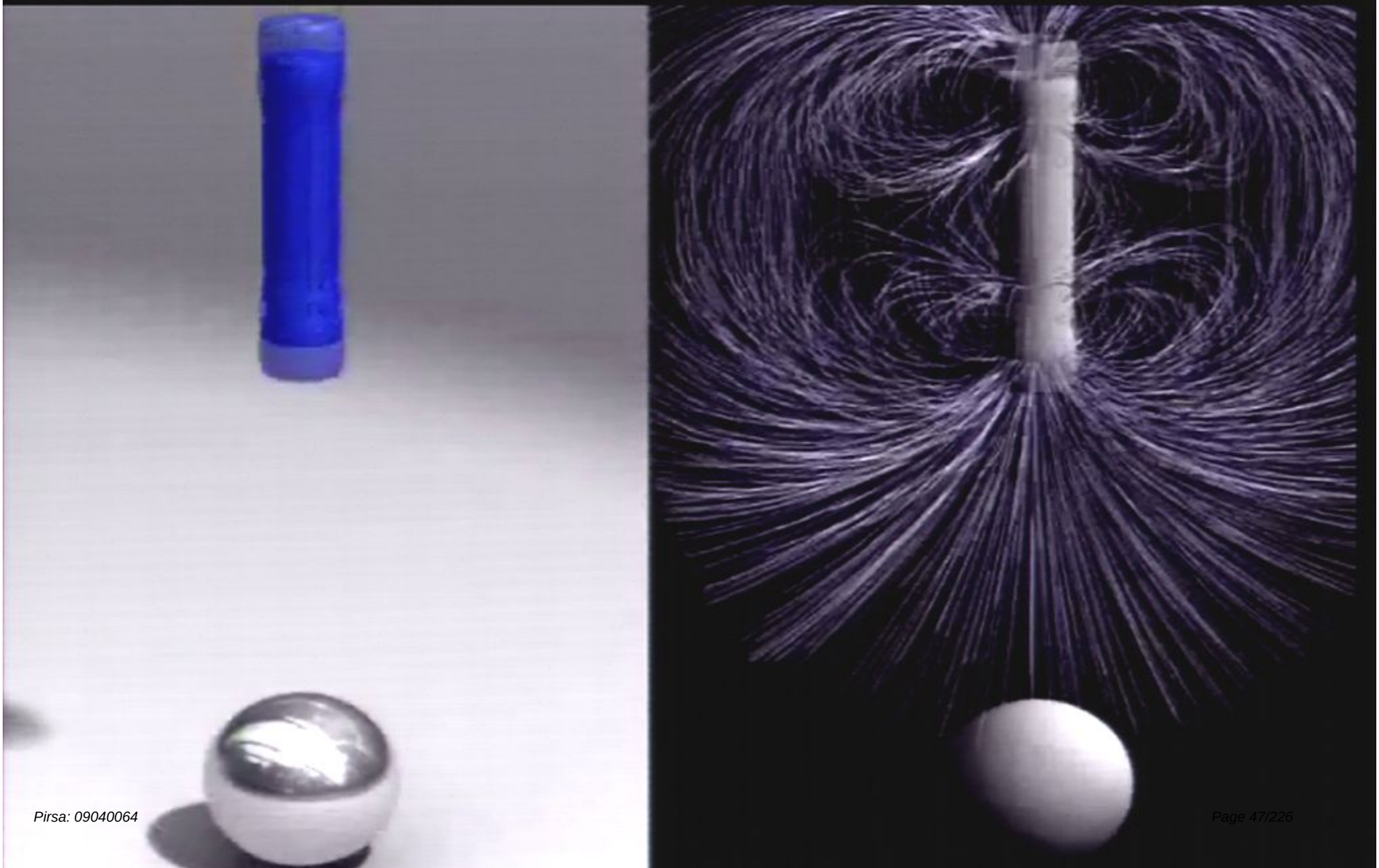
Simulated Reality

explore: magnetism

explore: magnetism



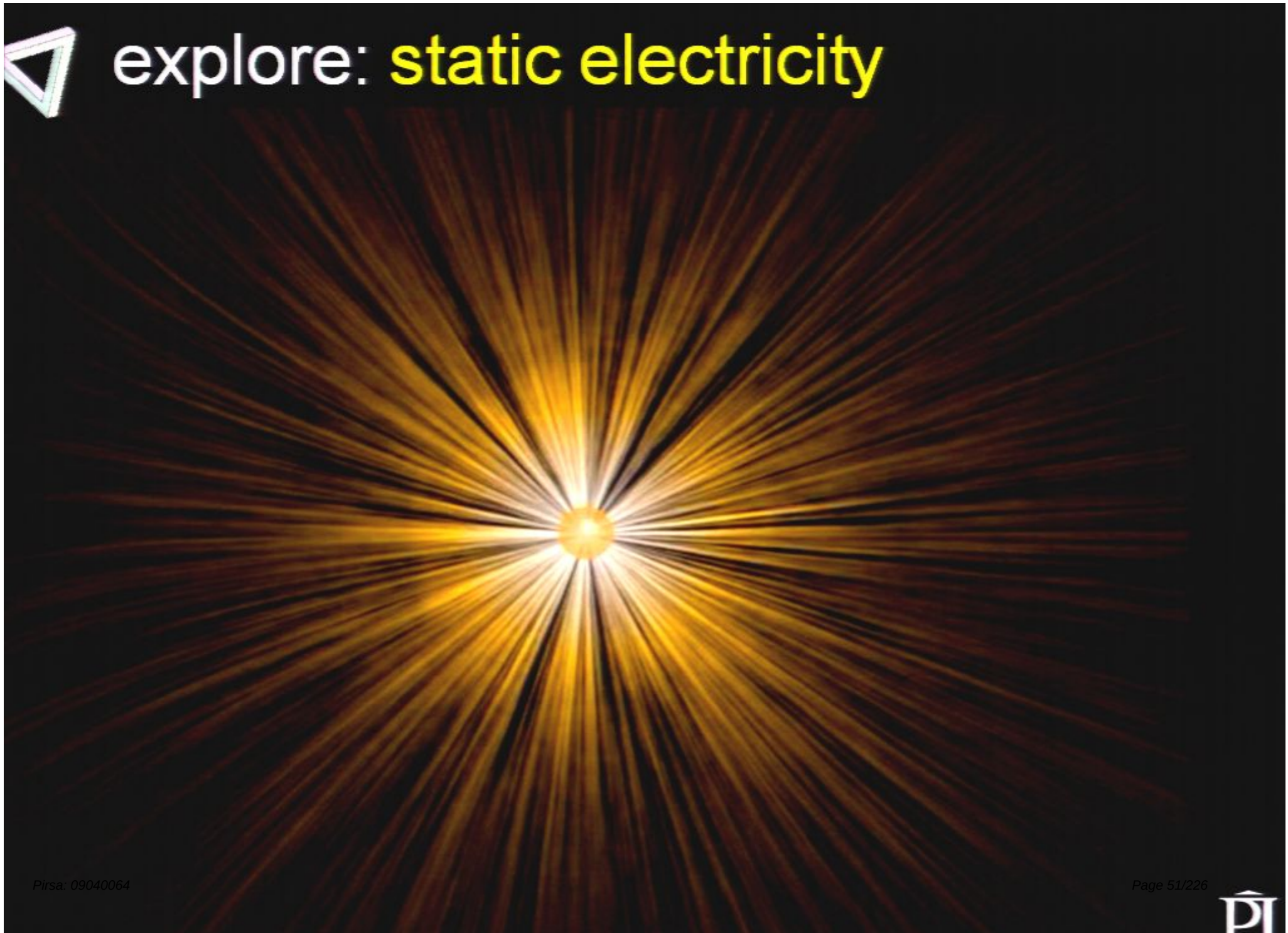
explore: magnetism



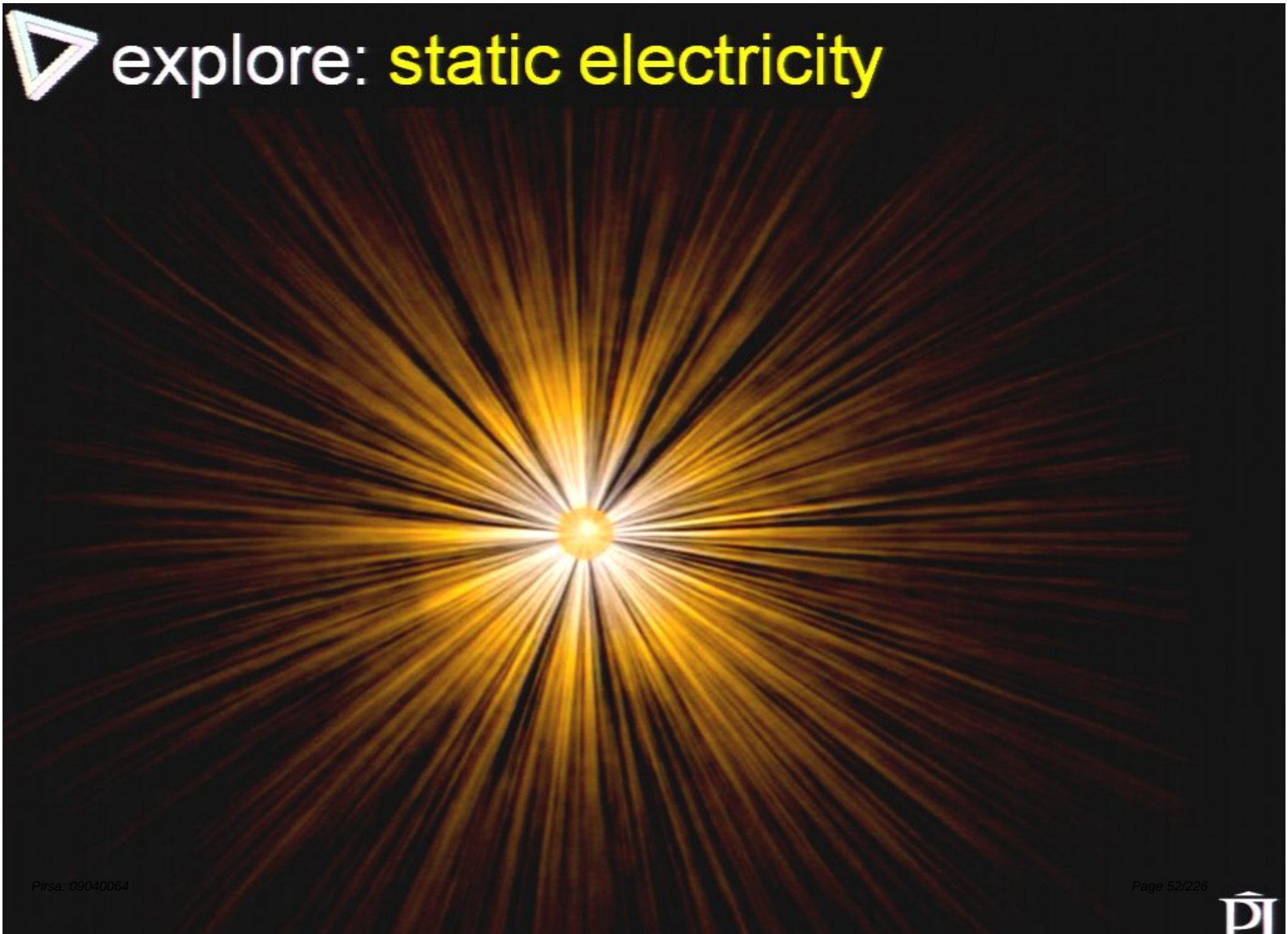
explore mystery:

explore: static electricity

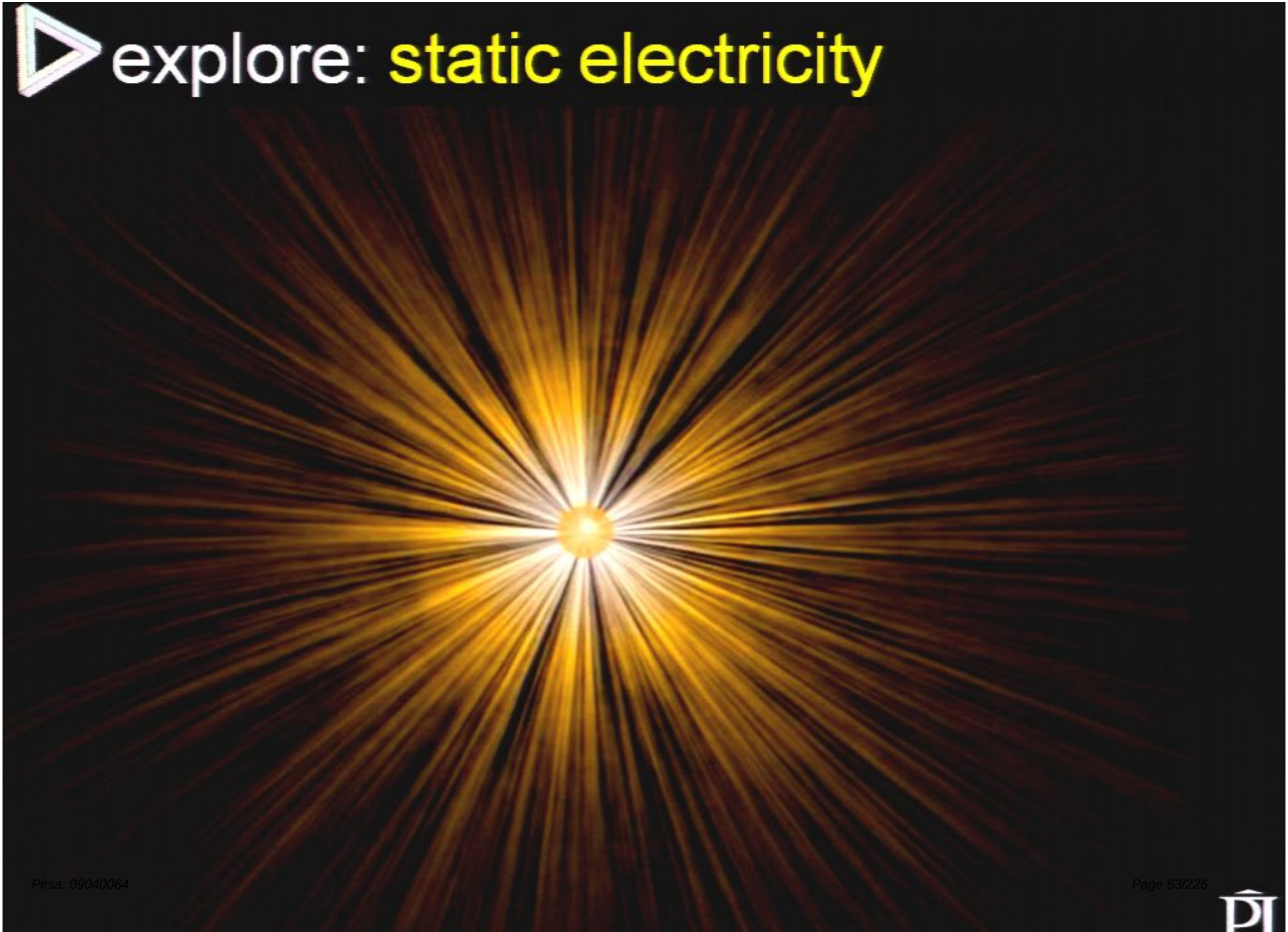
explore: static electricity



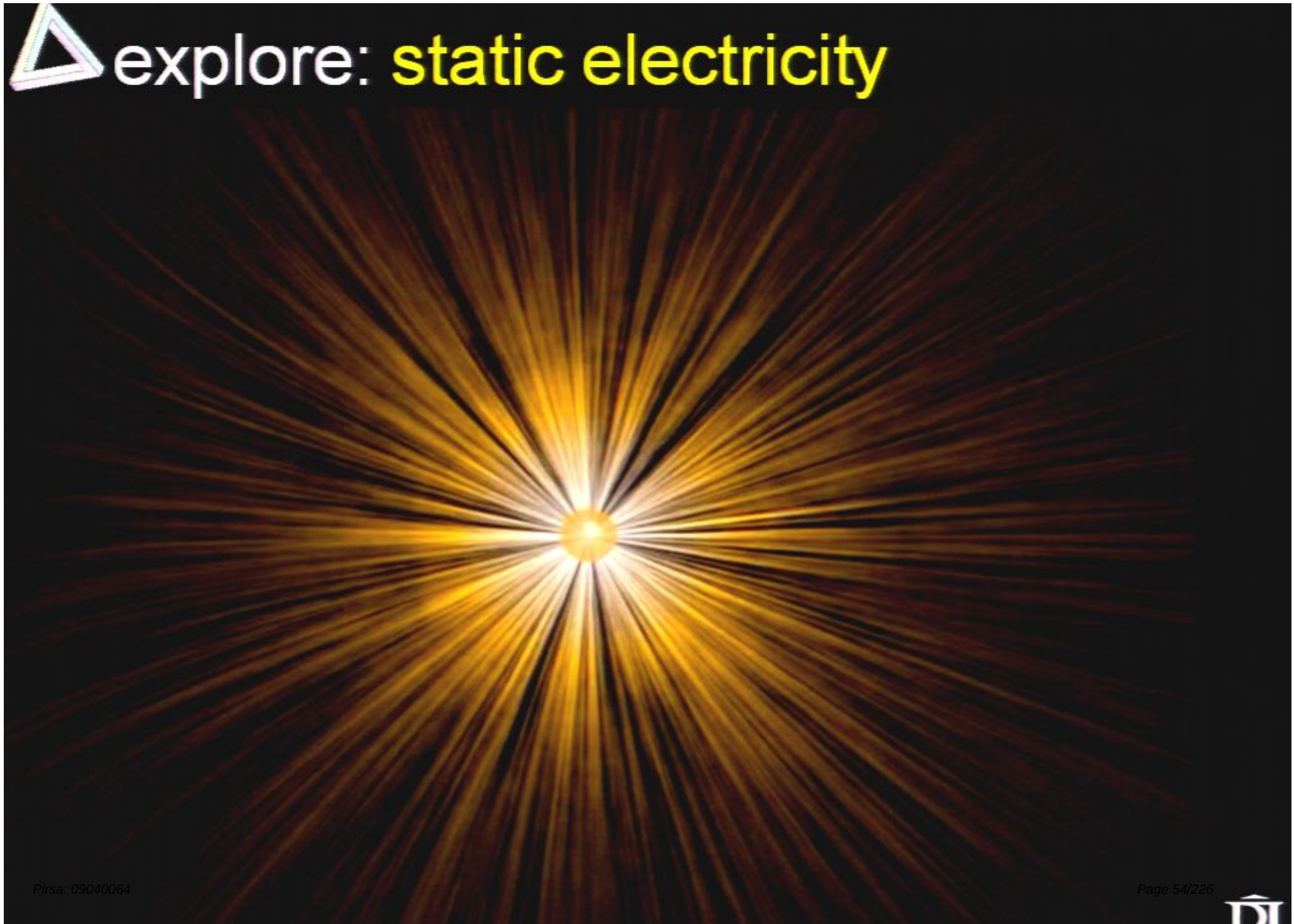
explore: static electricity



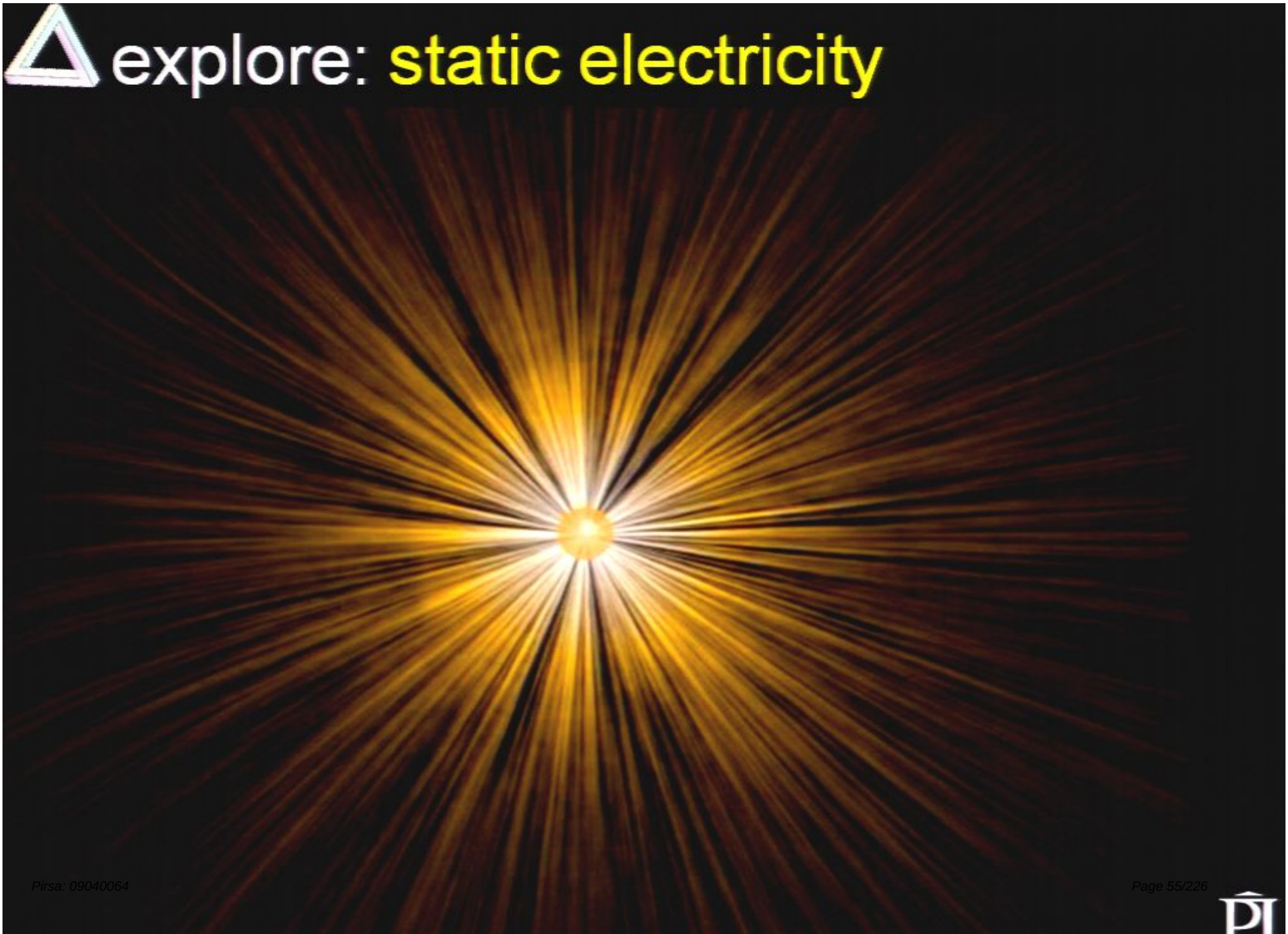
explore: static electricity



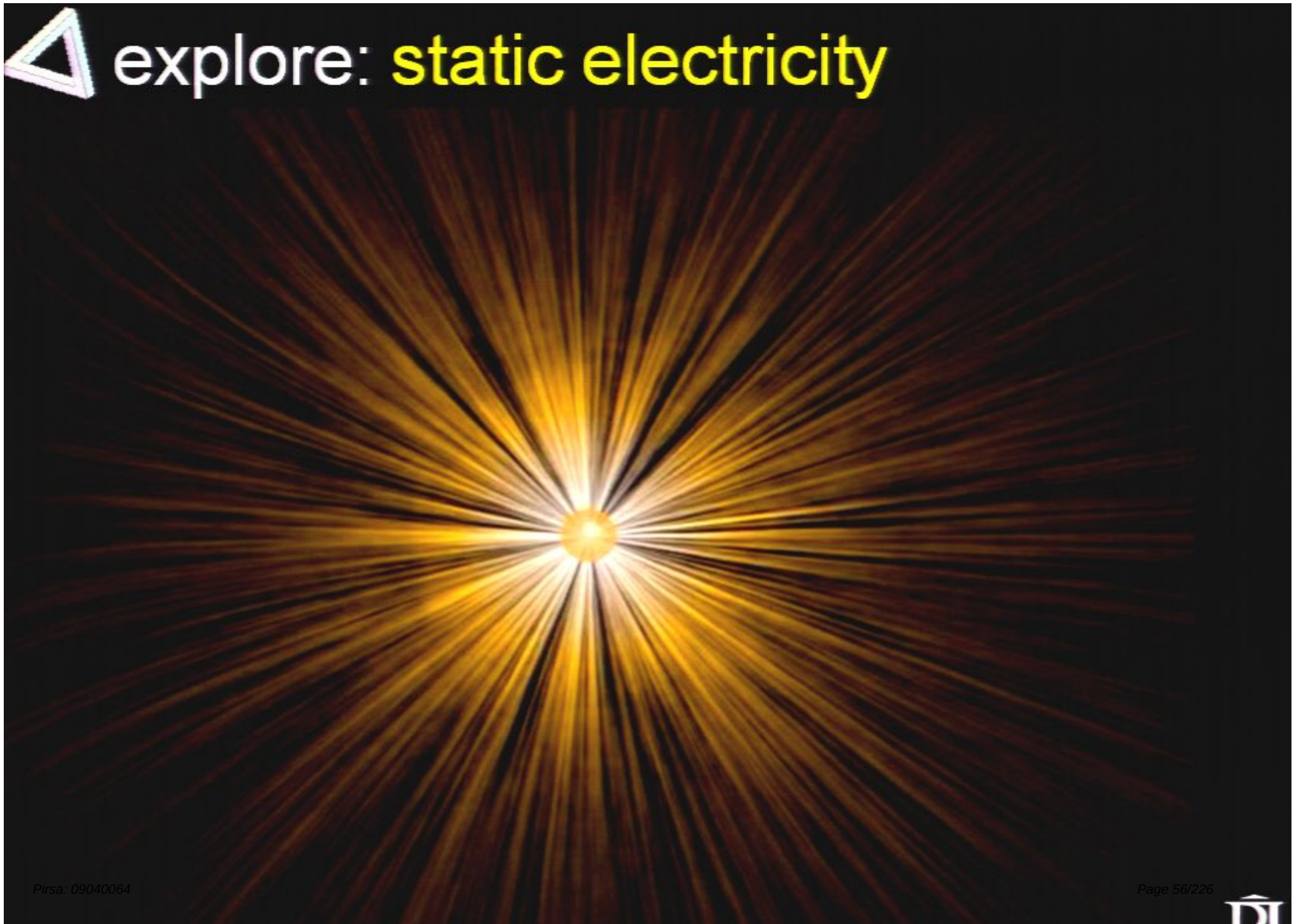
explore: static electricity



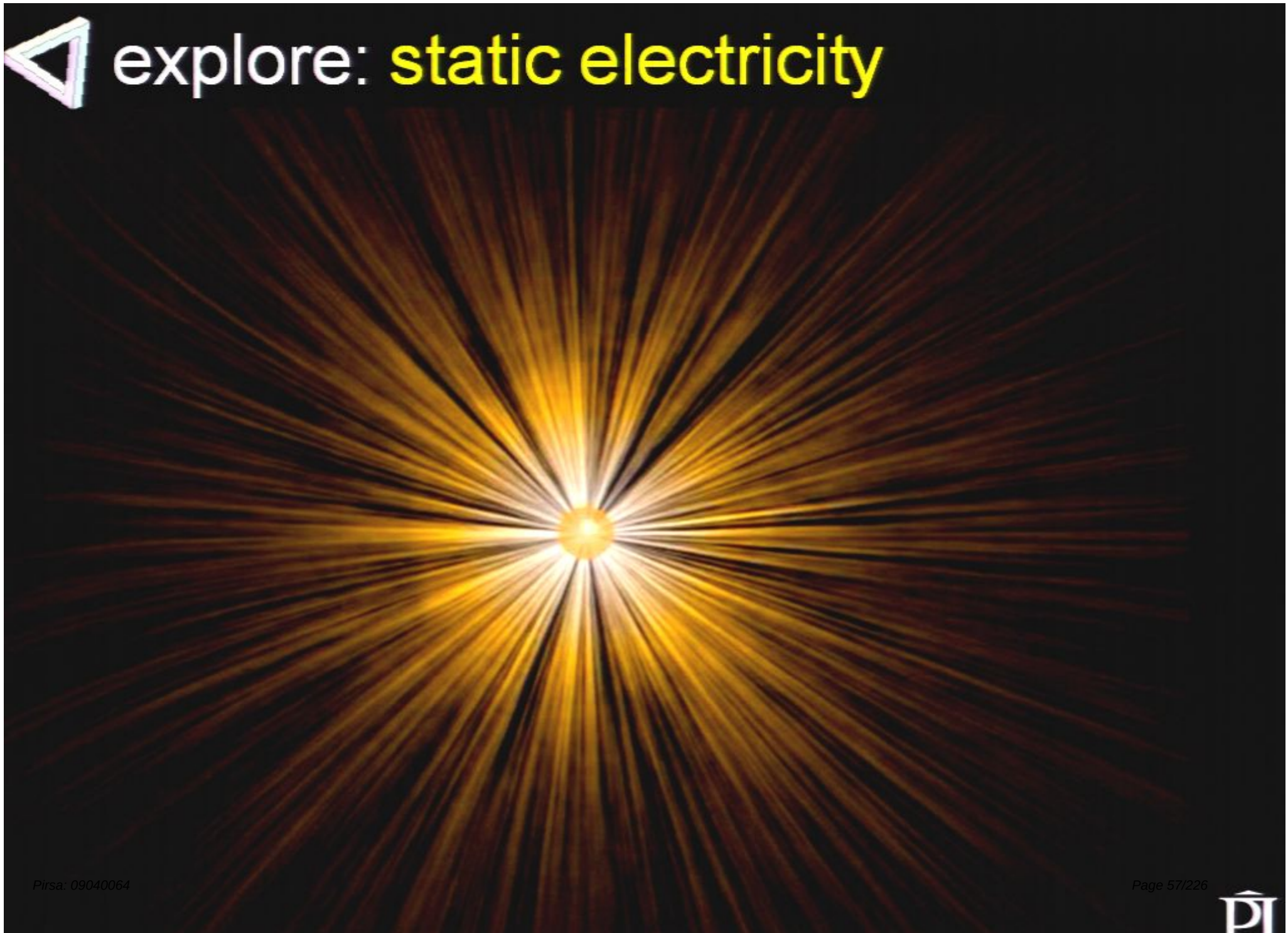
explore: static electricity



explore: static electricity



explore: static electricity



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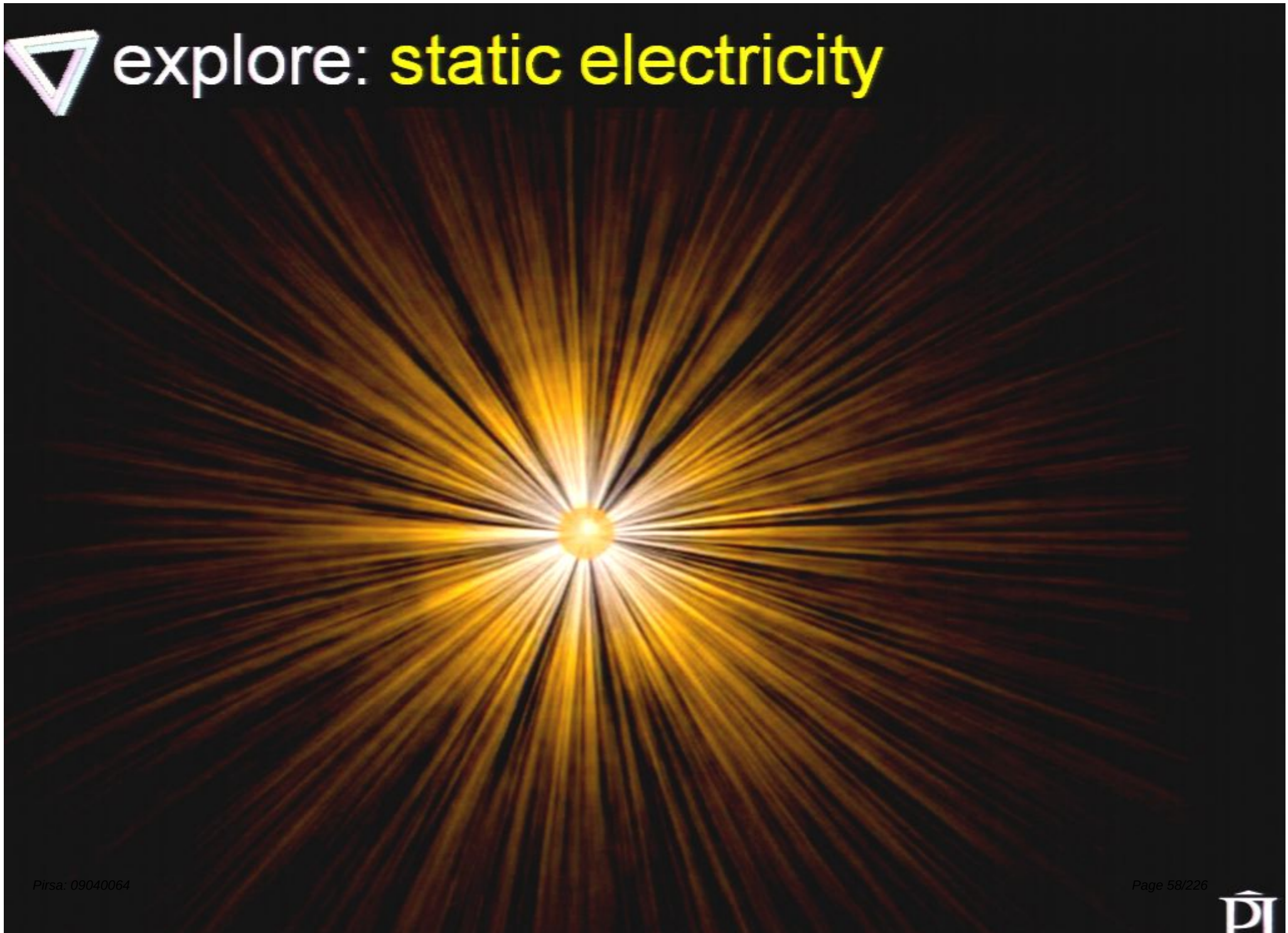
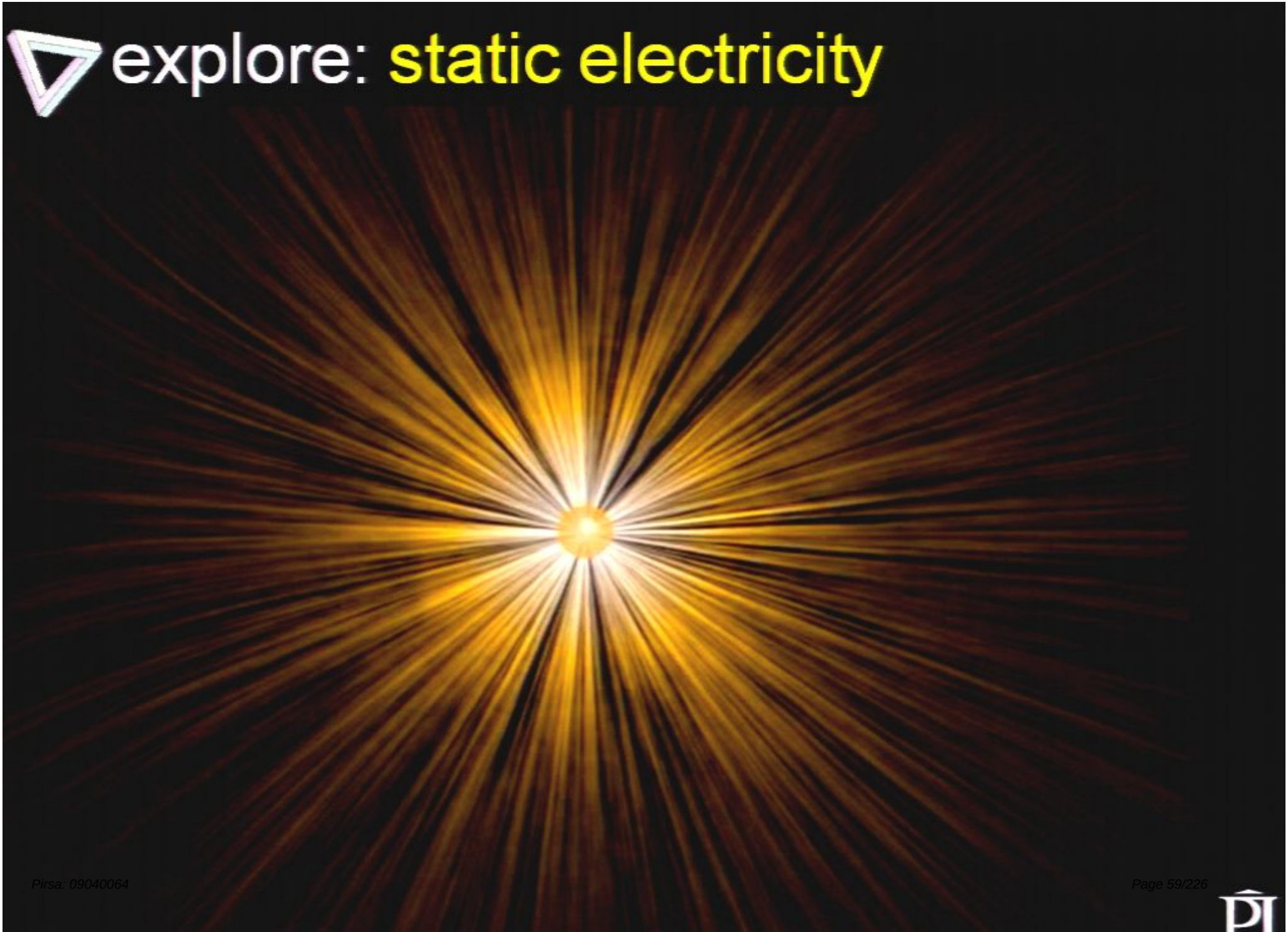
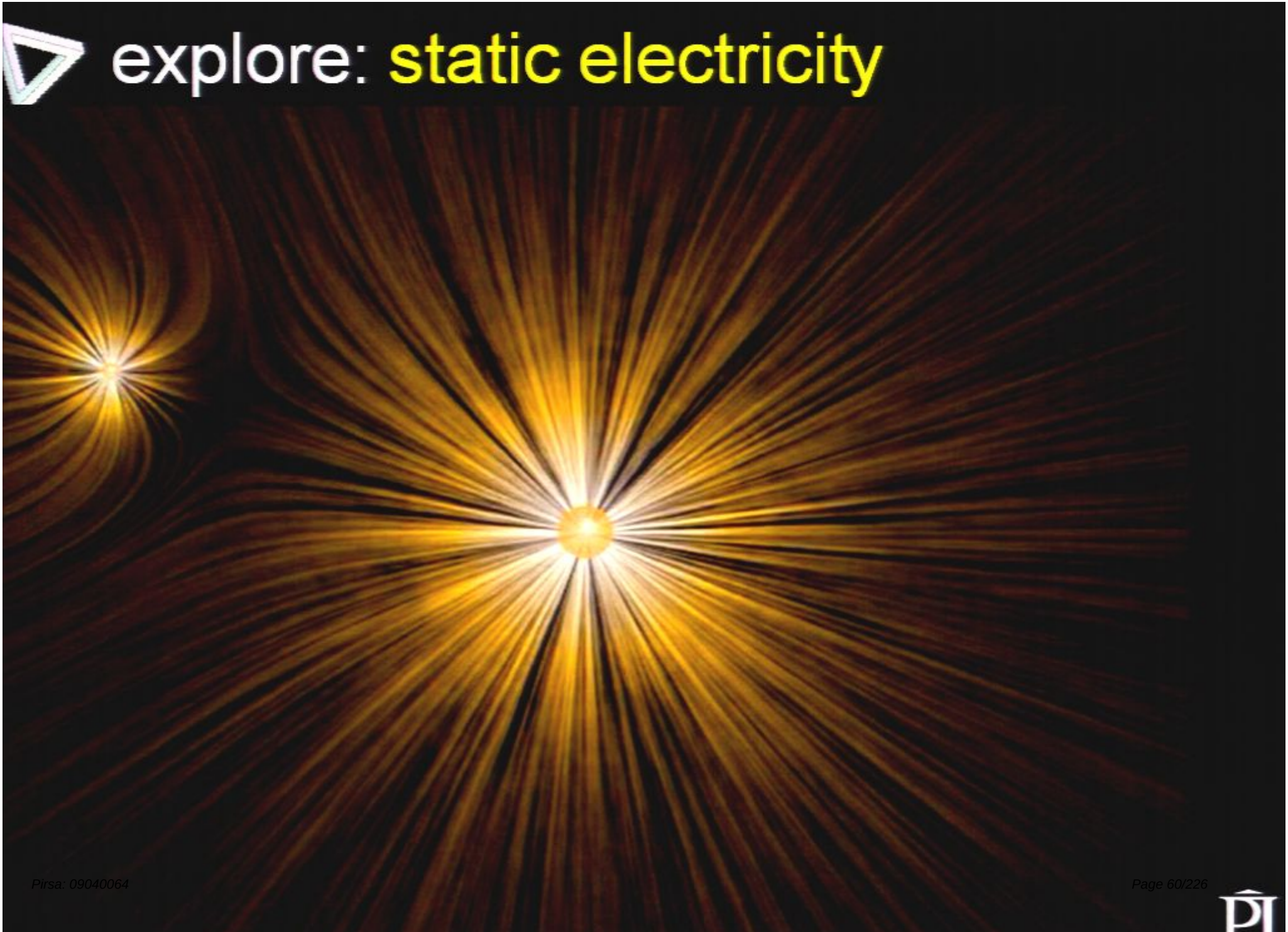


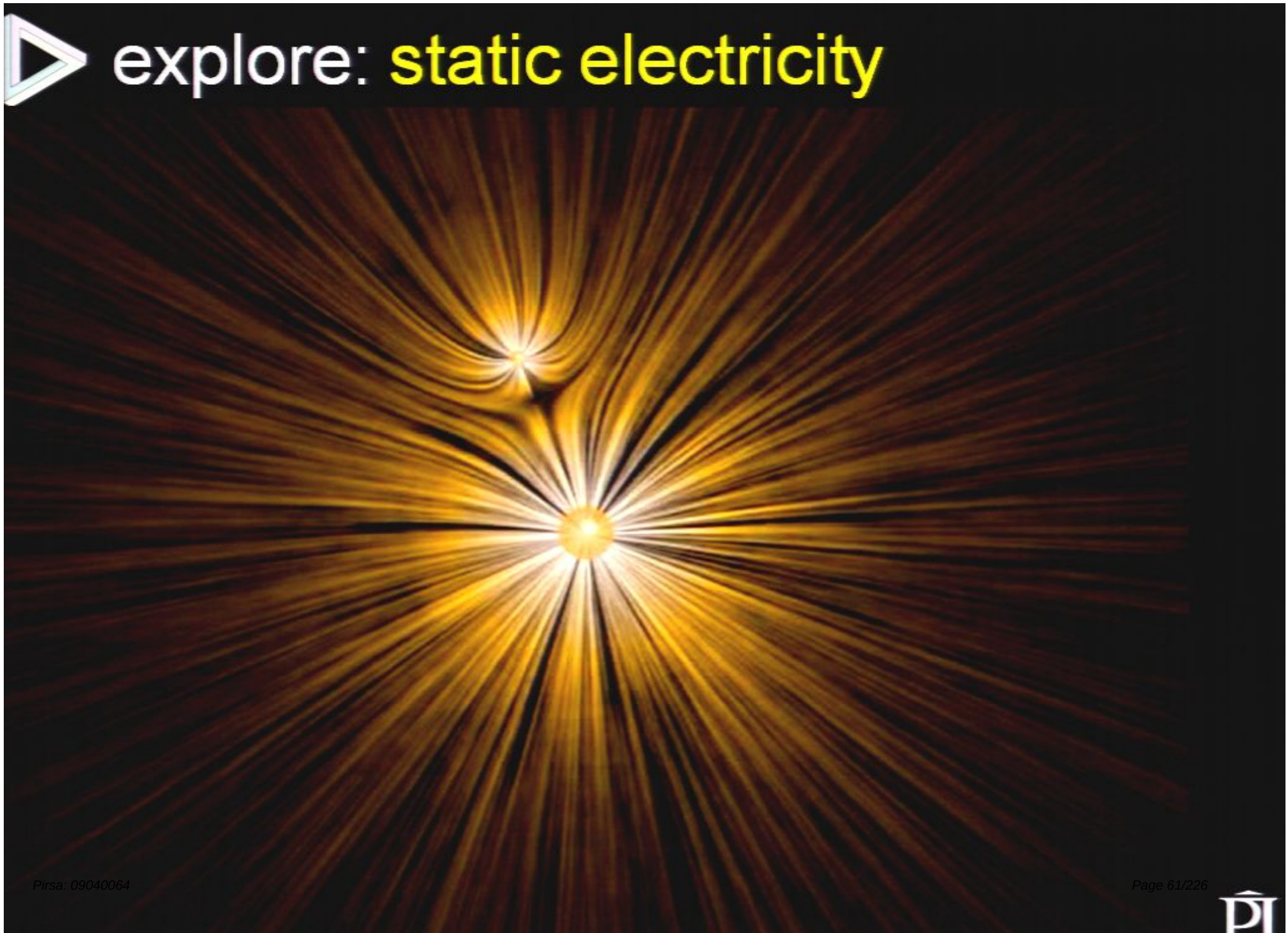
explore: static electricity



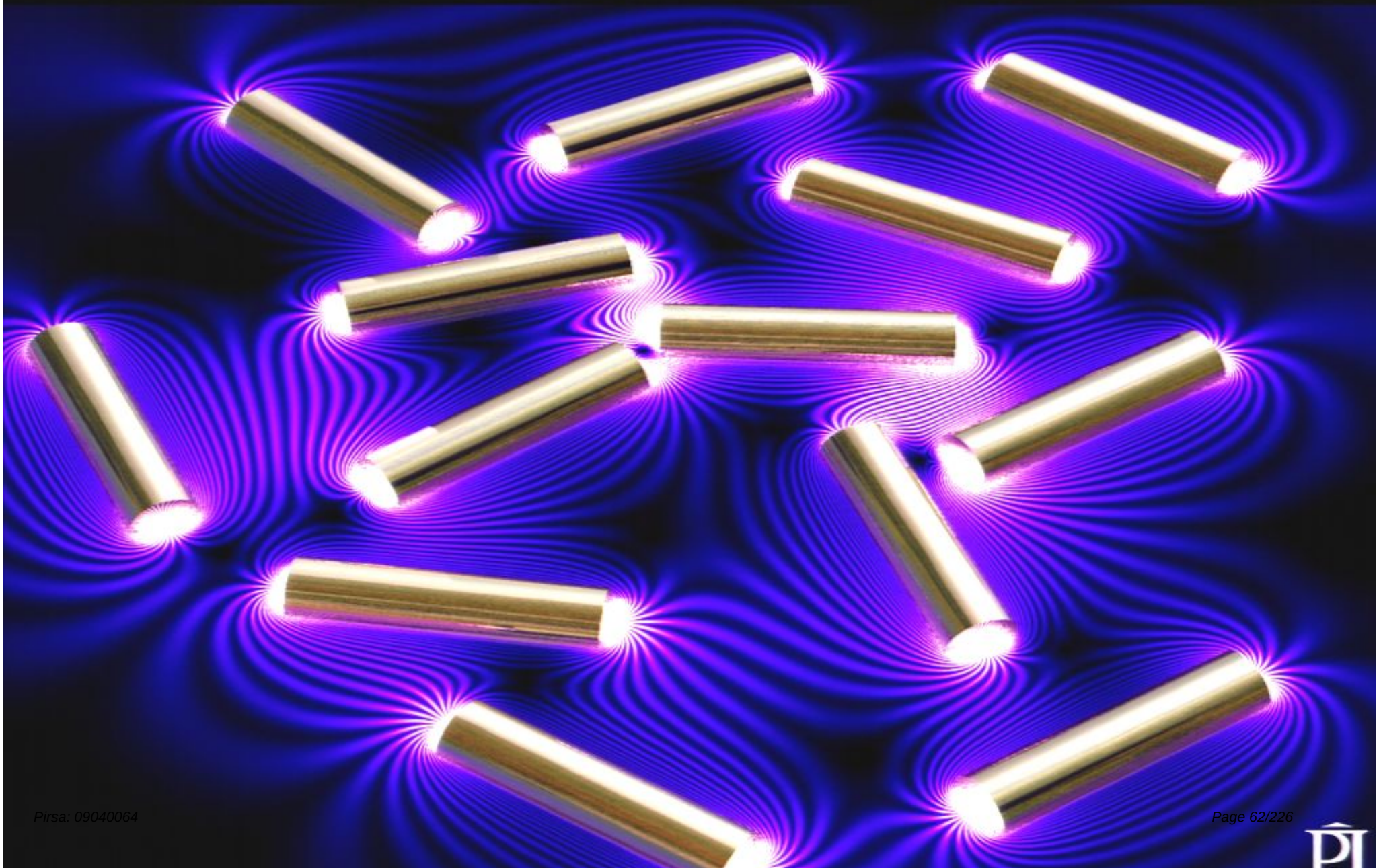
explore: static electricity



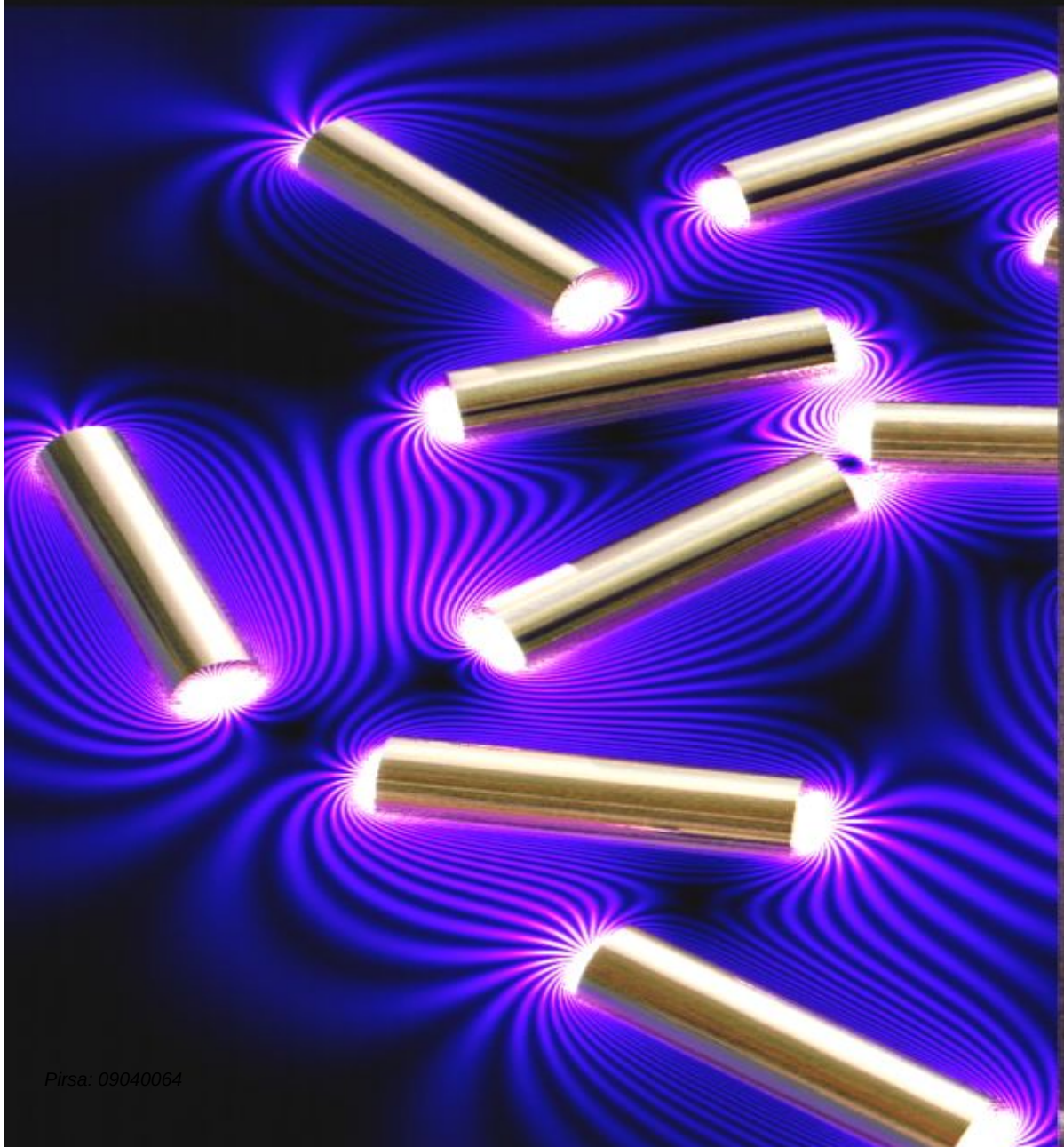
explore: static electricity

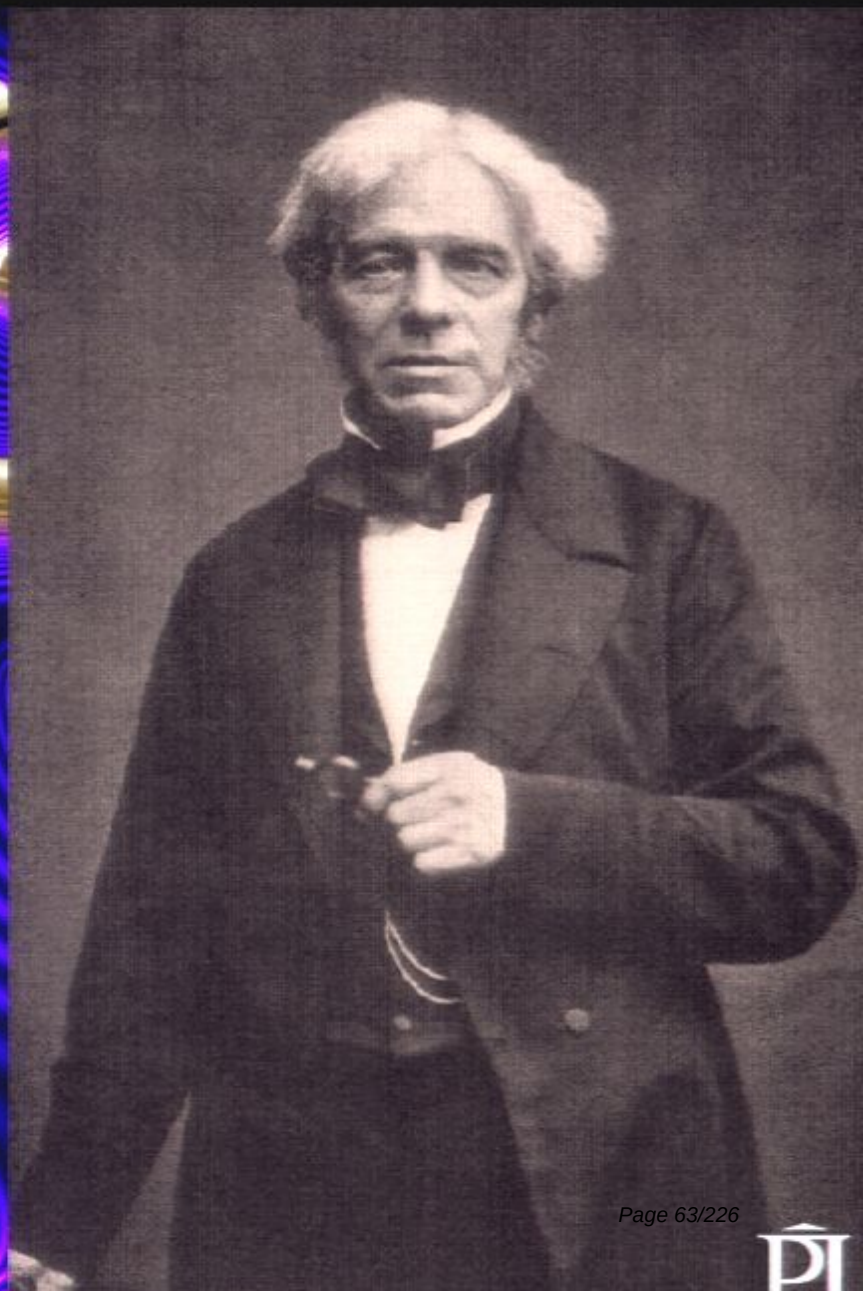


explore: electric & magnetic fields



explore: electric & magnetic fields





understand reality:

understand reality:
electromagnetism

understand: electromagnetism

understand: electromagnetism

$$\nabla \cdot D = \rho$$

$$\nabla \cdot B = 0$$

$$\nabla \times E = -\frac{\partial B}{\partial t}$$

$$\nabla \times H = i + \frac{\partial D}{\partial t}$$


understand: electromagnetism


understand: electromagnetism
..how nature transports pure energy


understand: electromagnetism
..how nature transports pure energy
at the speed of light

build: radio

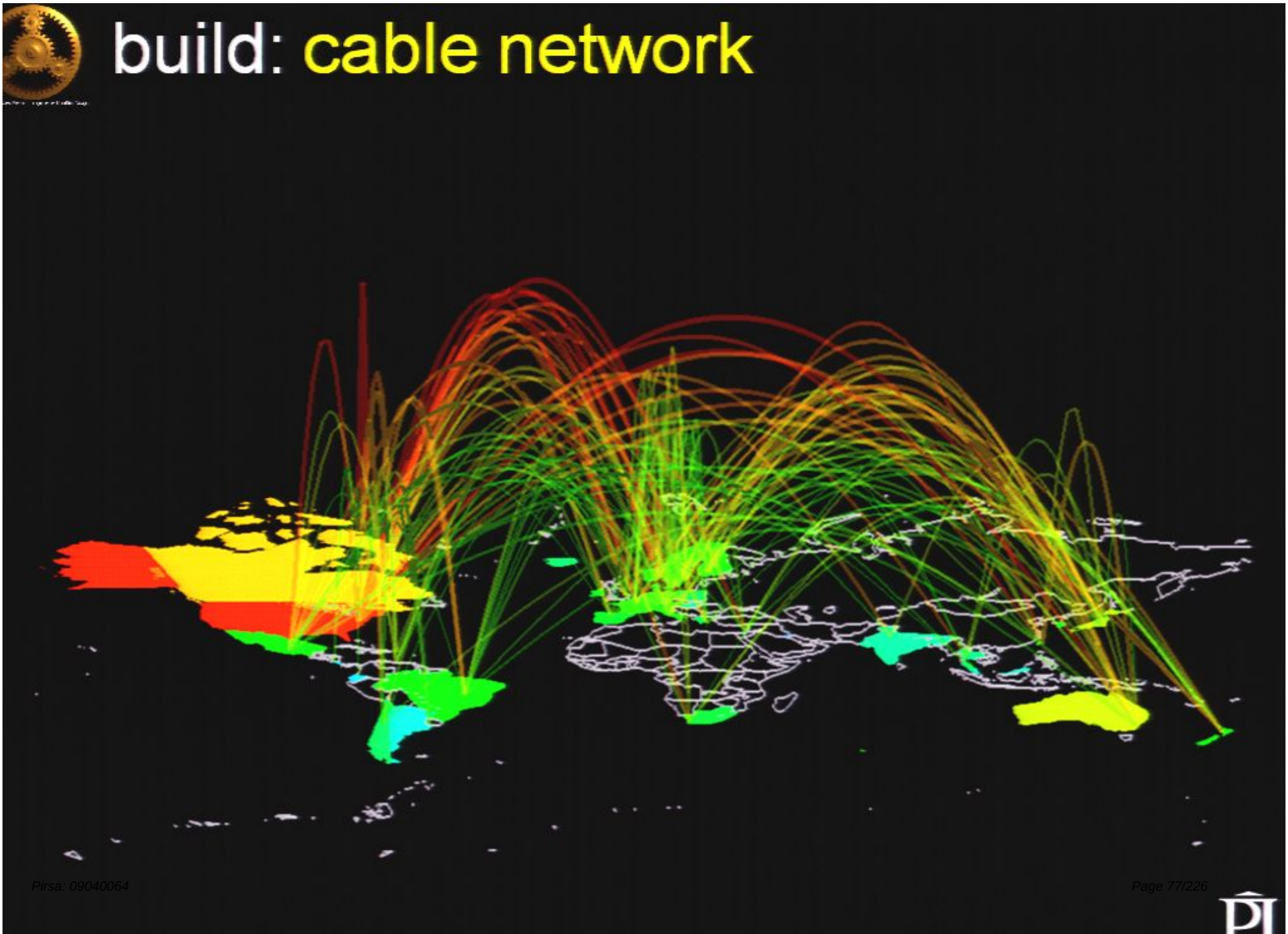
build: radio

build

build: television

build: television

build: cable network



build: microwave network

build: microwave network

build: satellite network

$$\nabla \cdot D = \rho$$

$$\nabla \cdot B = 0$$

$$\nabla \times E = -\frac{\partial B}{\partial t}$$

$$\nabla \times H = i + \frac{\partial D}{\partial t}$$

power of ideas

$$\nabla \cdot D = \rho$$

$$\nabla \cdot B = 0$$

$$\nabla \times E = -\frac{\partial B}{\partial t}$$

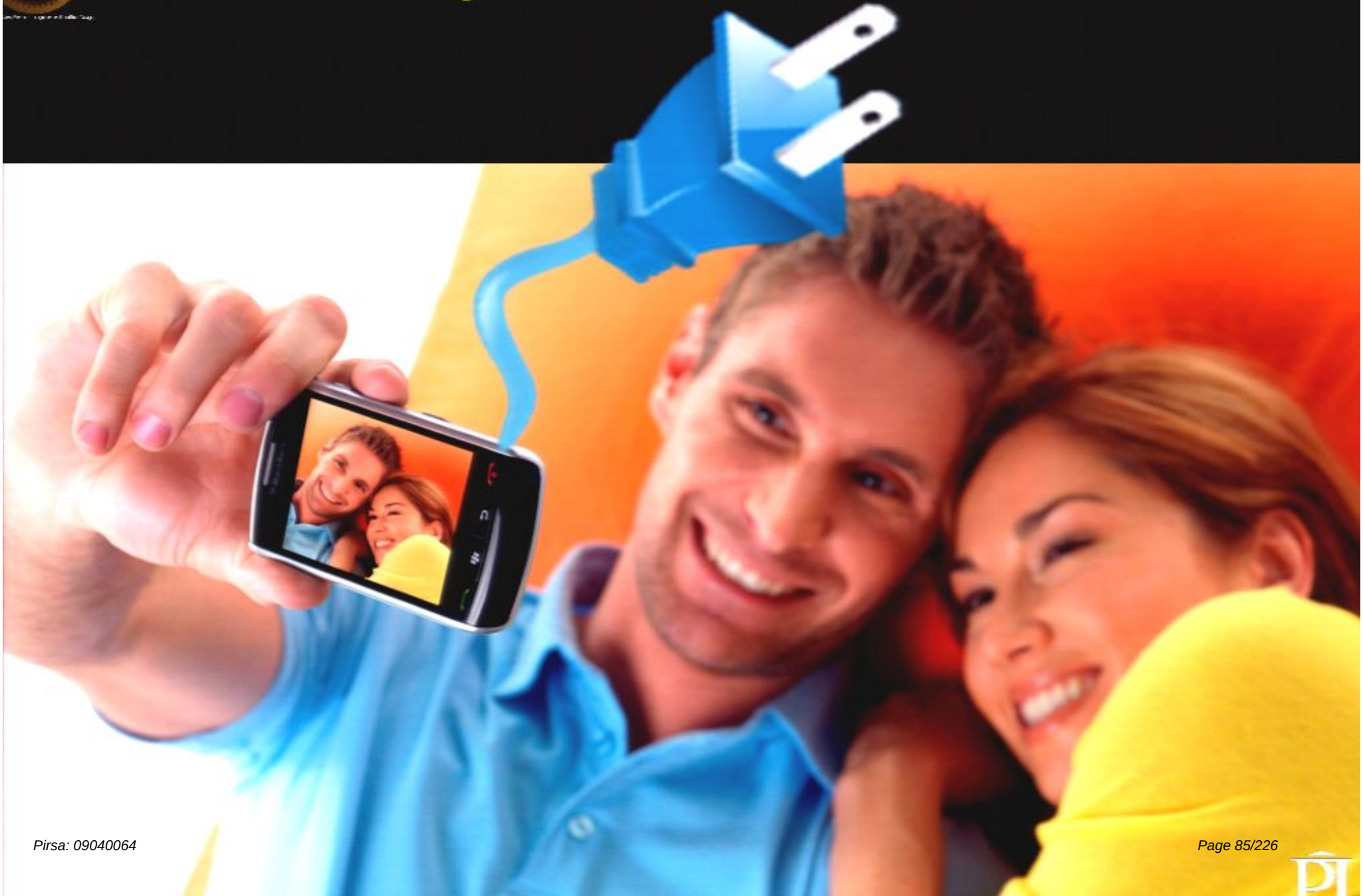
$$\nabla \times H = i + \frac{\partial D}{\partial t}$$

power of ideas

build: cell phones

build: cell phones

build: cell phones



$$\nabla \cdot D = \rho$$

$$\nabla \cdot B = 0$$

$$\nabla \times E = -\frac{\partial B}{\partial t}$$

$$\nabla \times H = i + \frac{\partial D}{\partial t}$$

power of ideas

build cool stuff:

electric power

build cool stuff:

electric power system

a.k.a. "[illegible] grid"

build cool stuff:

electric power system

a.k.a. “the grid”

build: the grid

build: the grid

plugged in anything lately?

build: the grid

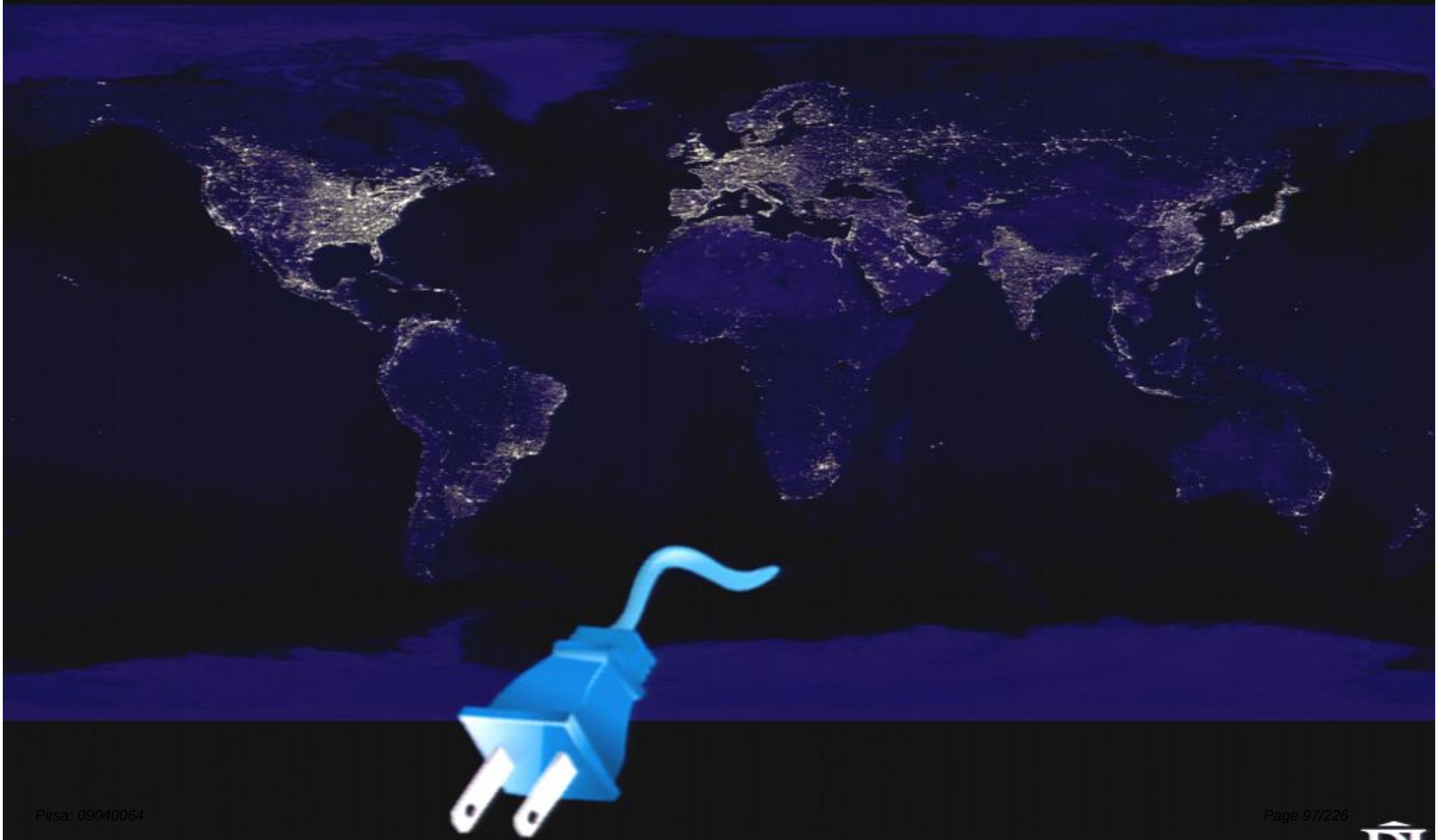
build: everything we plug in

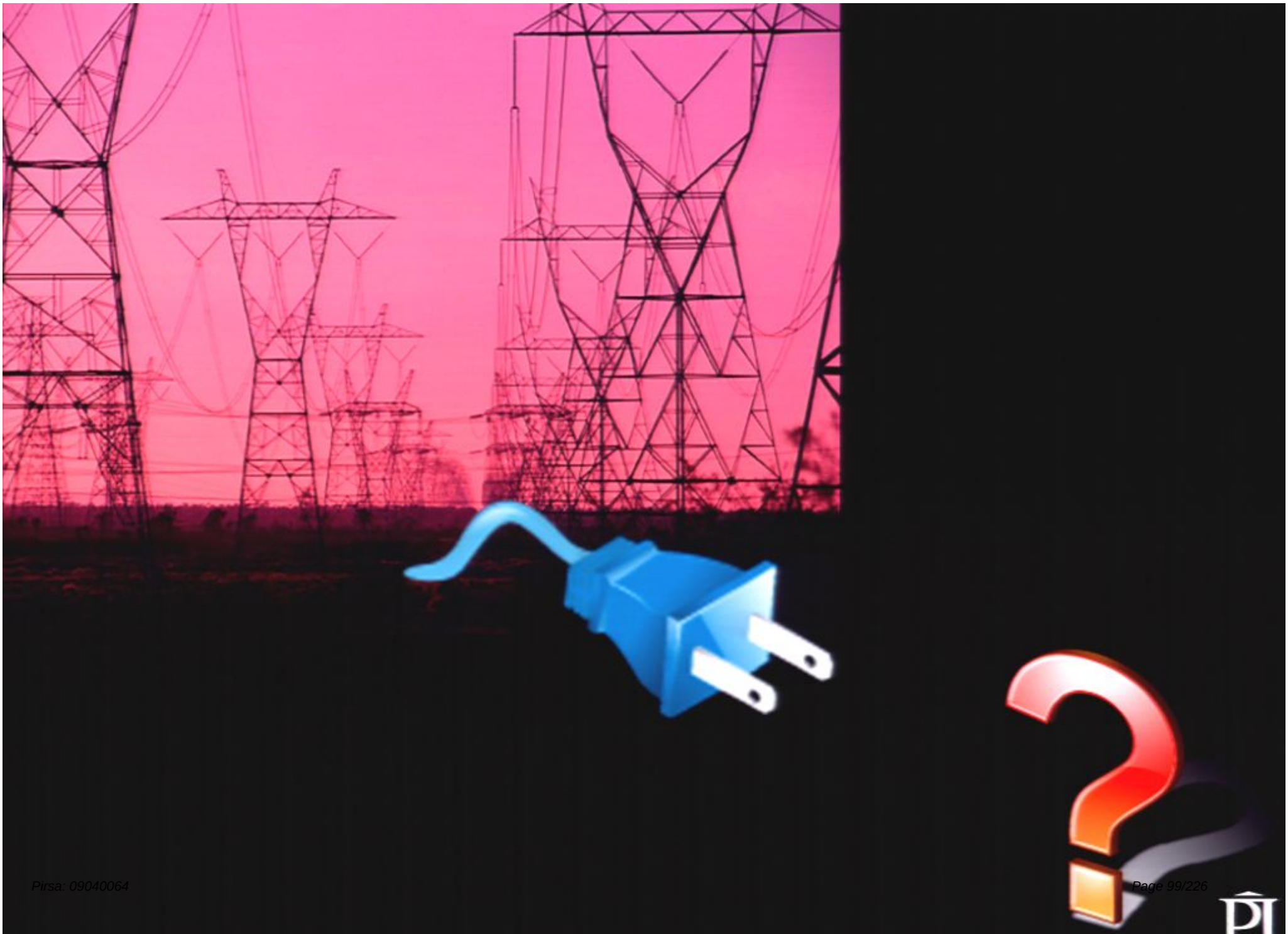
build: everything we plug in

build: everything we plug in

build: everything we plug in

build: everything we plug in





$$\nabla \cdot D = \rho$$

$$\nabla \cdot B = 0$$

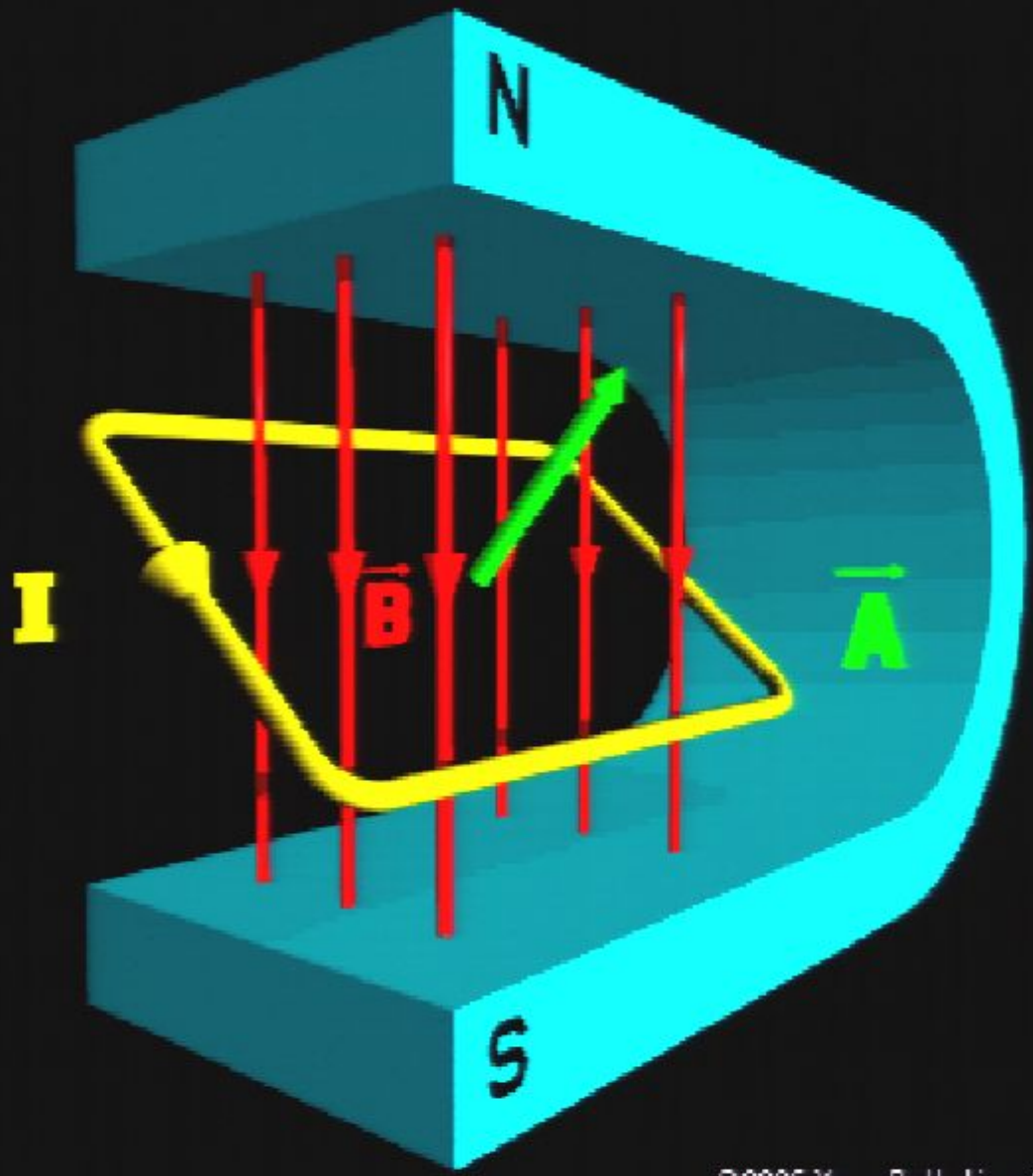
$$\nabla \times E = -\frac{\partial B}{\partial t}$$

$$\nabla \times H = i + \frac{\partial D}{\partial t}$$

power of ideas

build cool stuff:
electric power generators

build: power generators



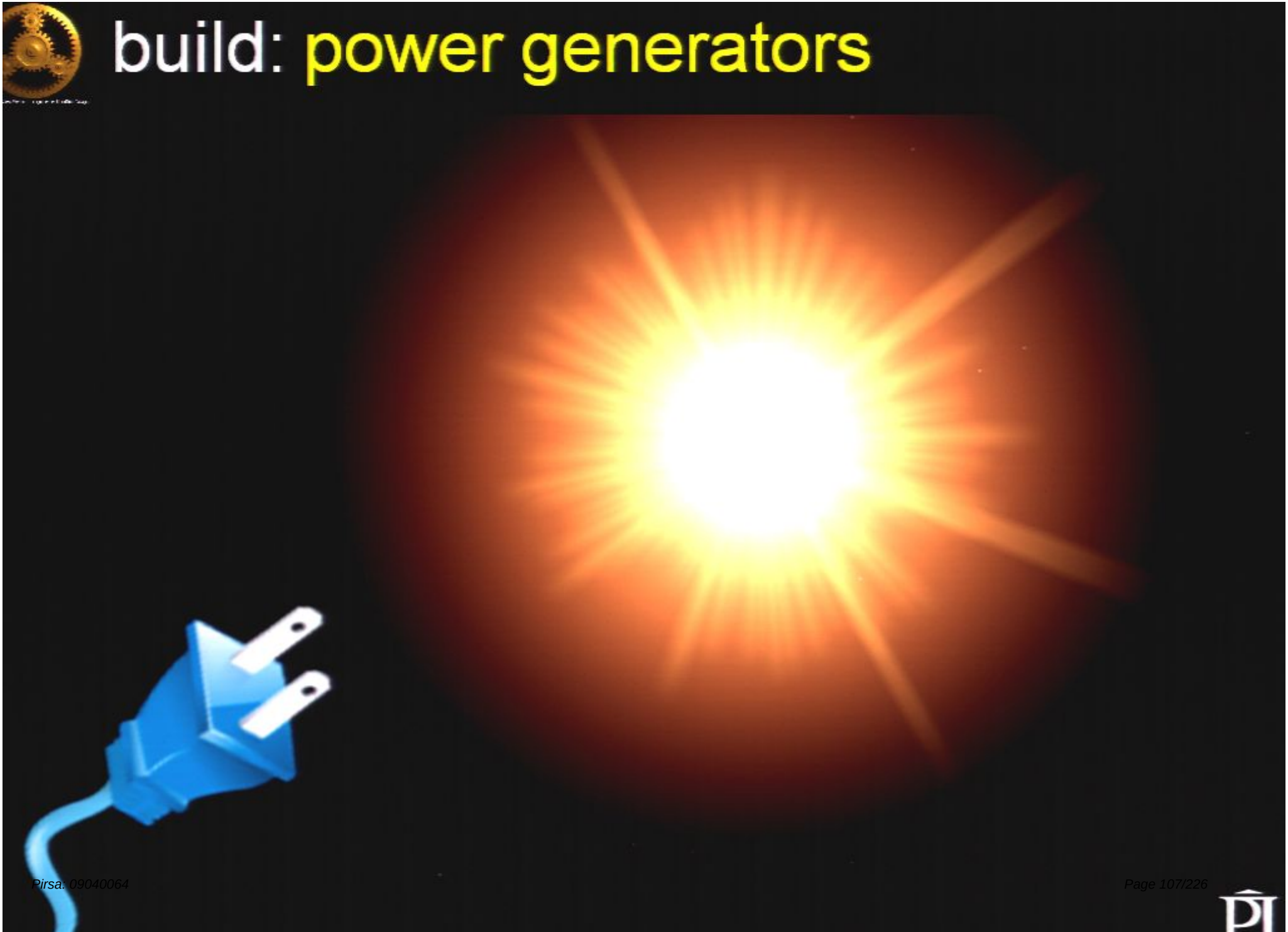
build: power generators

build: power generators

build: power generators

build: power generators

build: power generators



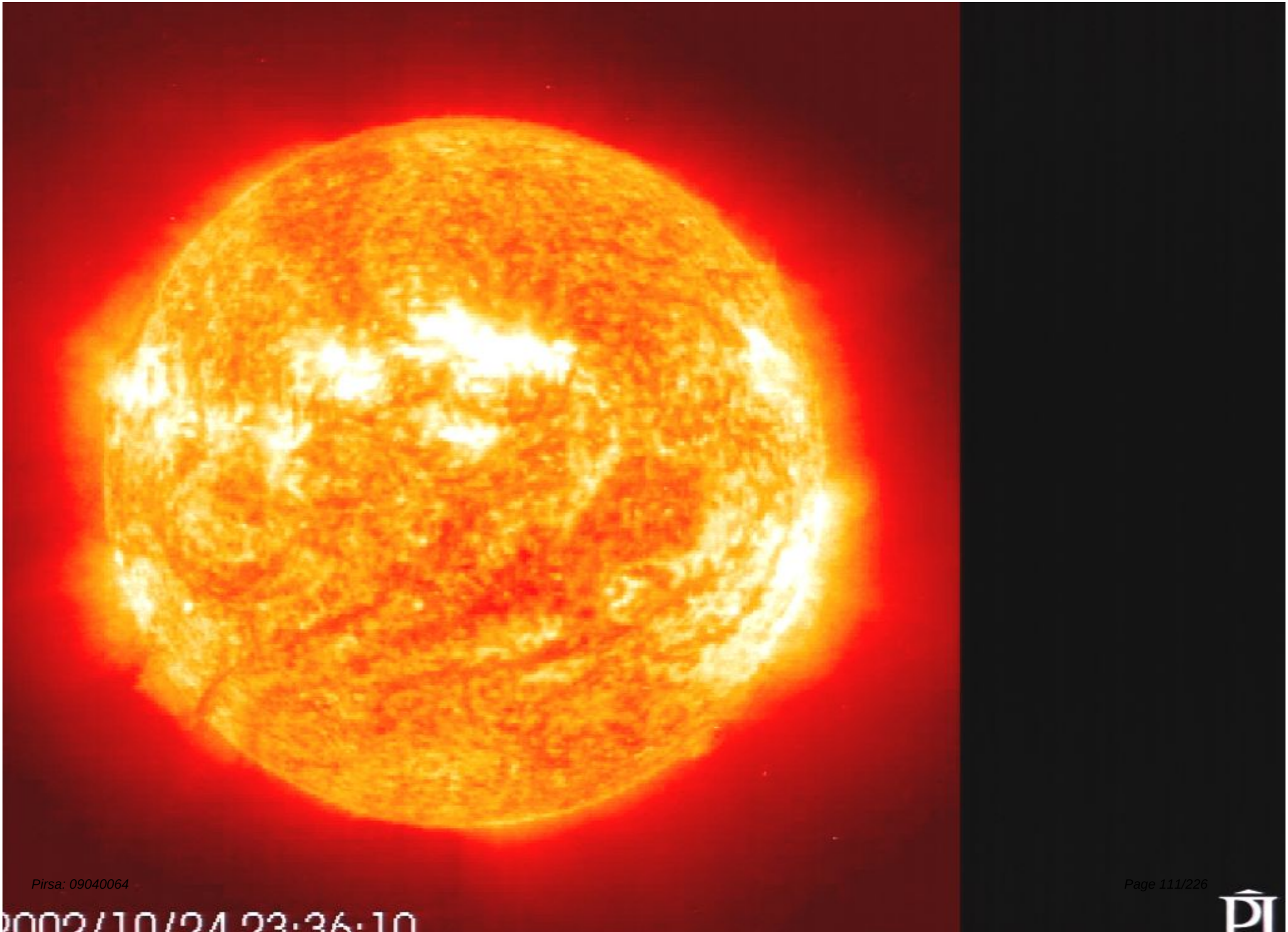
build: power generators

build: power generators

build an artificial sun?

build: power generators

build an artificial sun?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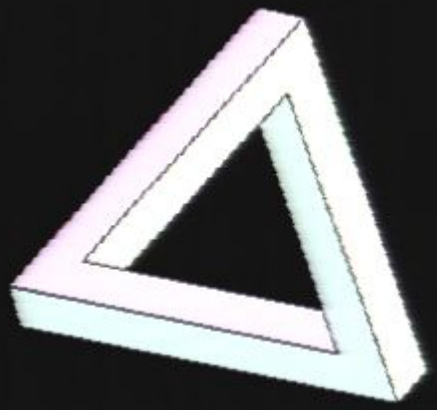
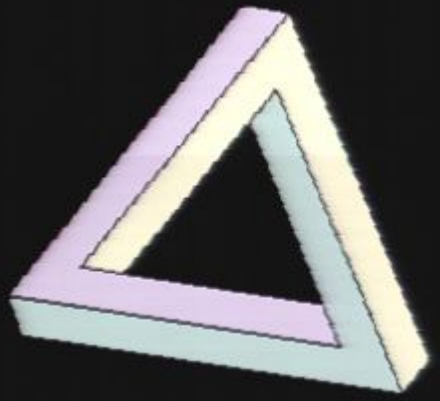
explore mystery:

sp i



explore mystery:
space


explore: space



explore mystery:
time

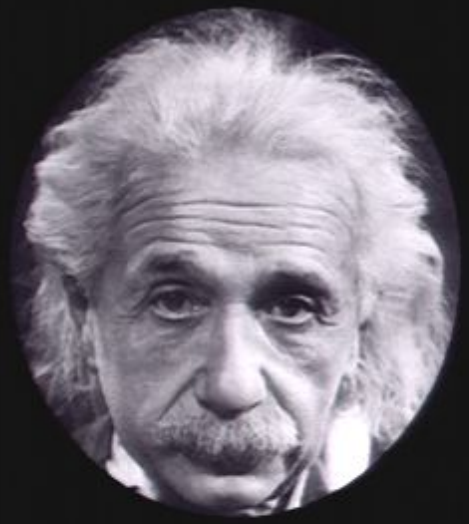
explore: time

understand reality:

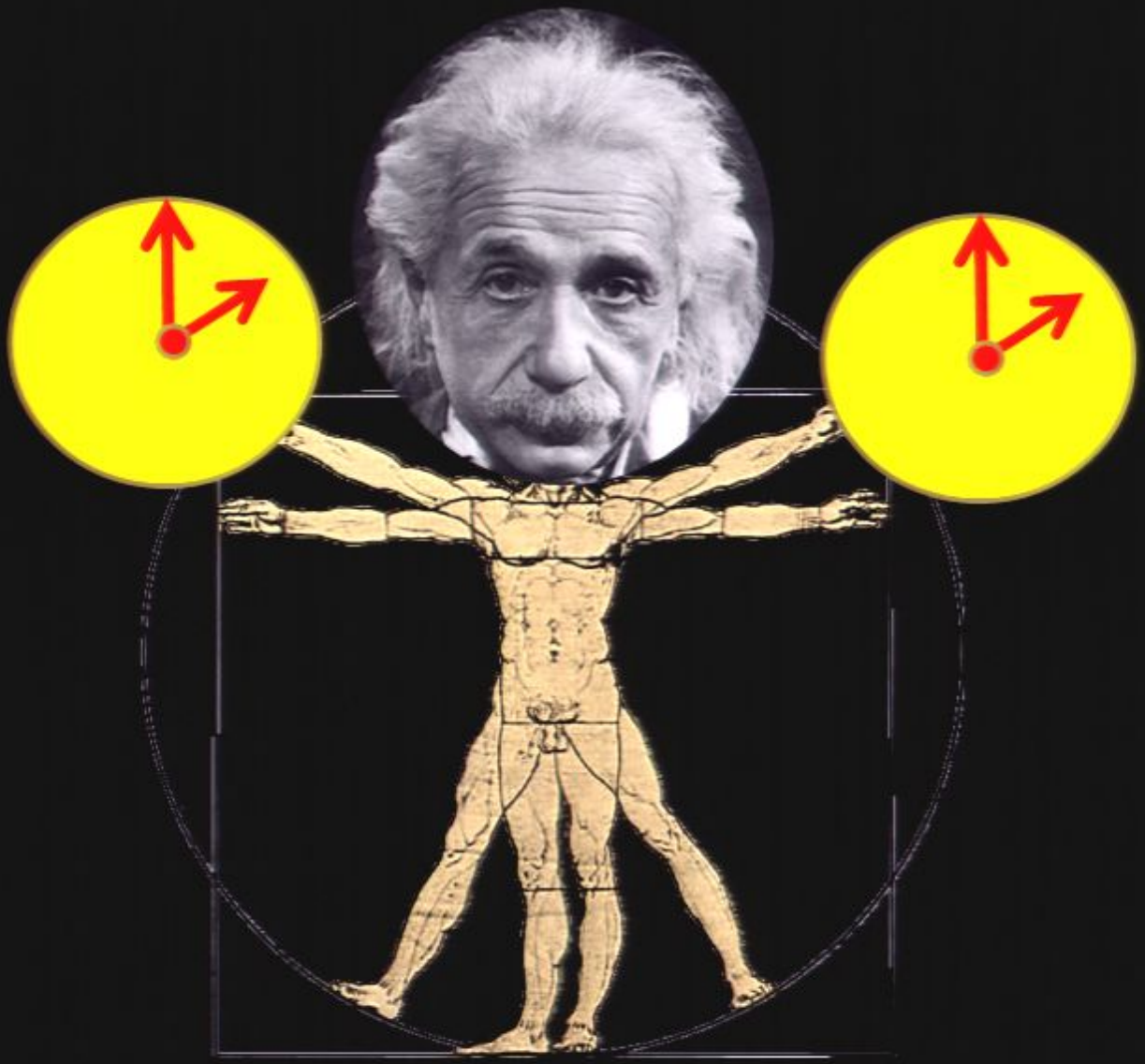
understand reality:
special relativity

understand: special relativity

understand: special relativity

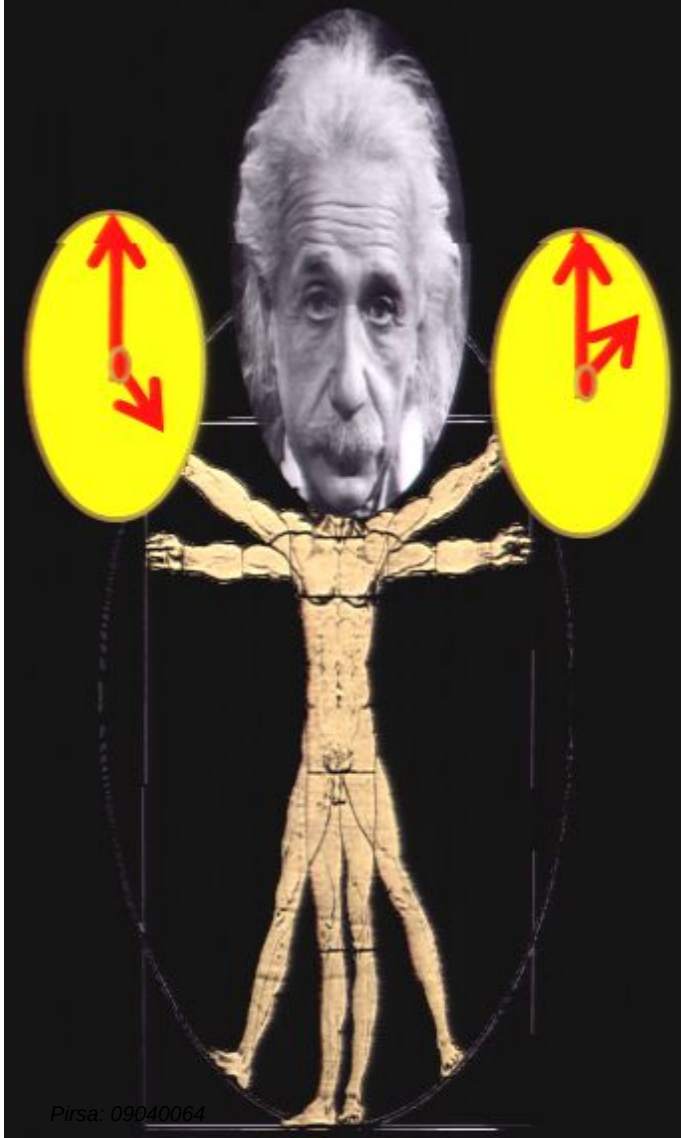


understand: special relativity

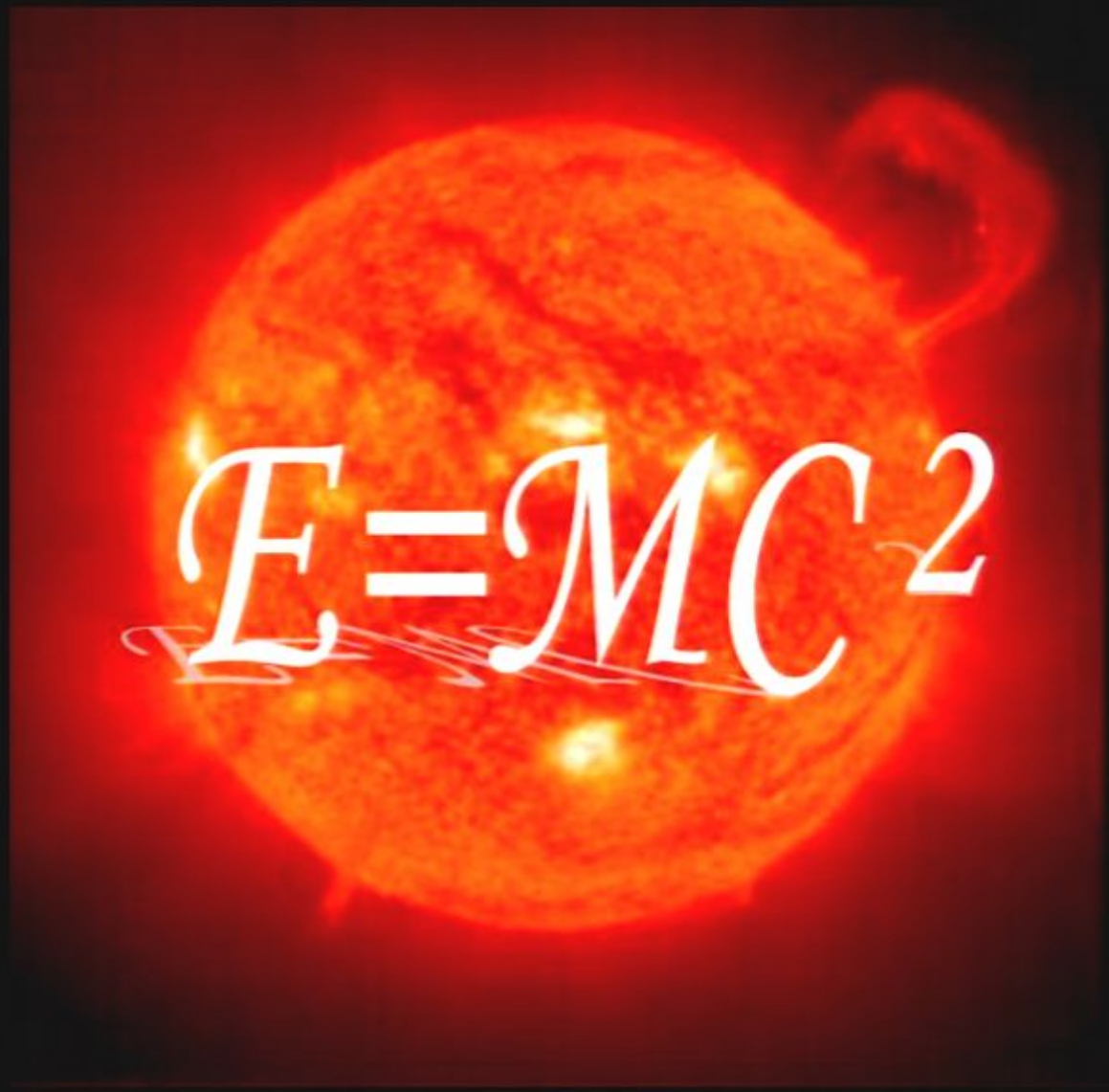


understand: special relativity

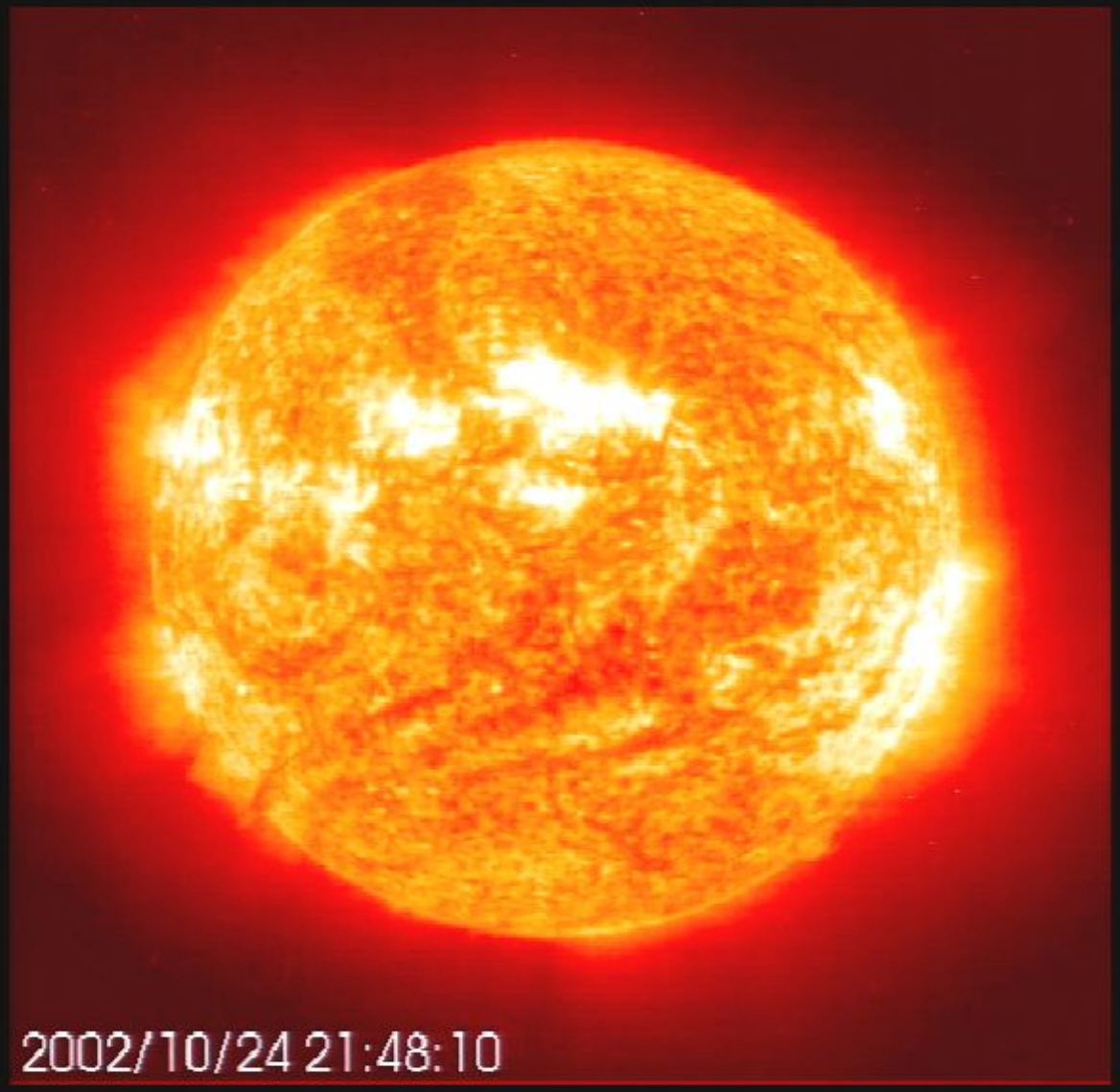
understand: special relativity



understand: special relativity

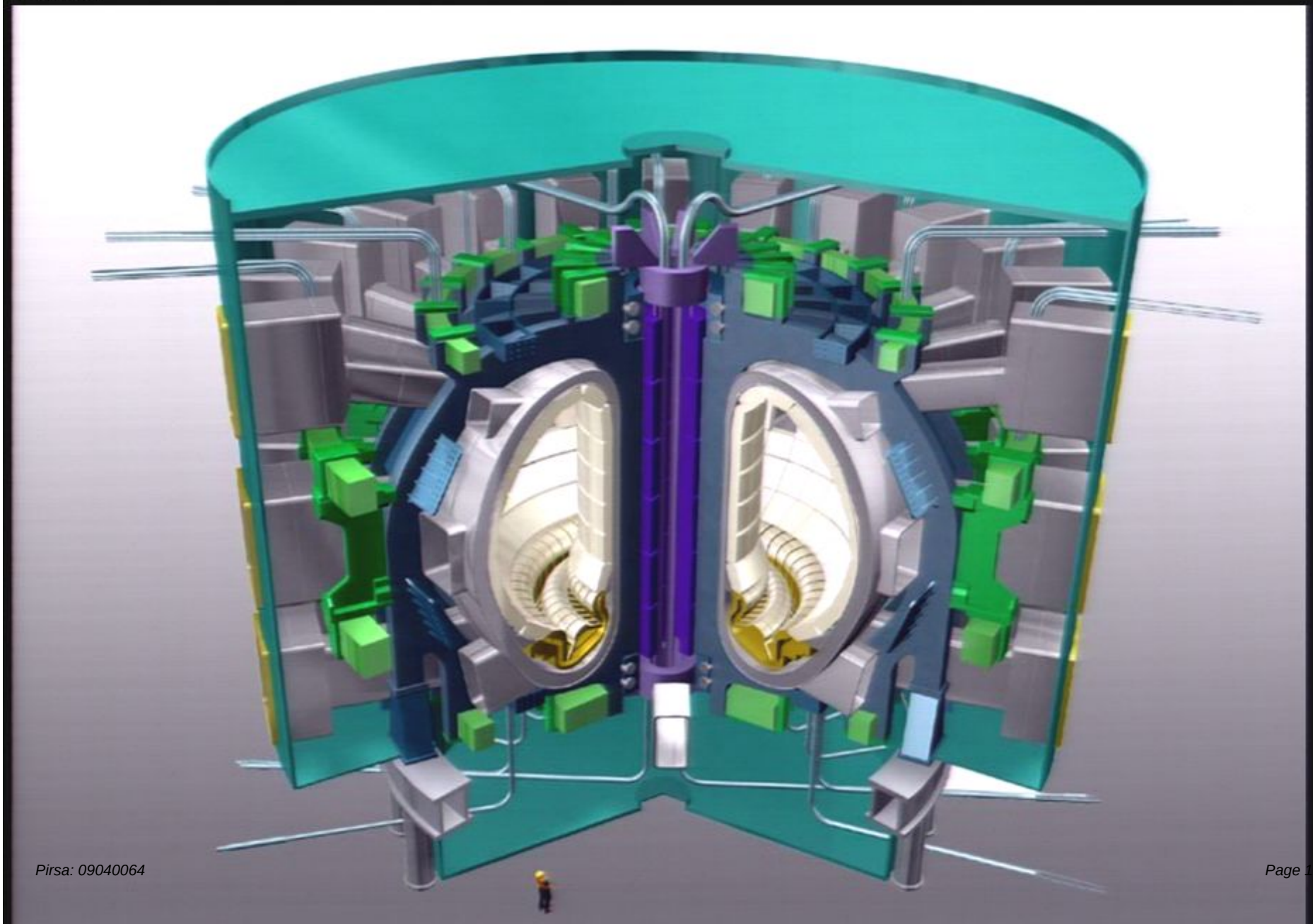


understand: special relativity

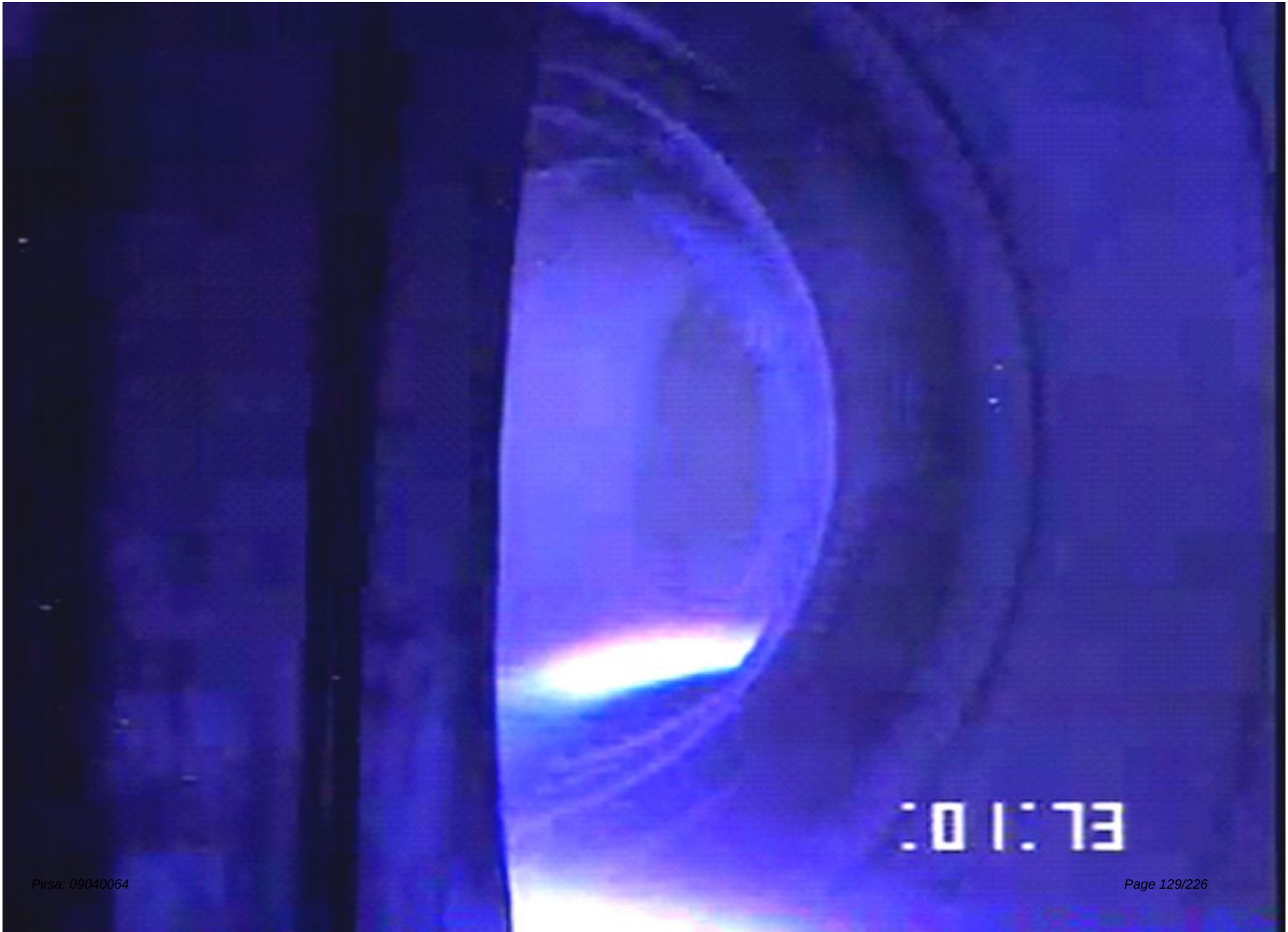


build cool stuff:
artificial sun

build: artificial sun (I.T.E.R.)



build: artificial sun (I.T.E.R.)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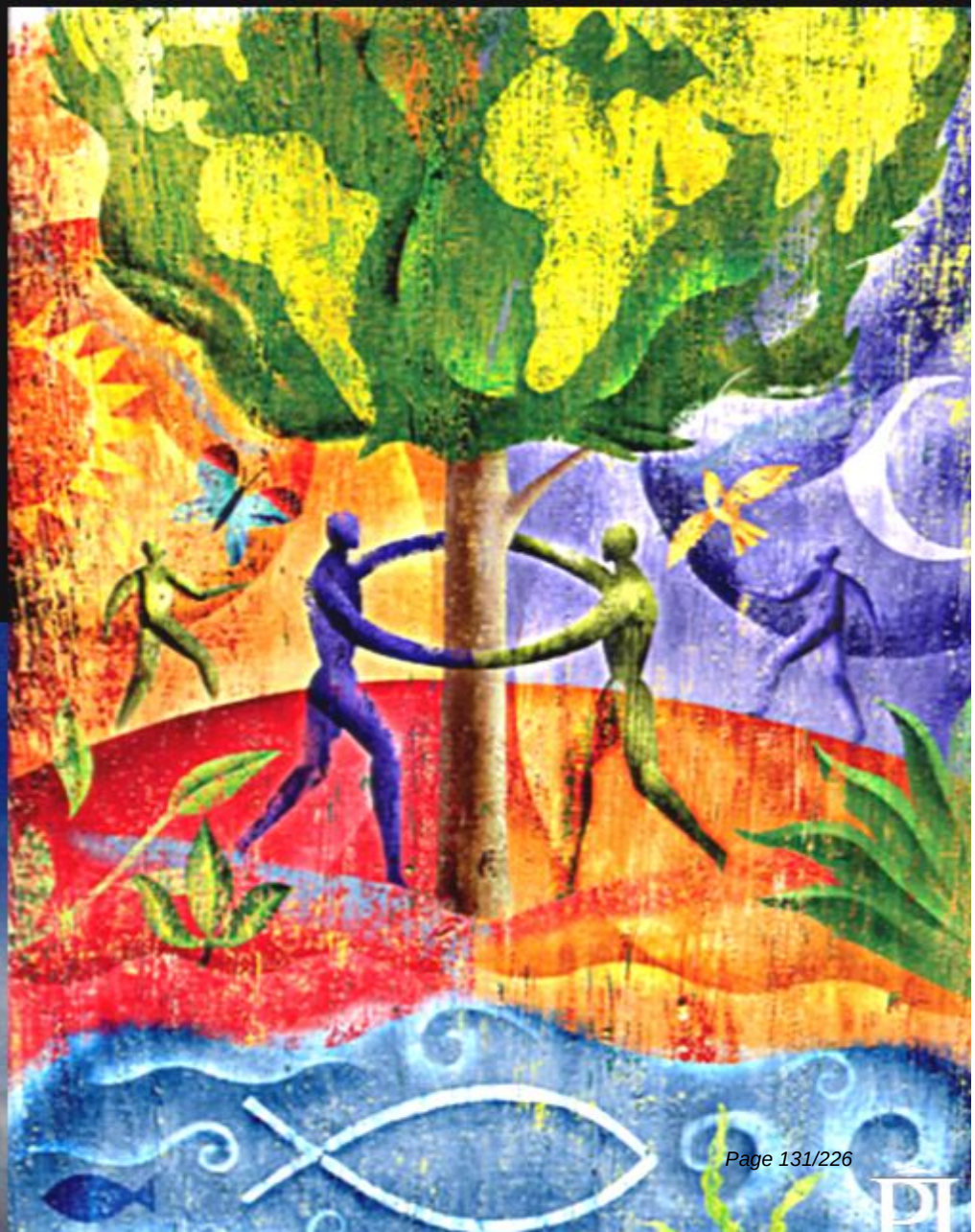
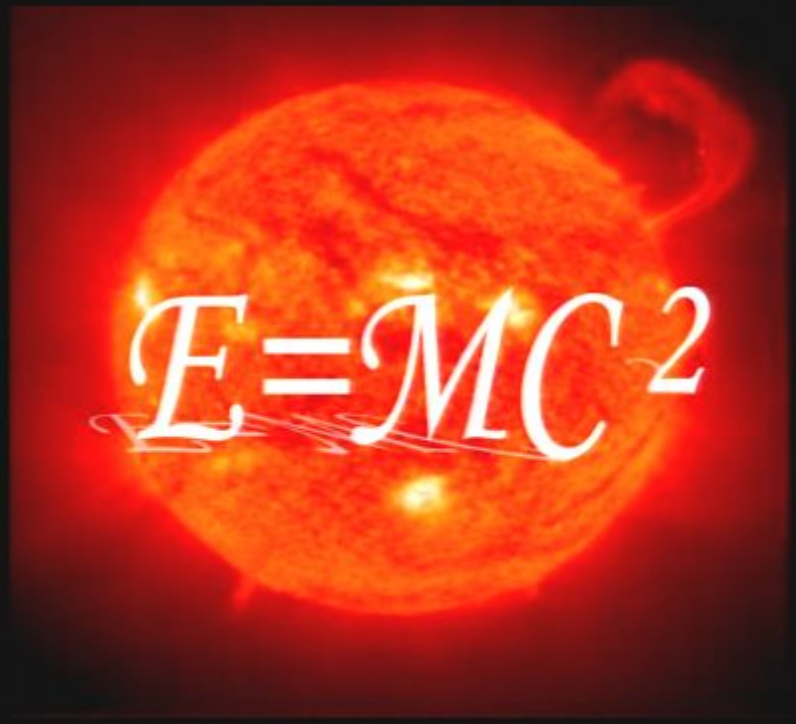
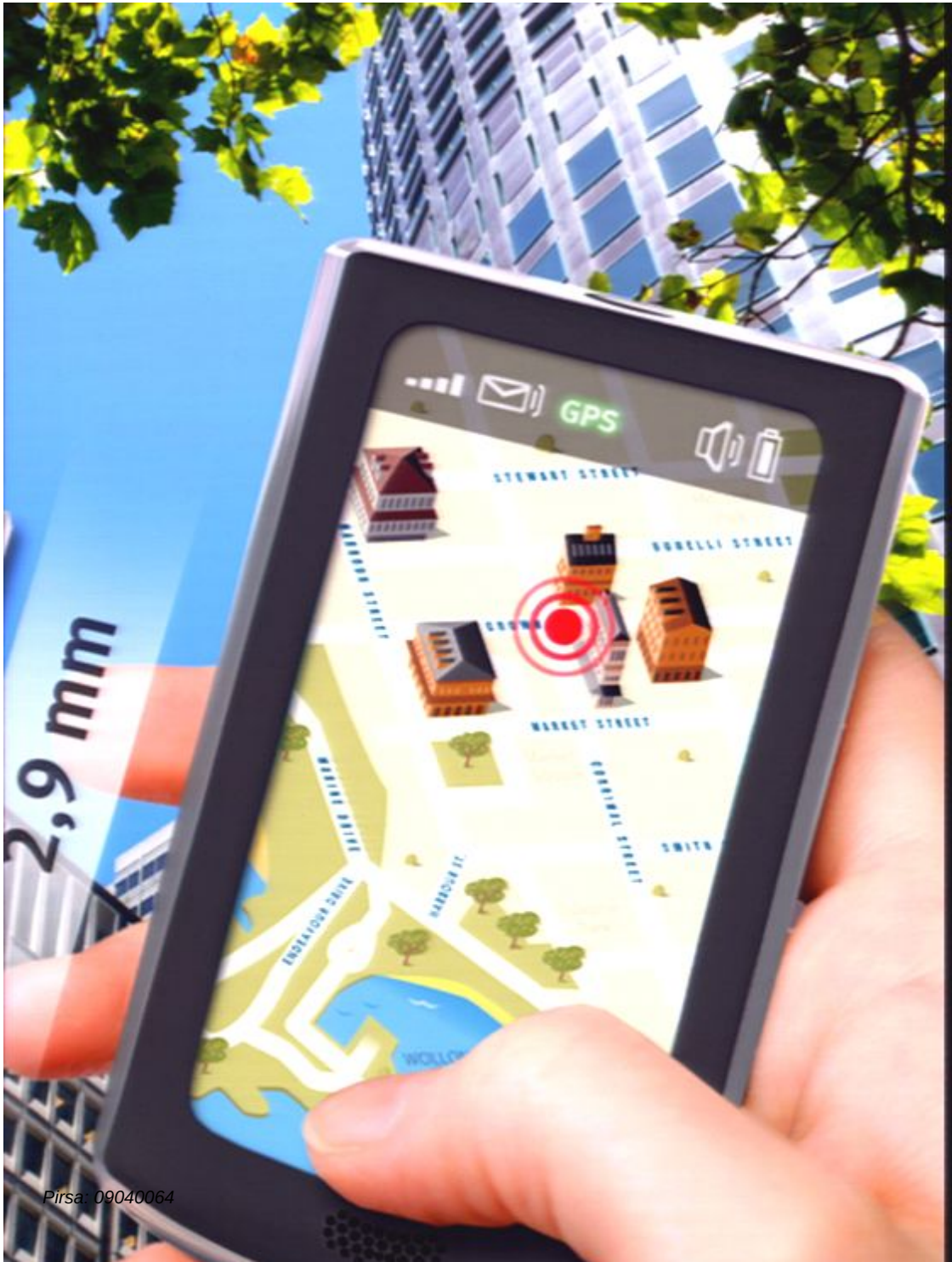
build: artificial sun (I.T.E.R.)

build: artificial sun (I.T.E.R.)





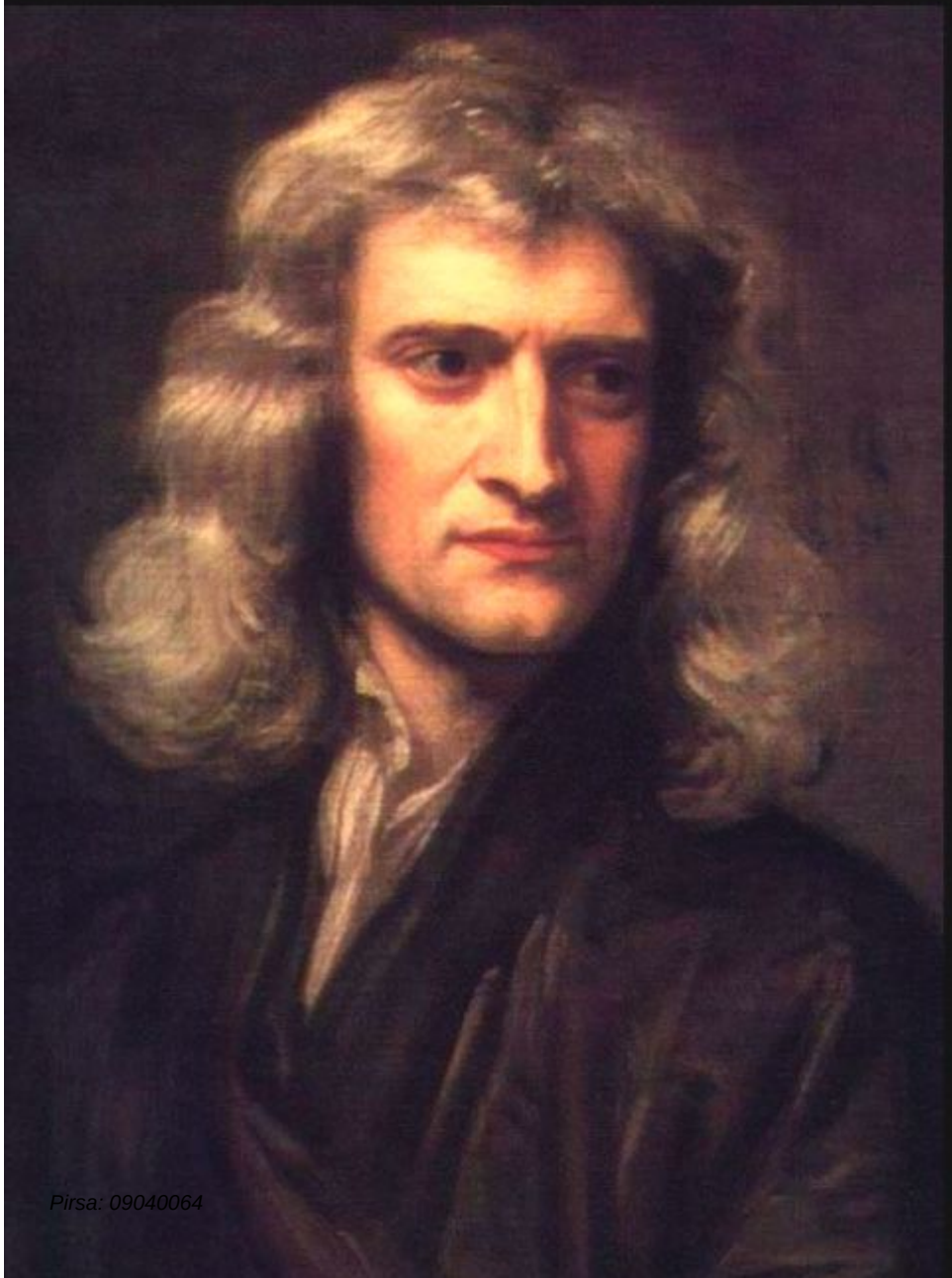
power of ideas



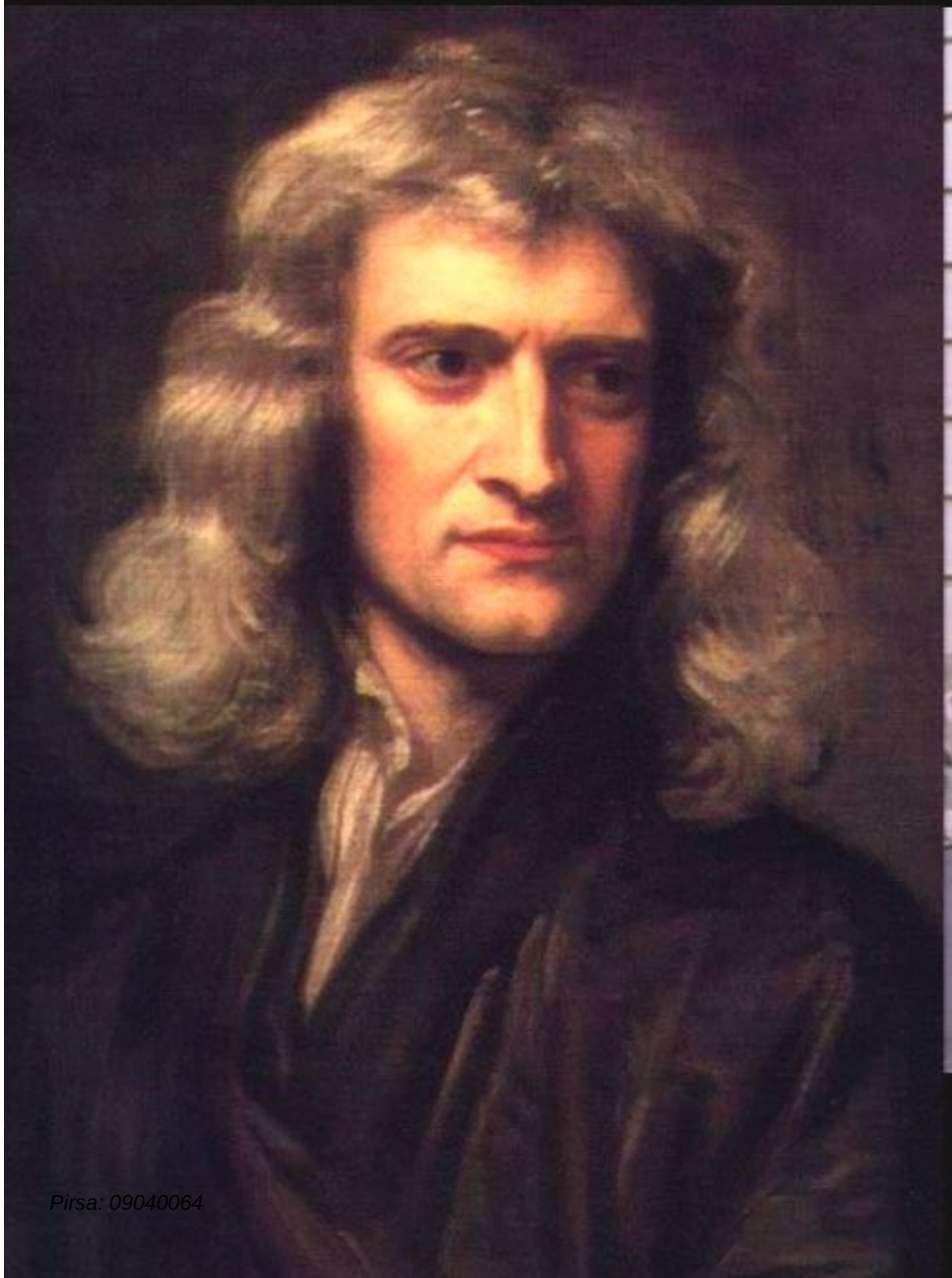
where does this come from?

explore mystery:

explore: gravity



explore: gravity



understand reality:

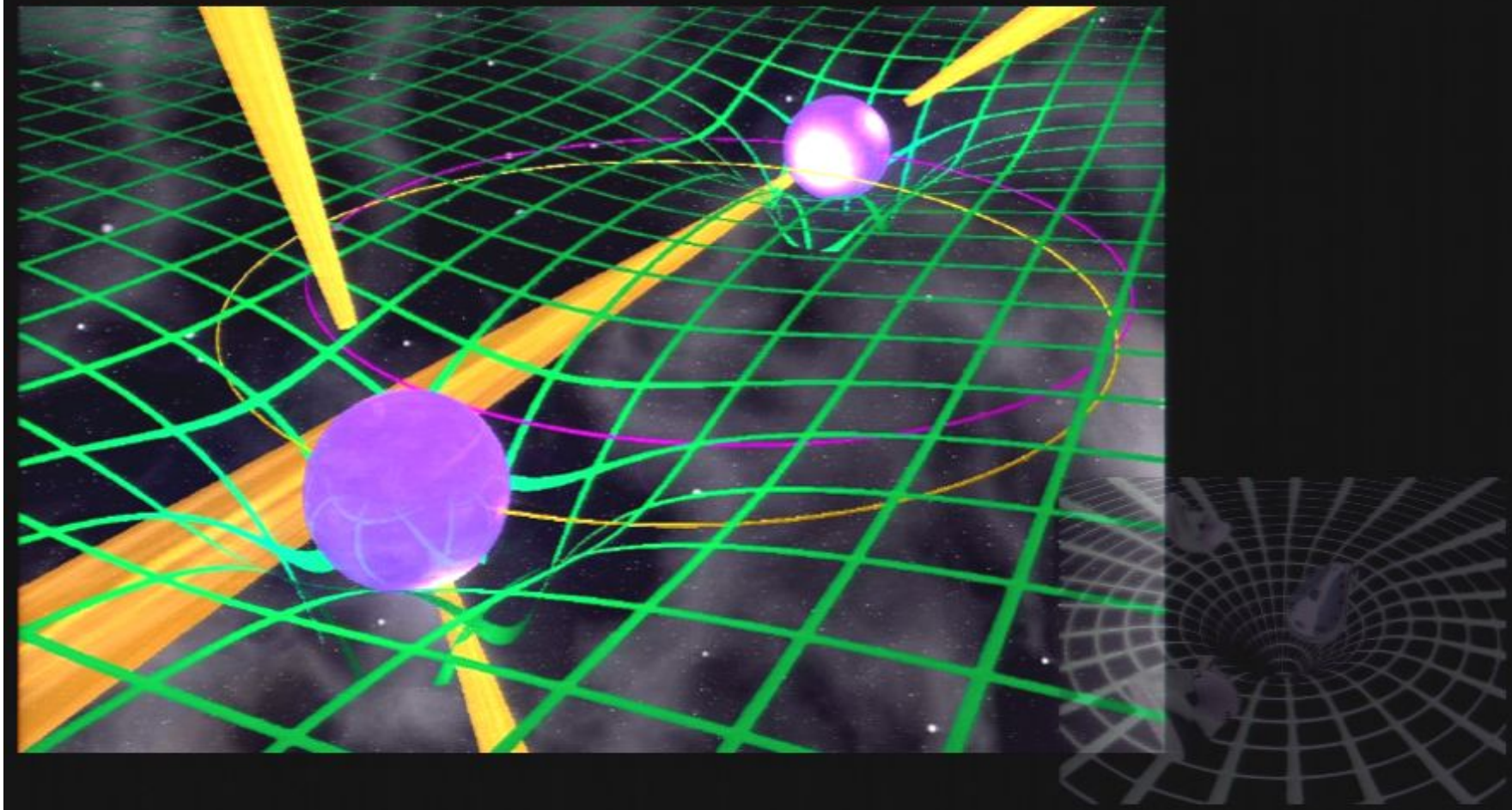
understand reality:
general relativity

understand: general relativity

understand: general relativity

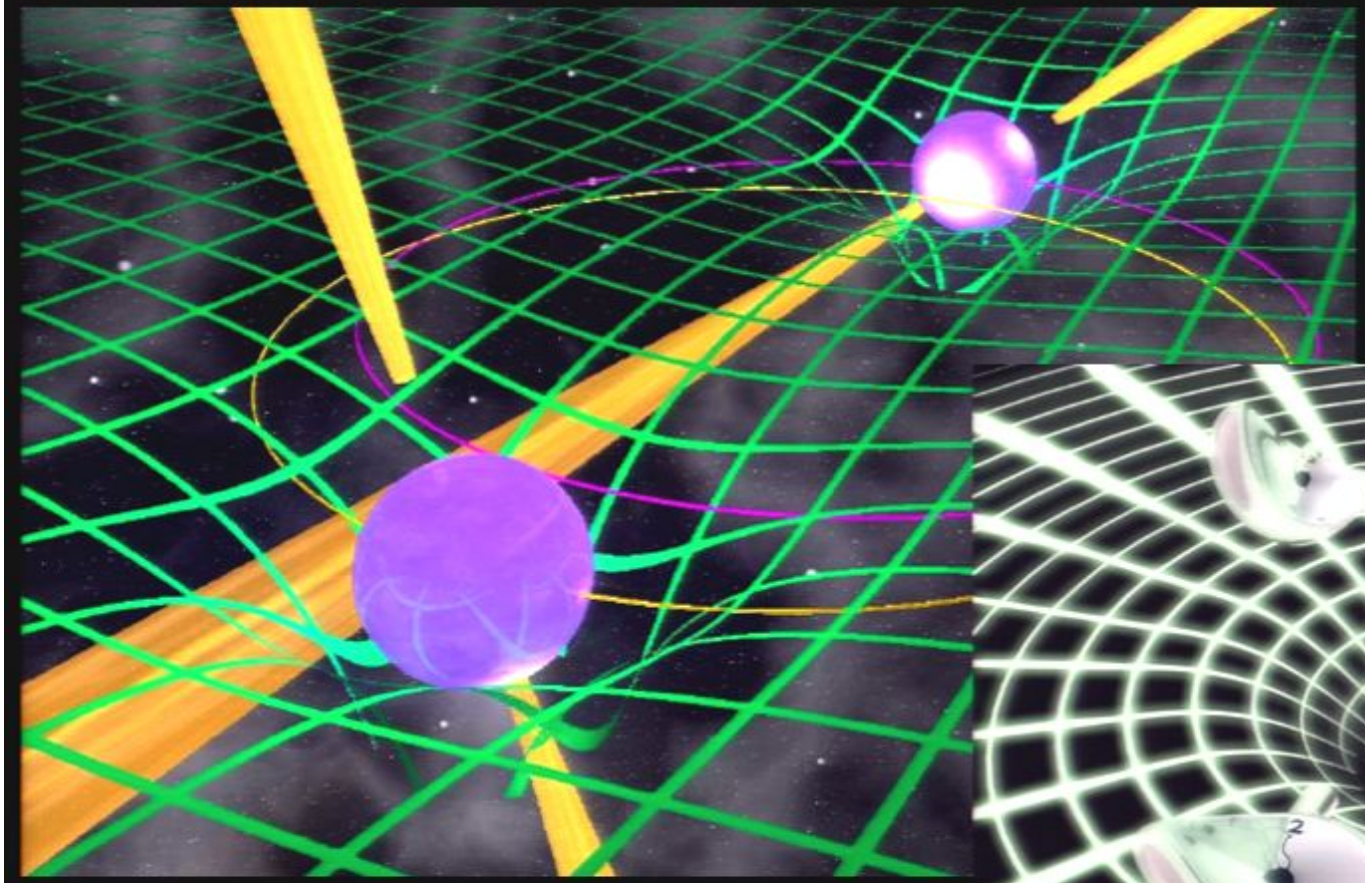
gravity = warped spacetime

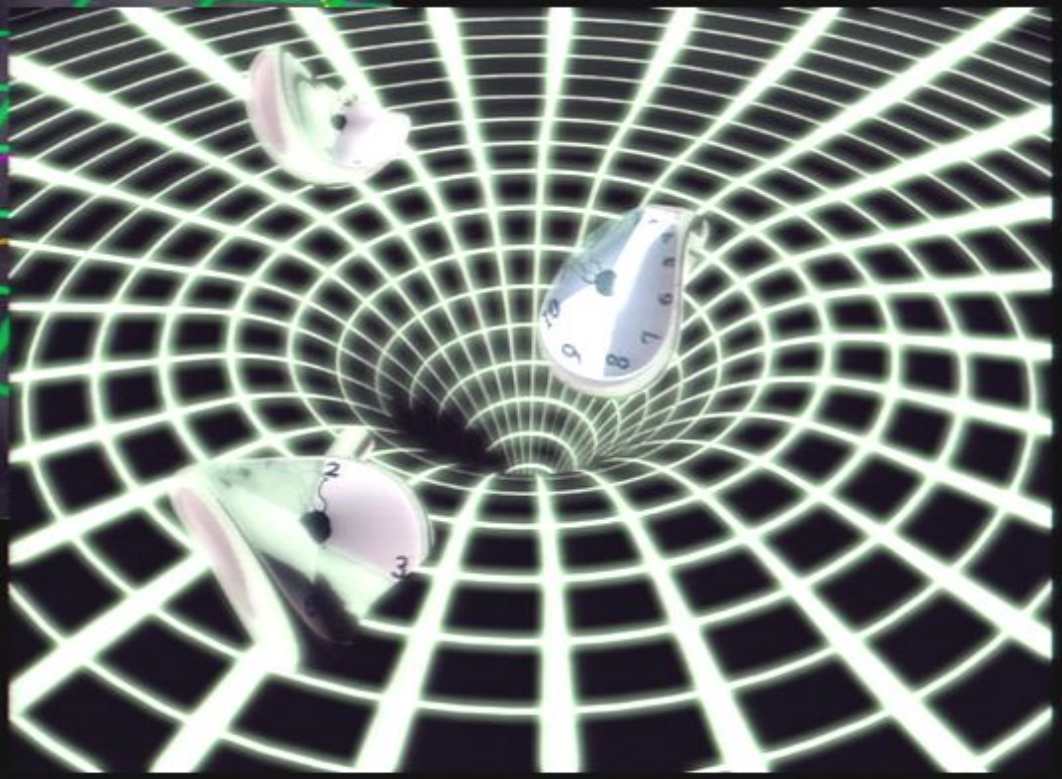
understand: general relativity



gravity = warped spacetime

understand: general relativity





gravity = warped spacetime

understand: general relativity

understand: general relativity

build cool stuff:

build cool stuff:
global positioning system

build: GPS

build: GPS

where →

build: GPS

where →

← when

build: GPS

where →

← when

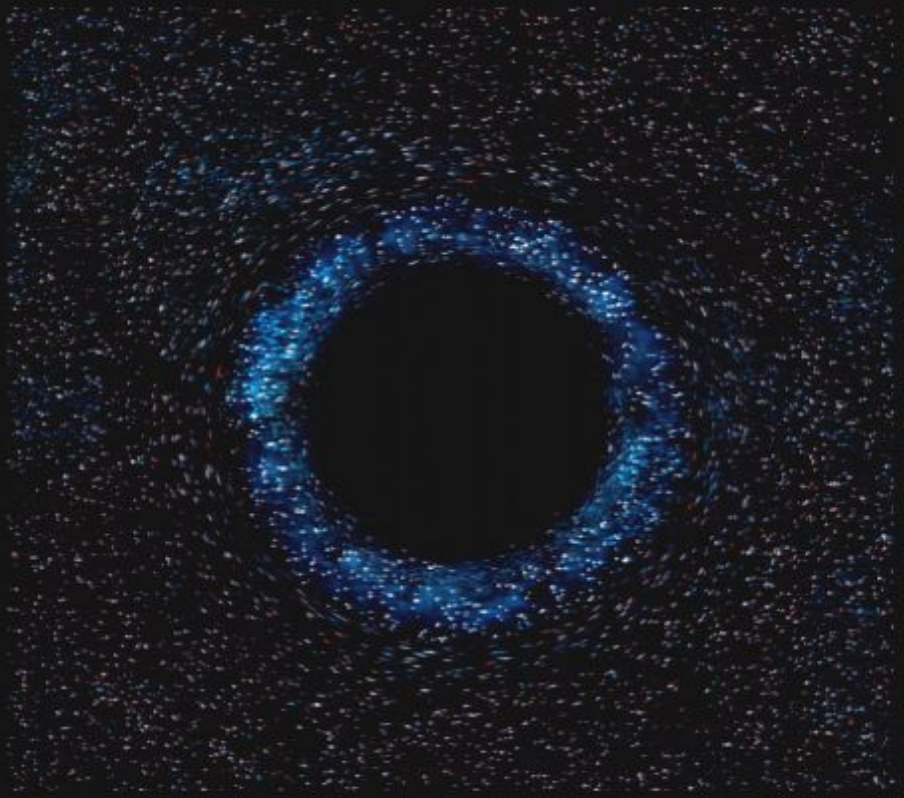
11:57.55.685010759375 94

build: future energy sources?

build: future energy sources?

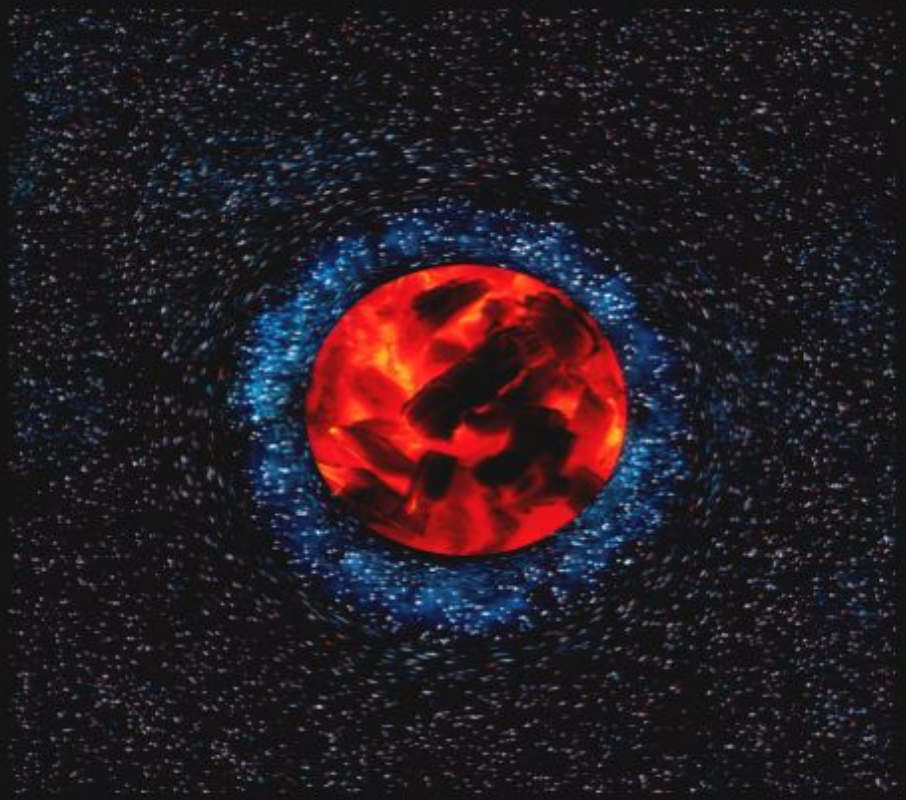
Hawking radiation

build: future energy sources?



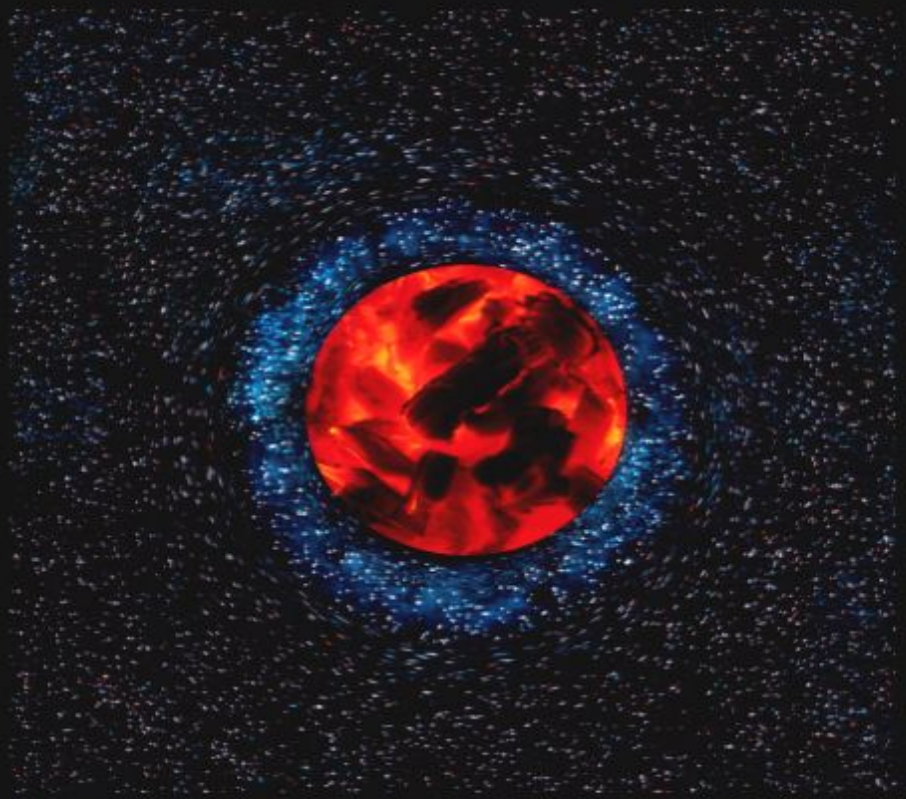
Hawking radiation

build: future energy sources?



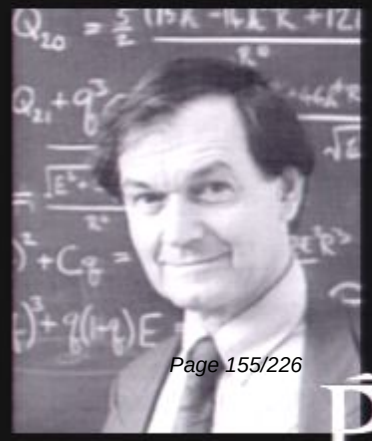
Hawking radiation

build: future energy sources?

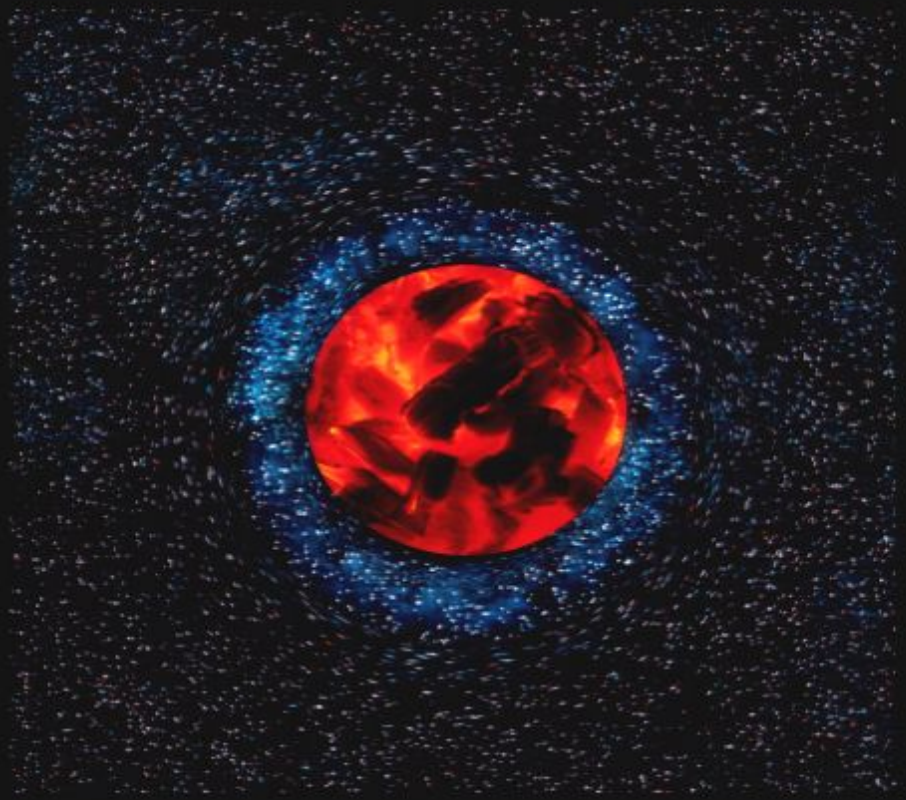


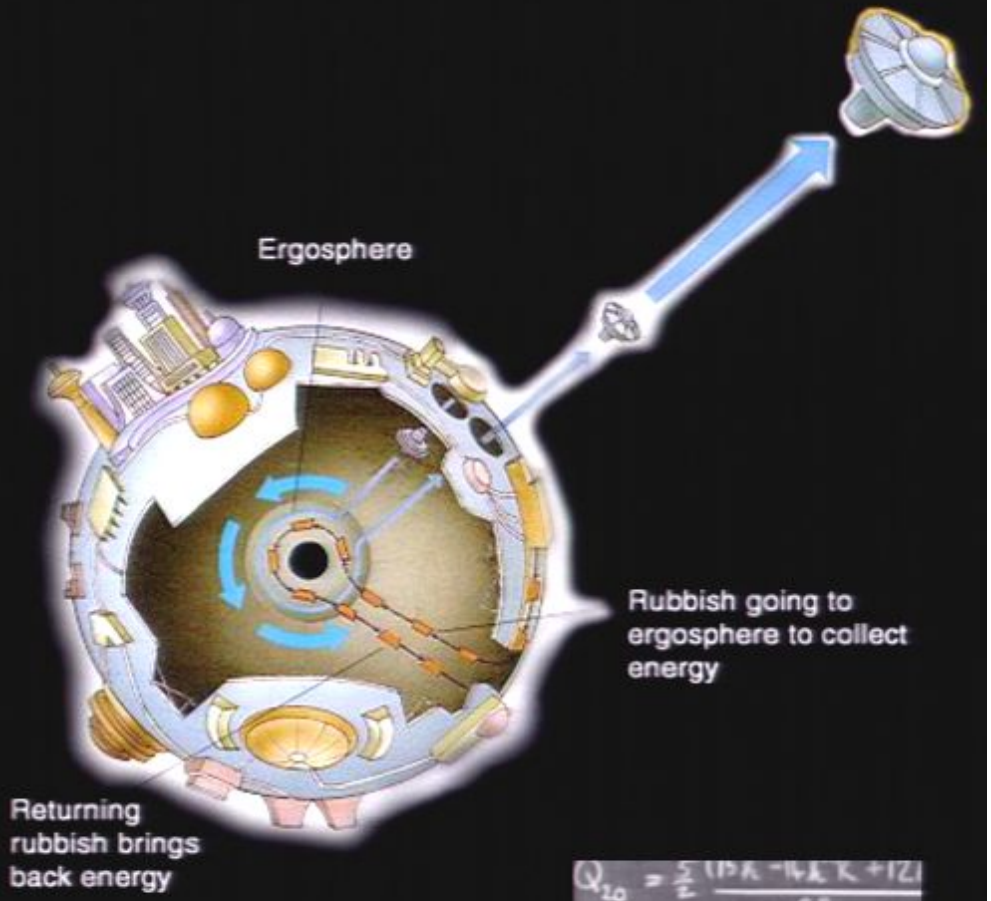
Hawking radiation

Penrose process



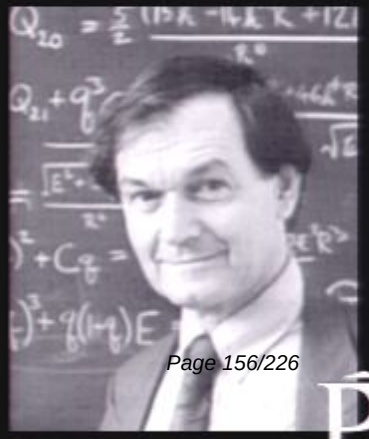
build: future energy sources?



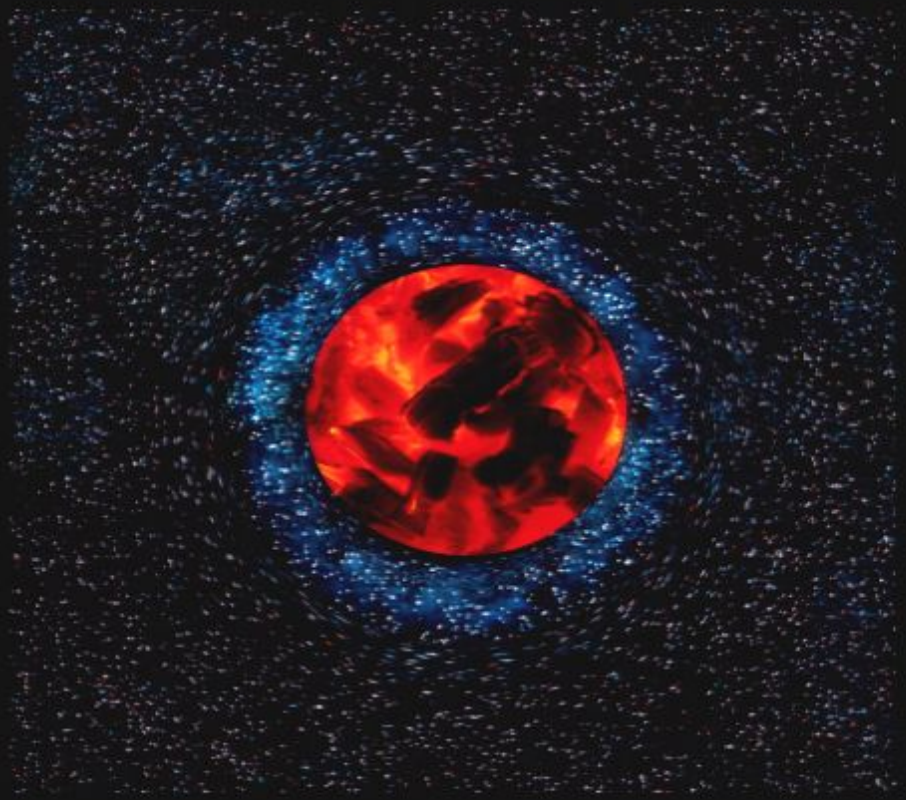


Hawking radiation

Penrose process

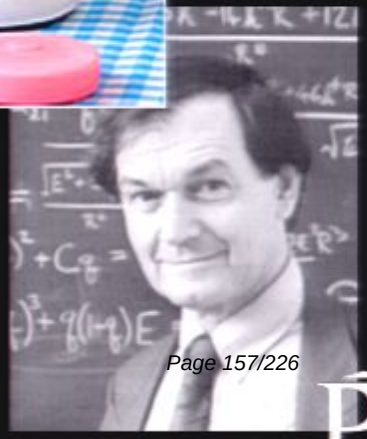


build: future energy sources?

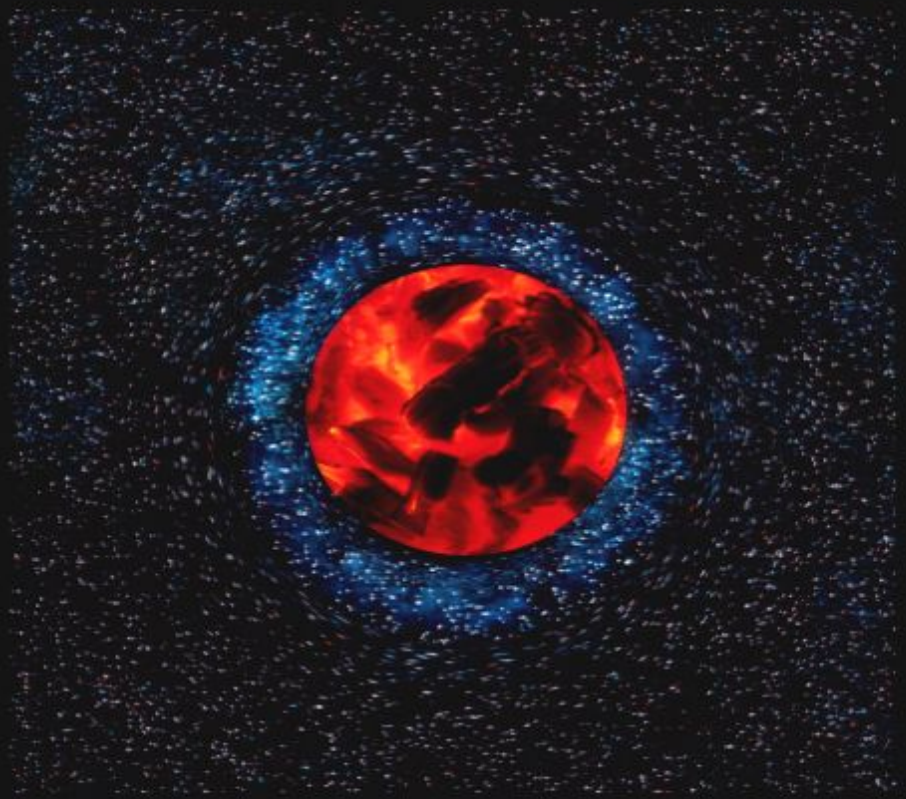


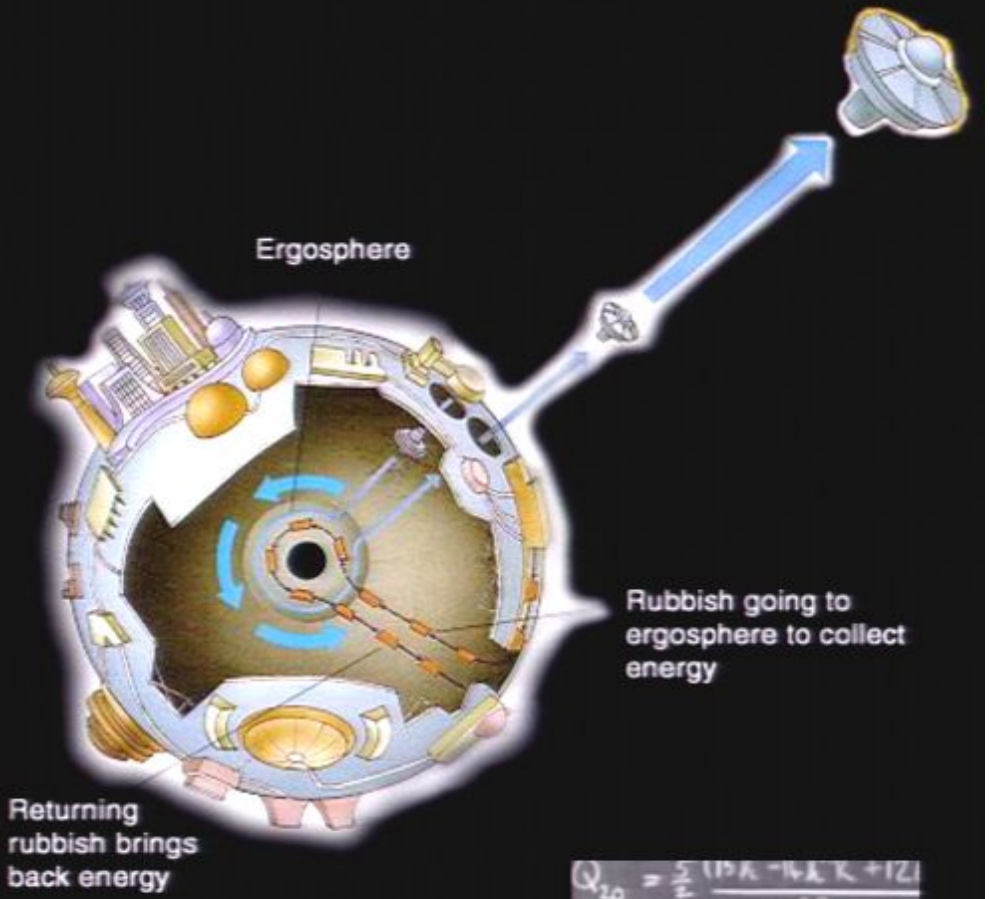
Hawking radiation

Penrose process



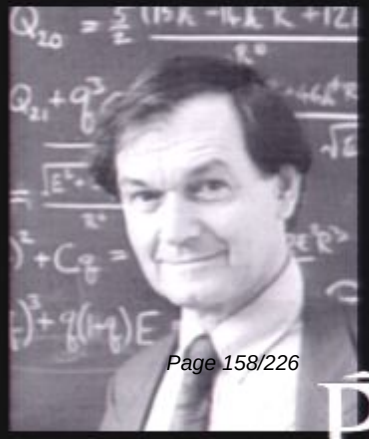
build: future energy sources?





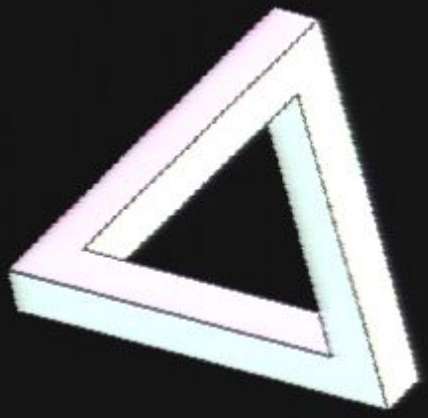
Hawking radiation

Penrose process



power of ideas

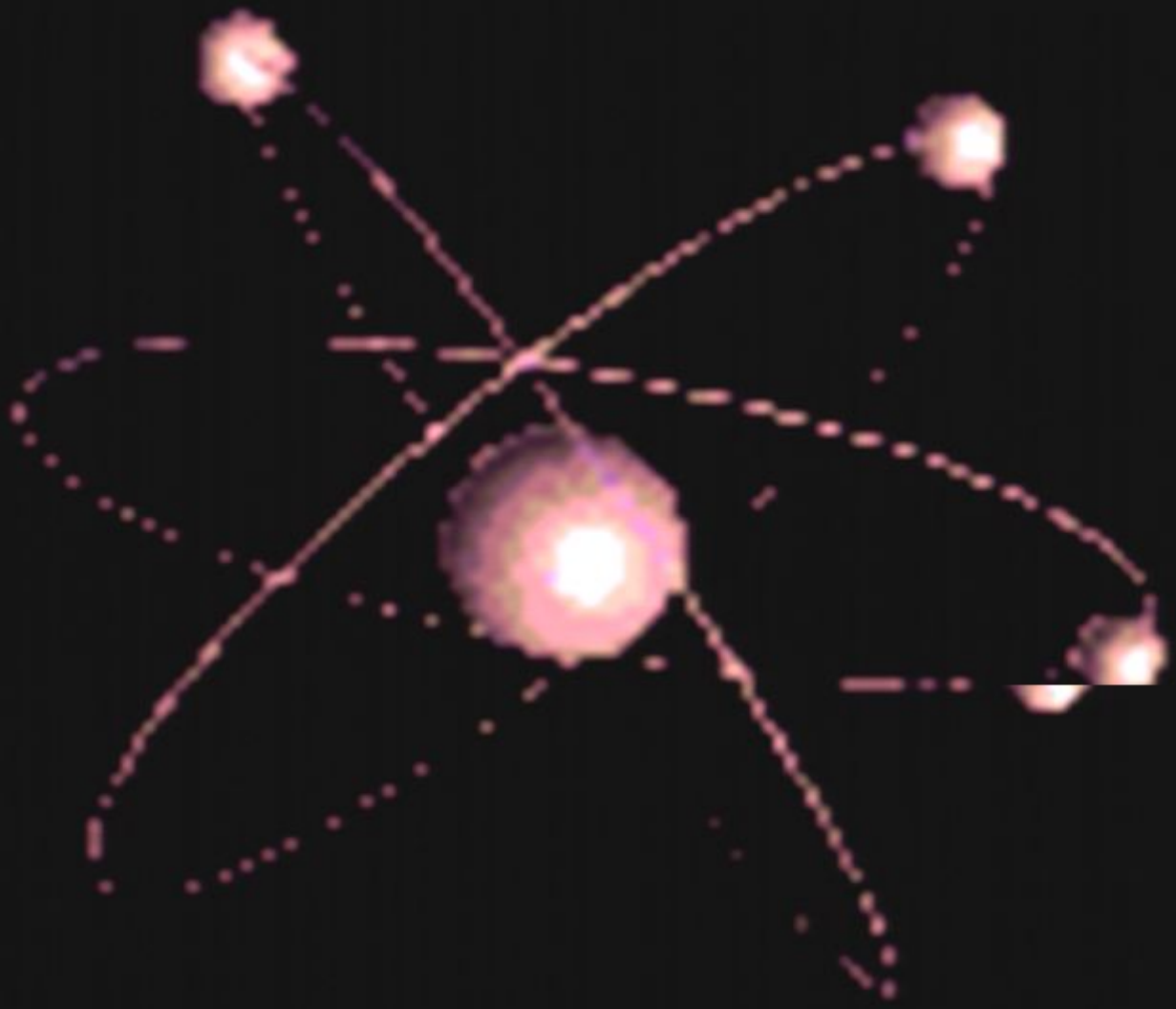
where does this come from?



explore mystery:

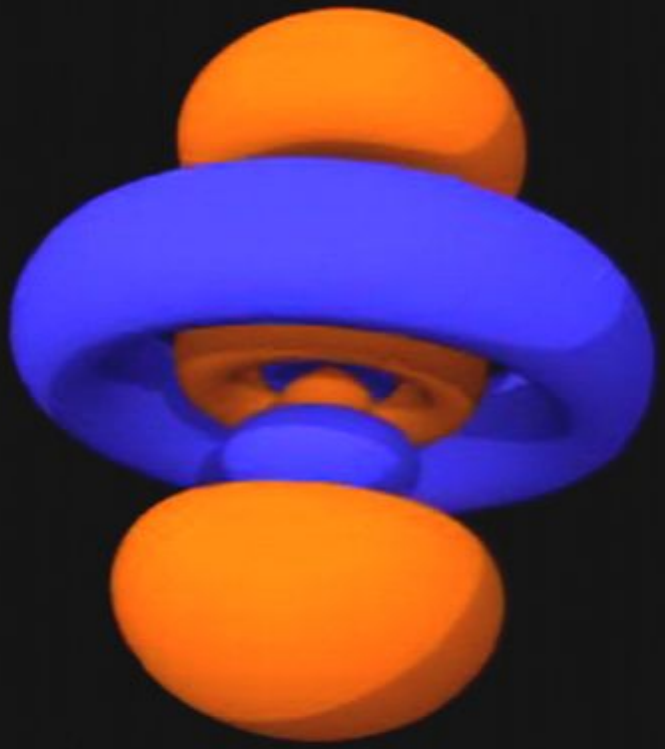
explore mystery:
how atoms can exist

explore: how atoms can exist

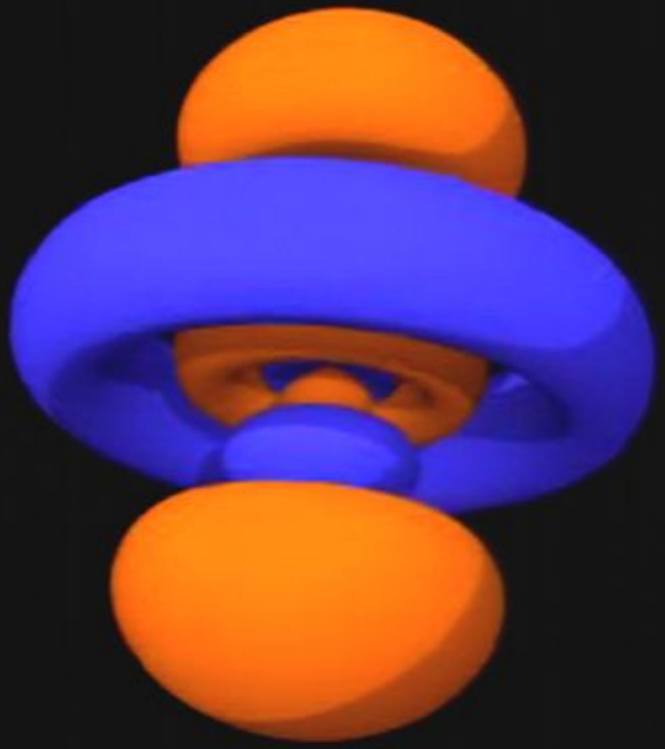


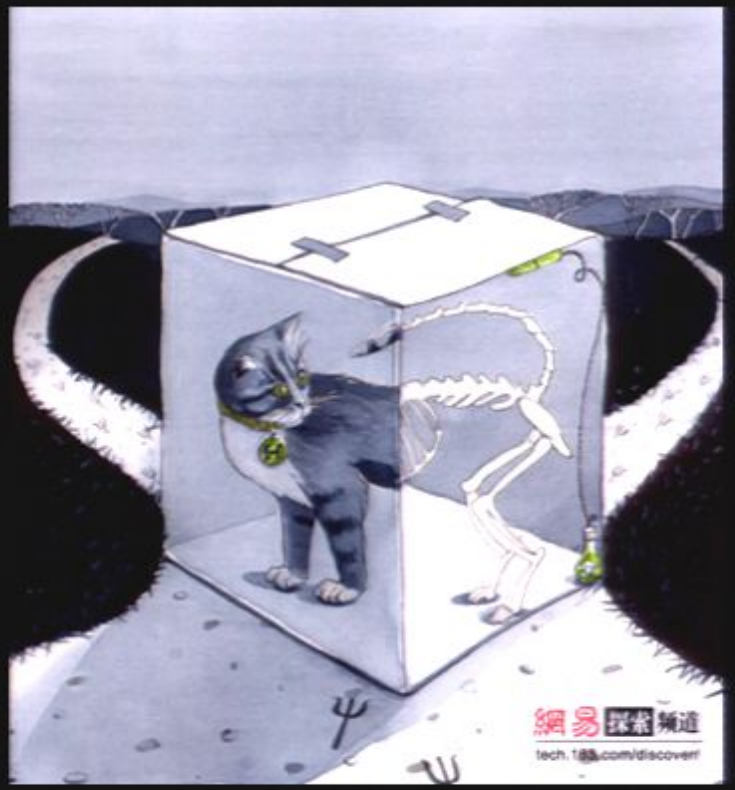
understand reality:
quantum

understand: quantum

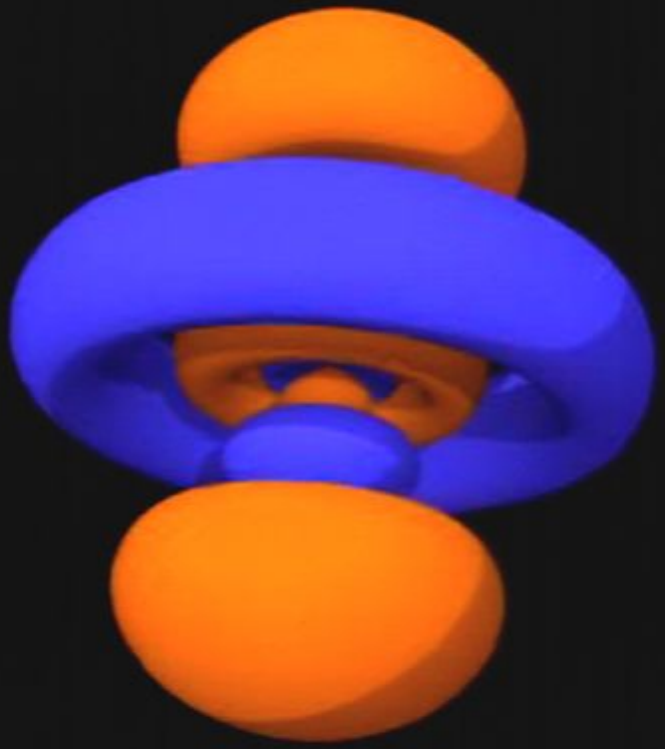


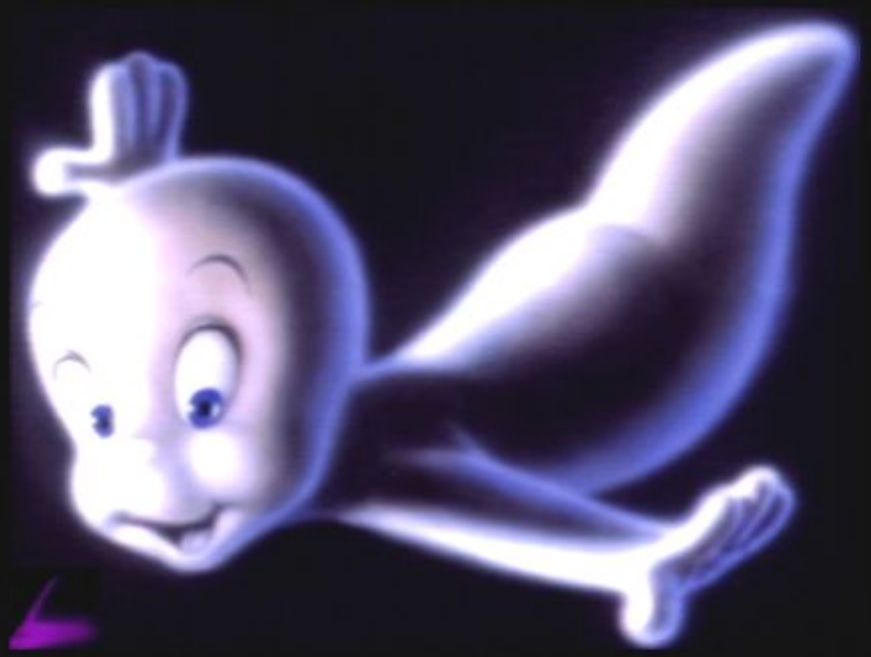
understand: quantum



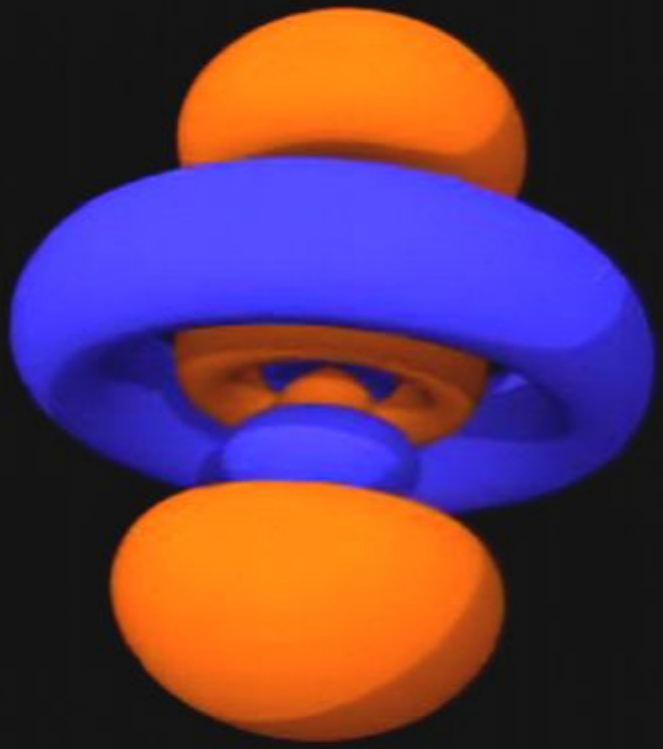


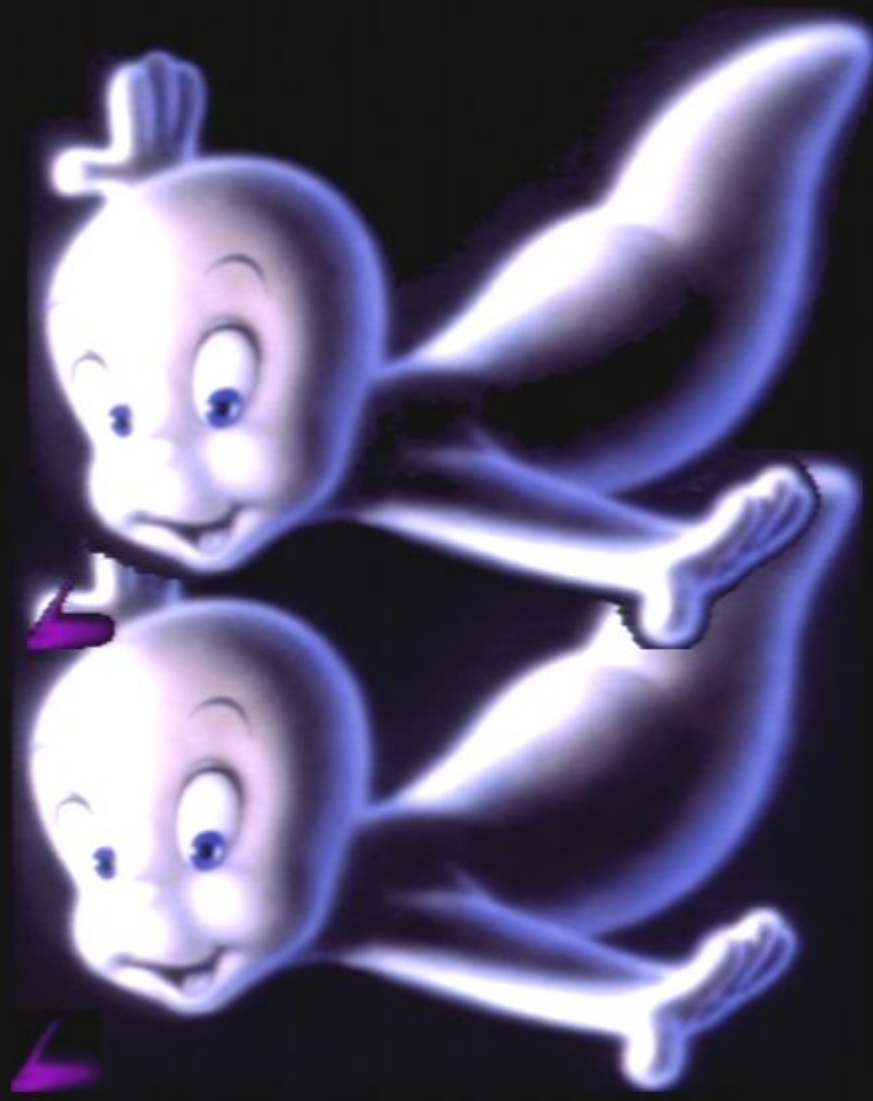
understand: quantum





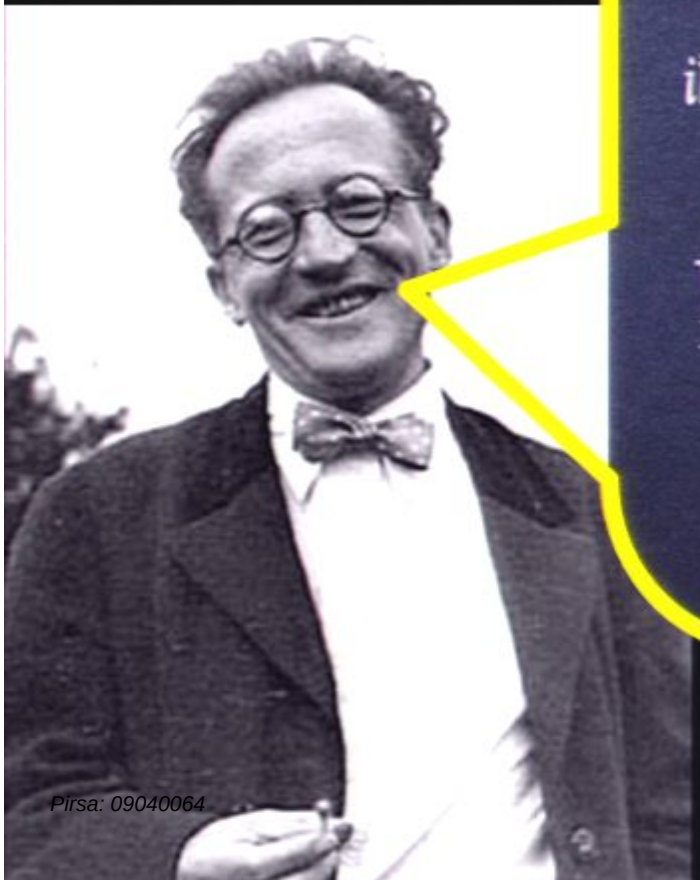
understand: quantum





understand: quantum

understand: quantum



WHAT PART OF

$$i\hbar\frac{\partial}{\partial t}\Psi(\vec{r},t) = \left(-\frac{\hbar^2}{2m}\nabla^2 + V(\vec{r},t)\right)\Psi(\vec{r},t)$$

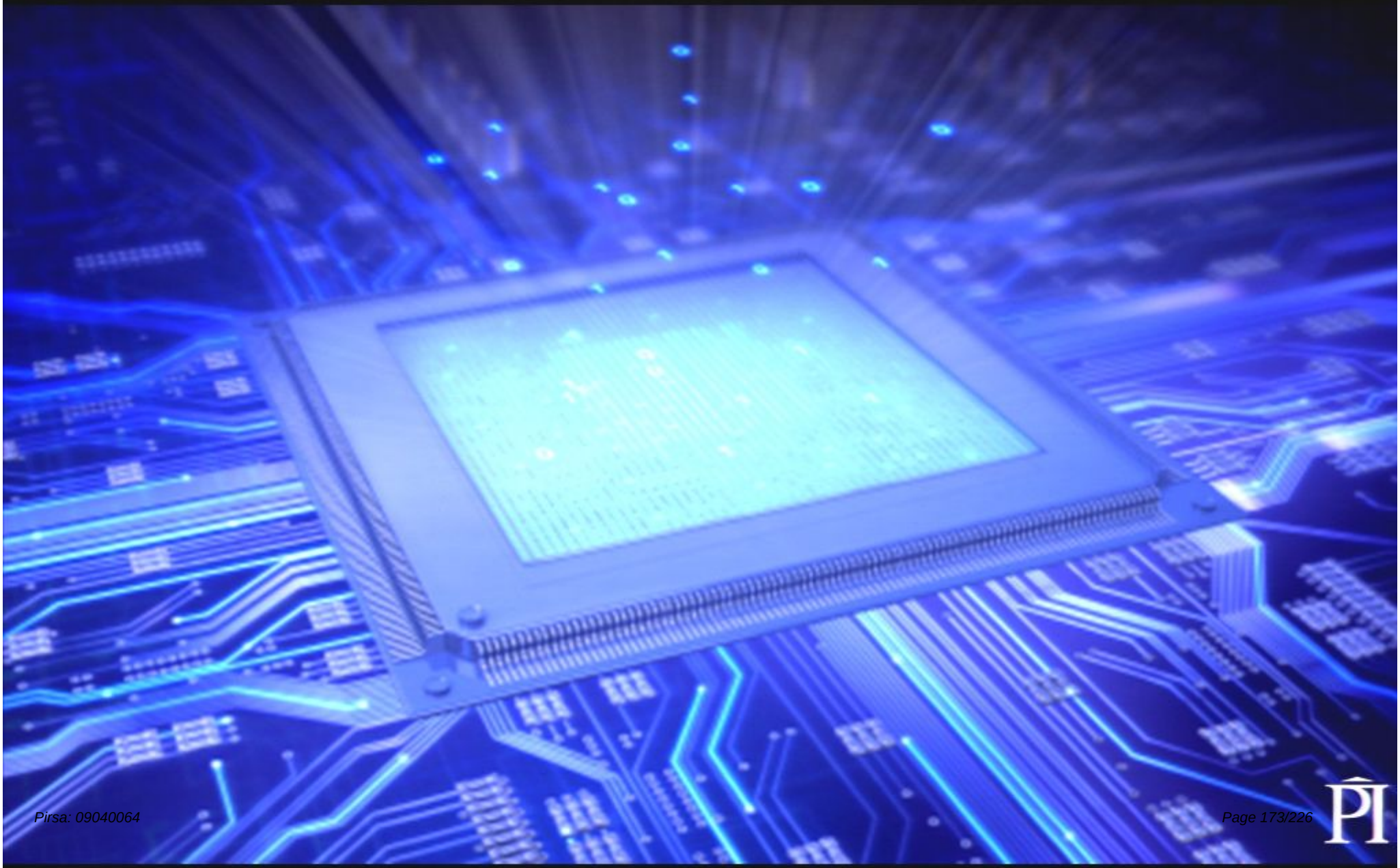
DON'T YOU UNDERSTAND?

UBC PHYSICS

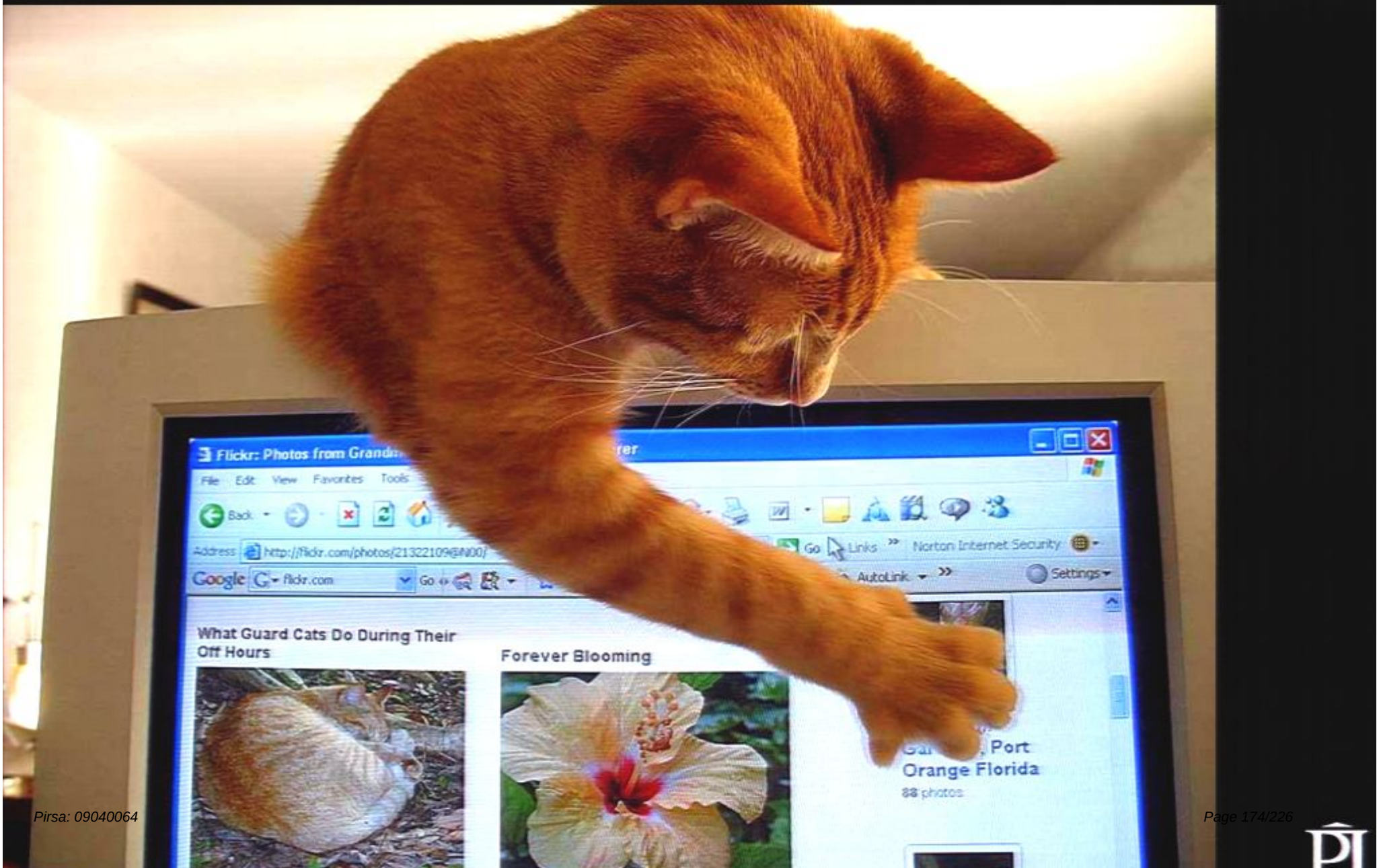
build cool stuff:

build cool stuff:
every electronic device
on the planet

build: electronic devices



build: computers



build: supercomputers

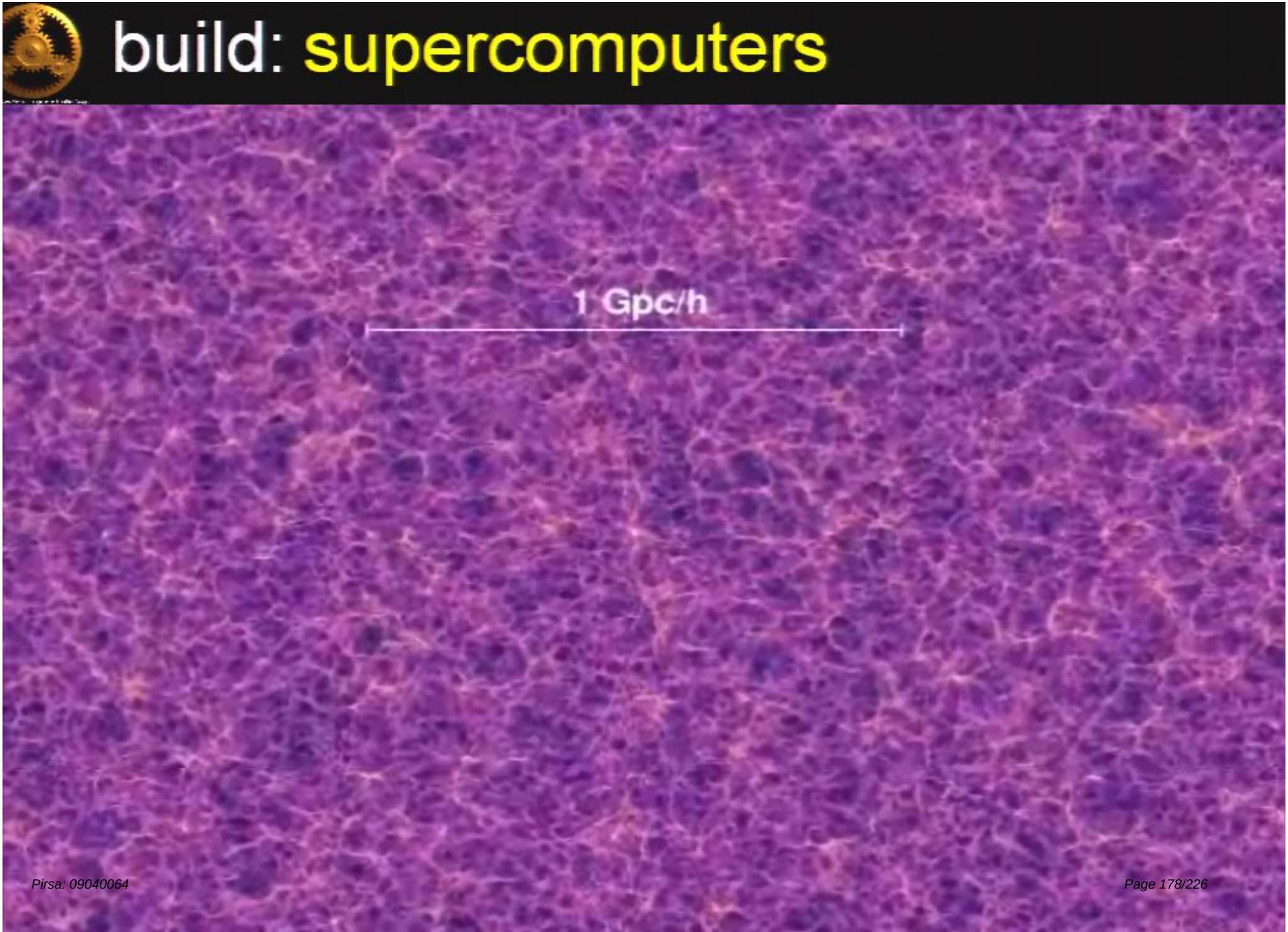
build: supercomputers

Millennium Simulation of the Universe

build: supercomputers

Simulated
Reality

build: supercomputers



build: supercomputers

1 Gpc/h

Millennium Simulation

10.077.696.000 particles

Volker Springel
Max-Planck-Institute
for Astrophysics

build: cell phones

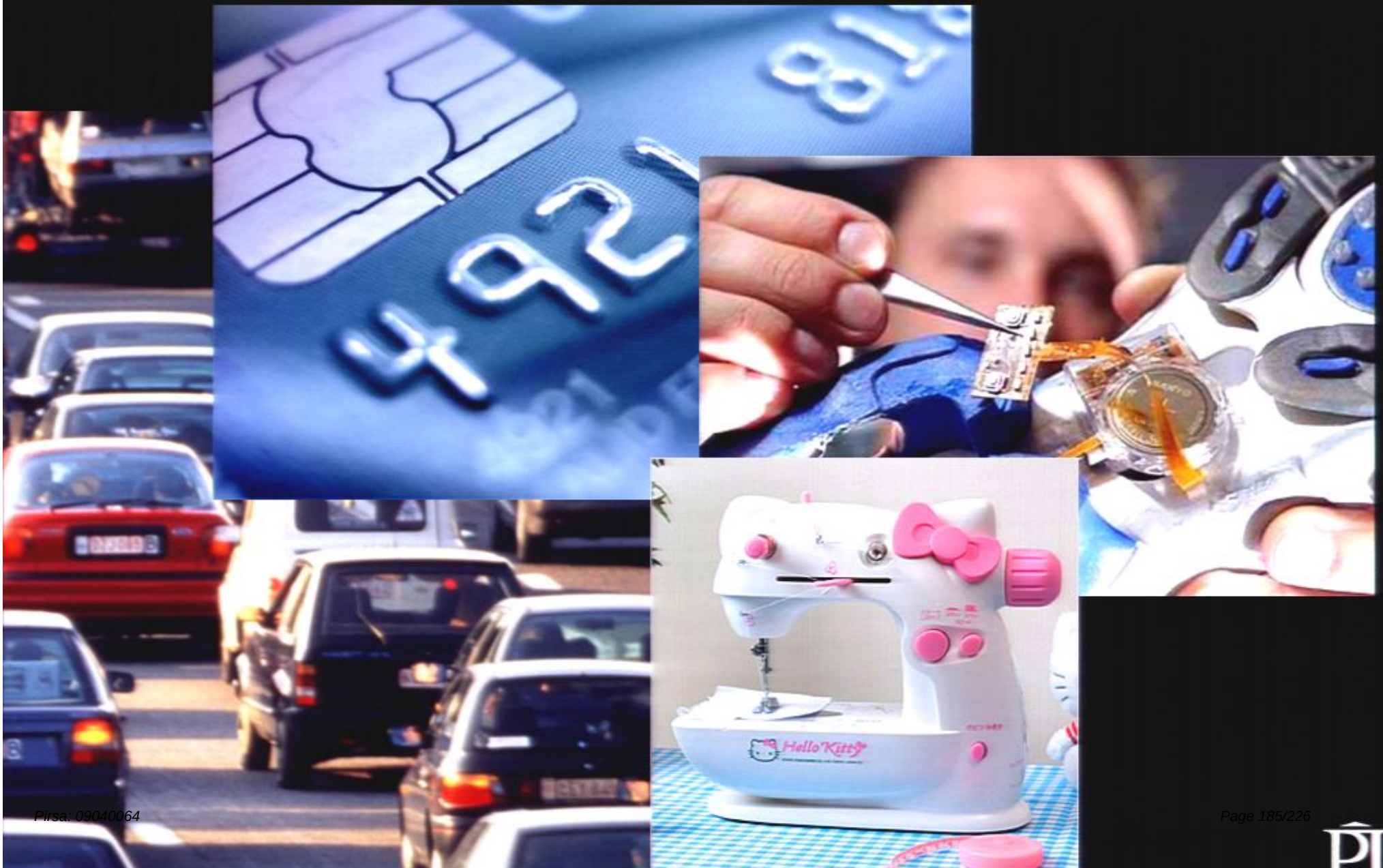
build: cell phones

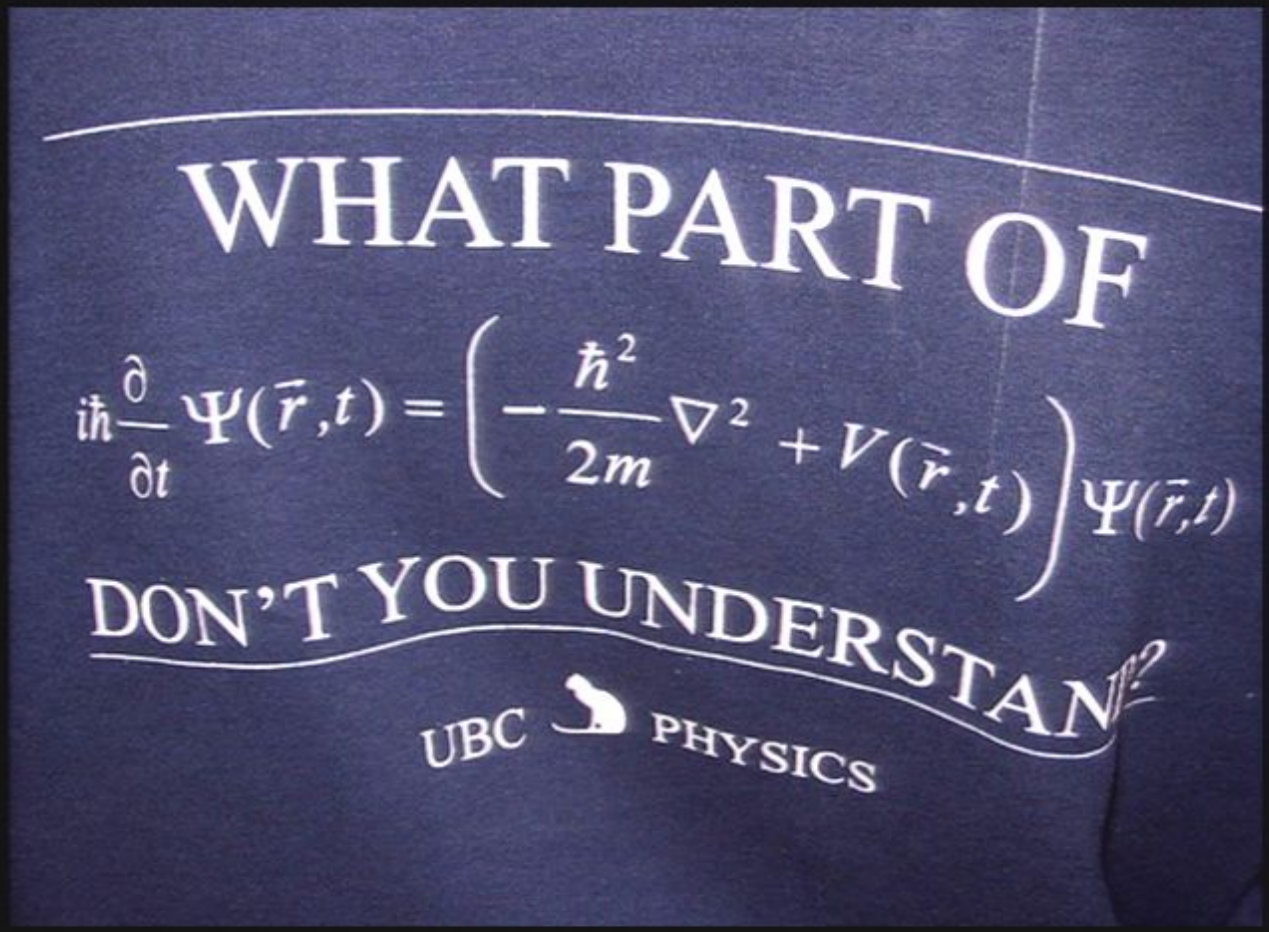
build: electronics everywhere

build: electronics everywhere

build: electronics everywhere

build: electronics everywhere





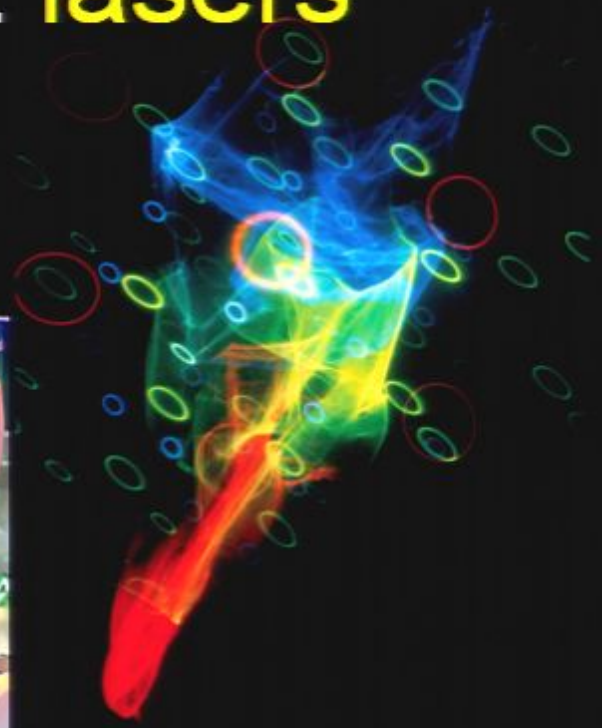
power of ideas

build cool stuff:
lasers

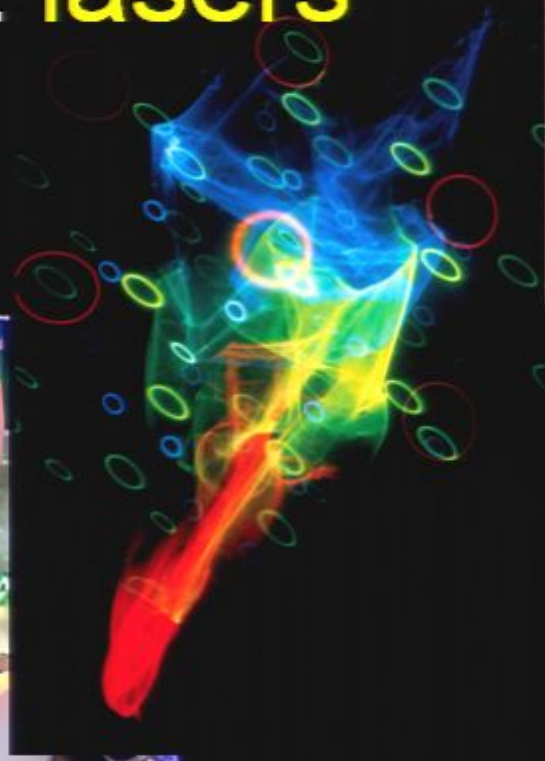
build: lasers

build: lasers

build: lasers

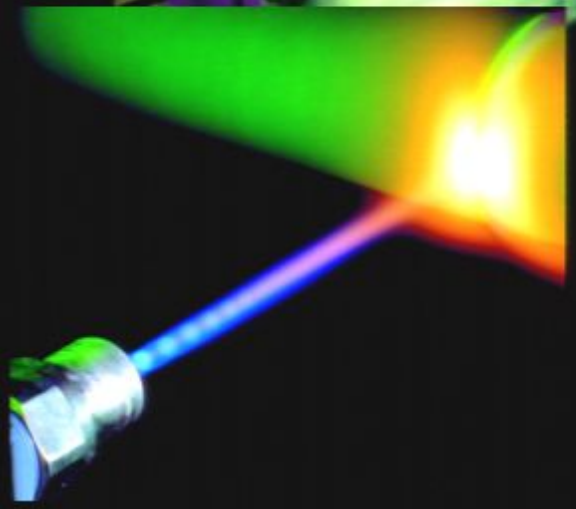


build: lasers

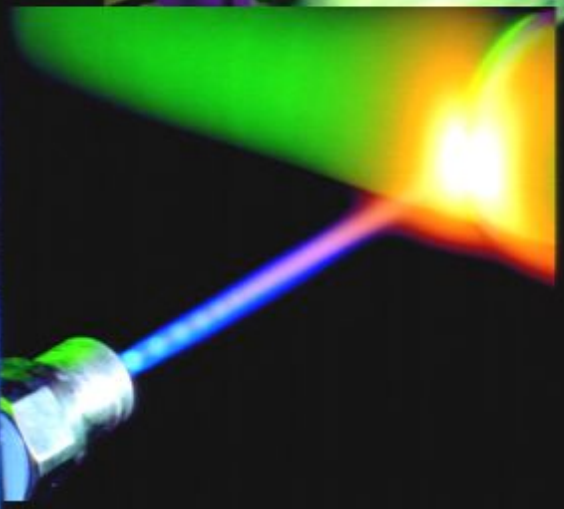


build: lasers

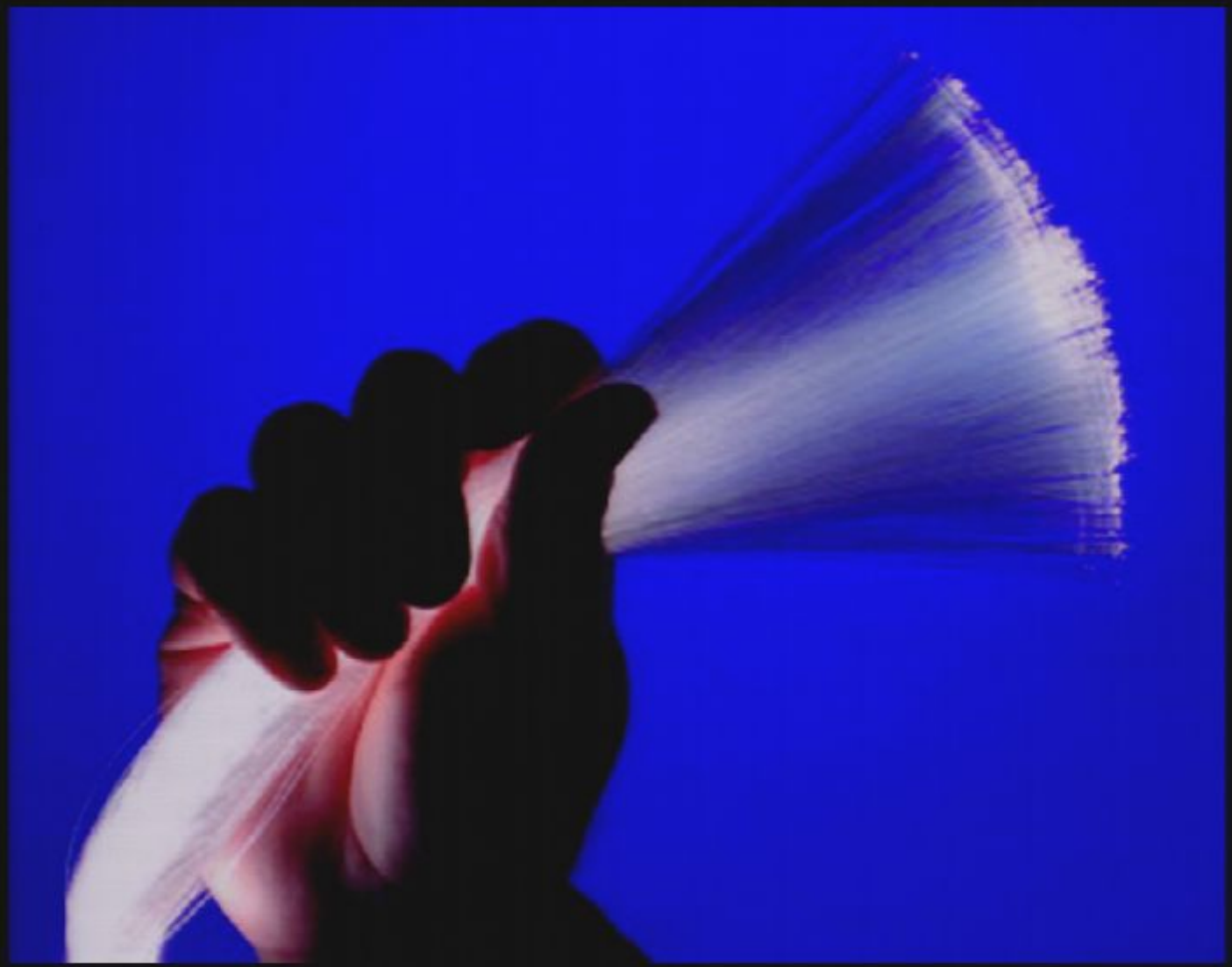
build: lasers



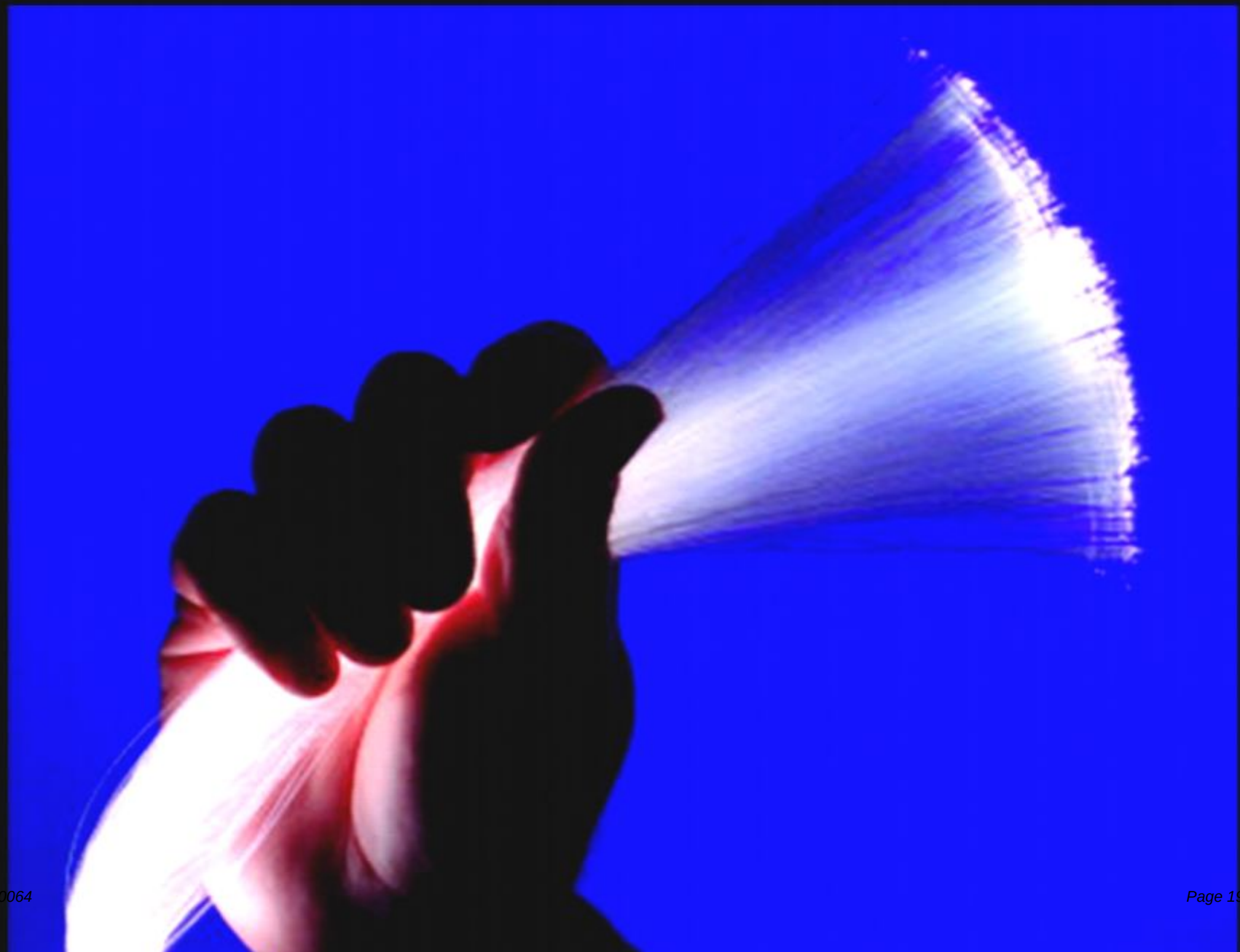
build: lasers



build: lasers



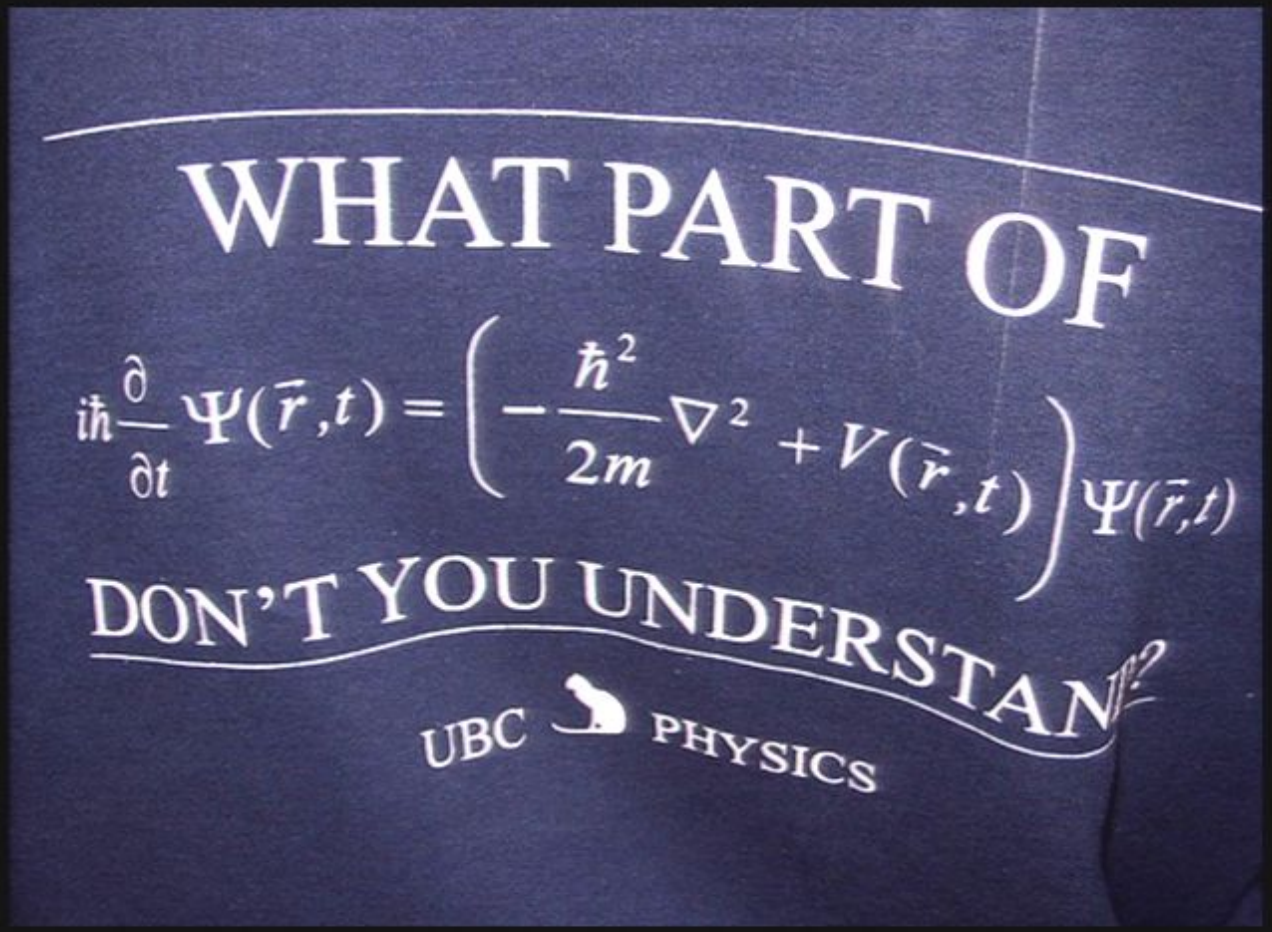
build: lasers



build: lasers

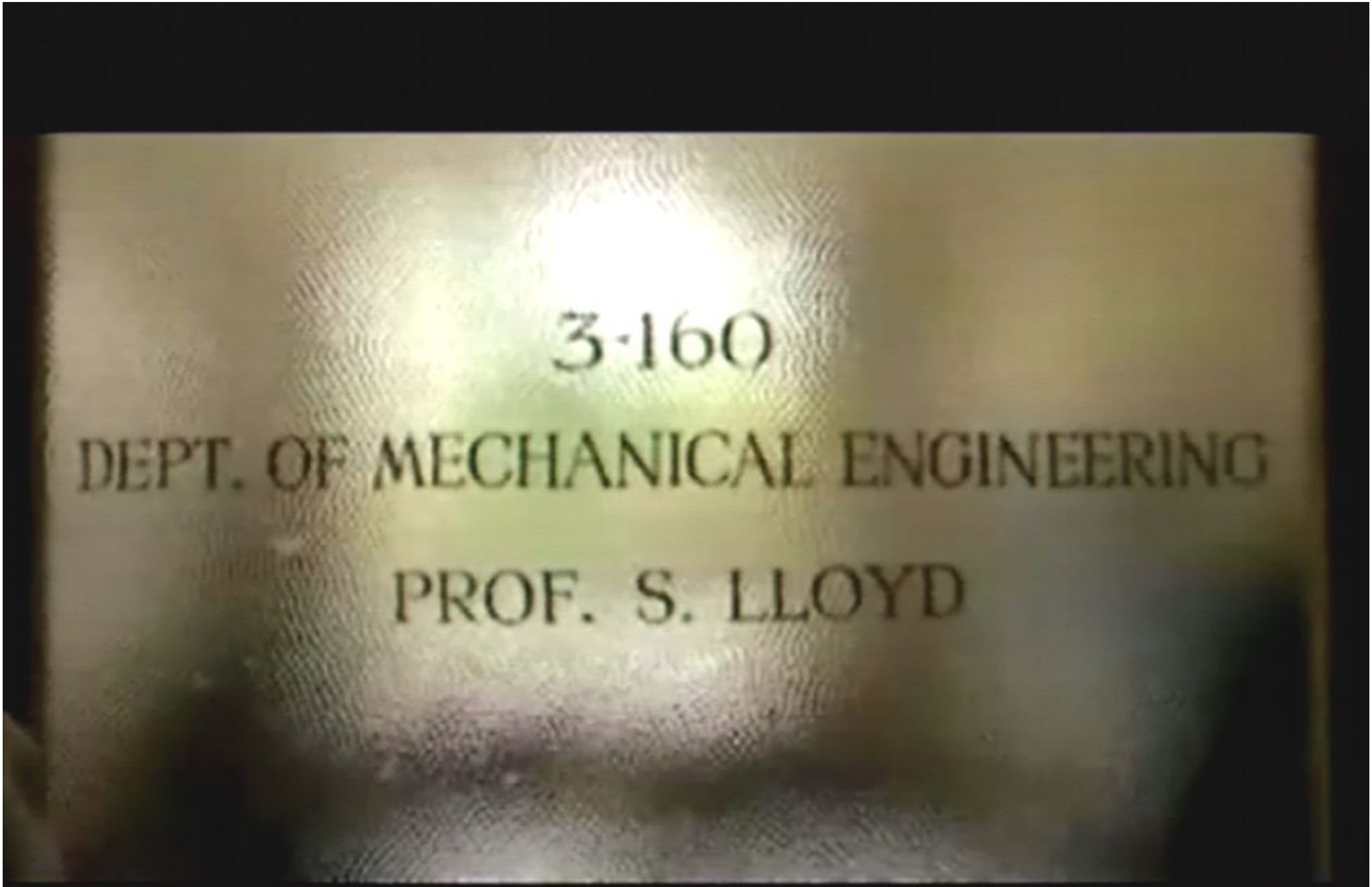
Google™

MAPQUEST.



power of ideas

build: quantum computer


3·160
DEPT. OF MECHANICAL ENGINEERING
PROF. S. LLOYD

power of ideas

power of ideas

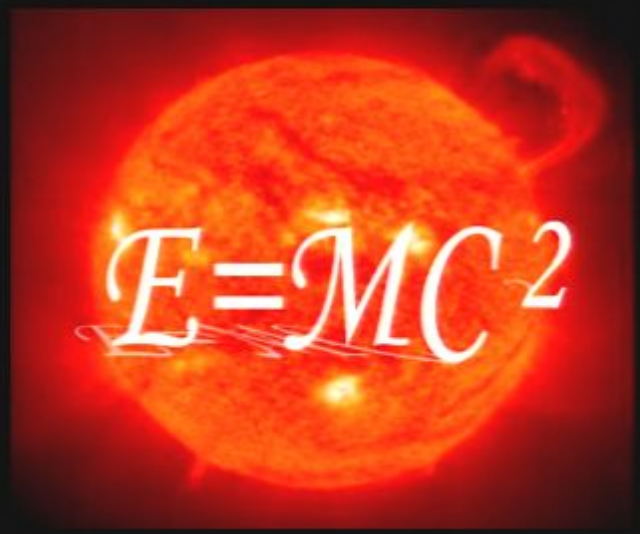
$$\nabla \cdot D = \rho$$

$$\nabla \cdot B = 0$$

$$\nabla \times E = -\frac{\partial B}{\partial t}$$

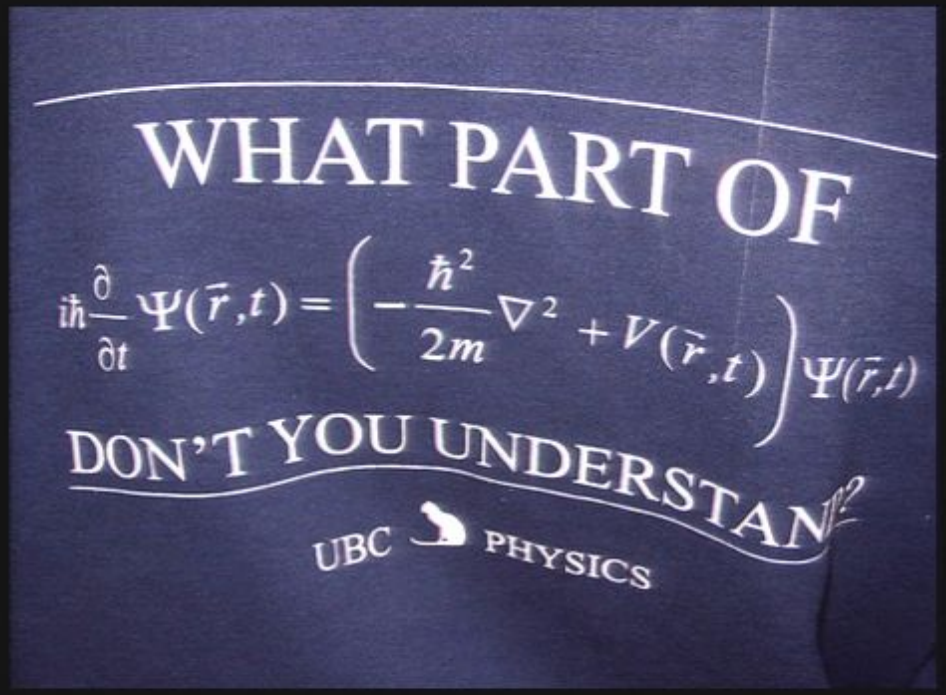
$$\nabla \times H = i + \frac{\partial D}{\partial t}$$

power of ideas



power of ideas

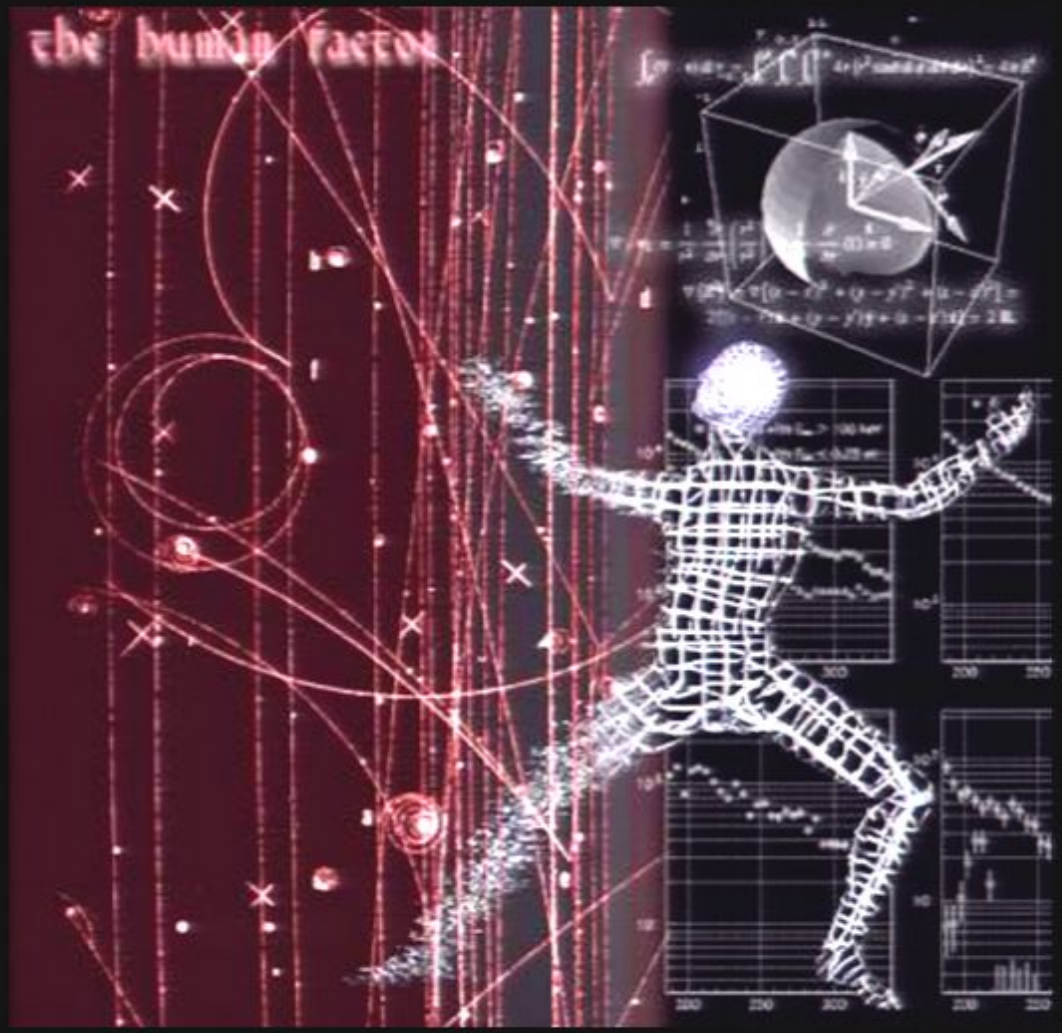
power of ideas



power of ideas

power of ideas

physics of innovation



physics of innovation

Physics of Innovation was created in conjunction with students and teachers across Canada.

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This presentation was made possible by the generous support of Research in Motion.

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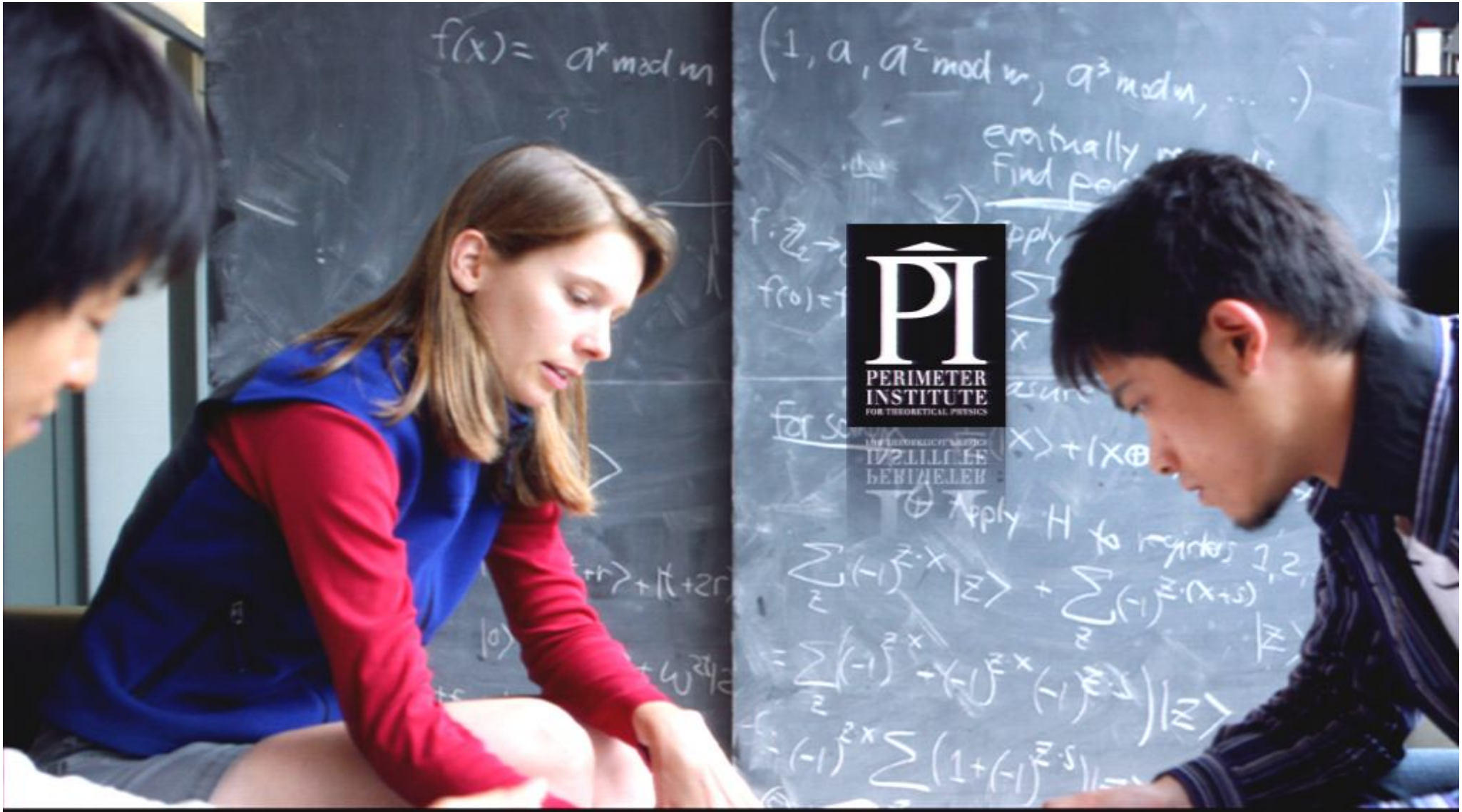
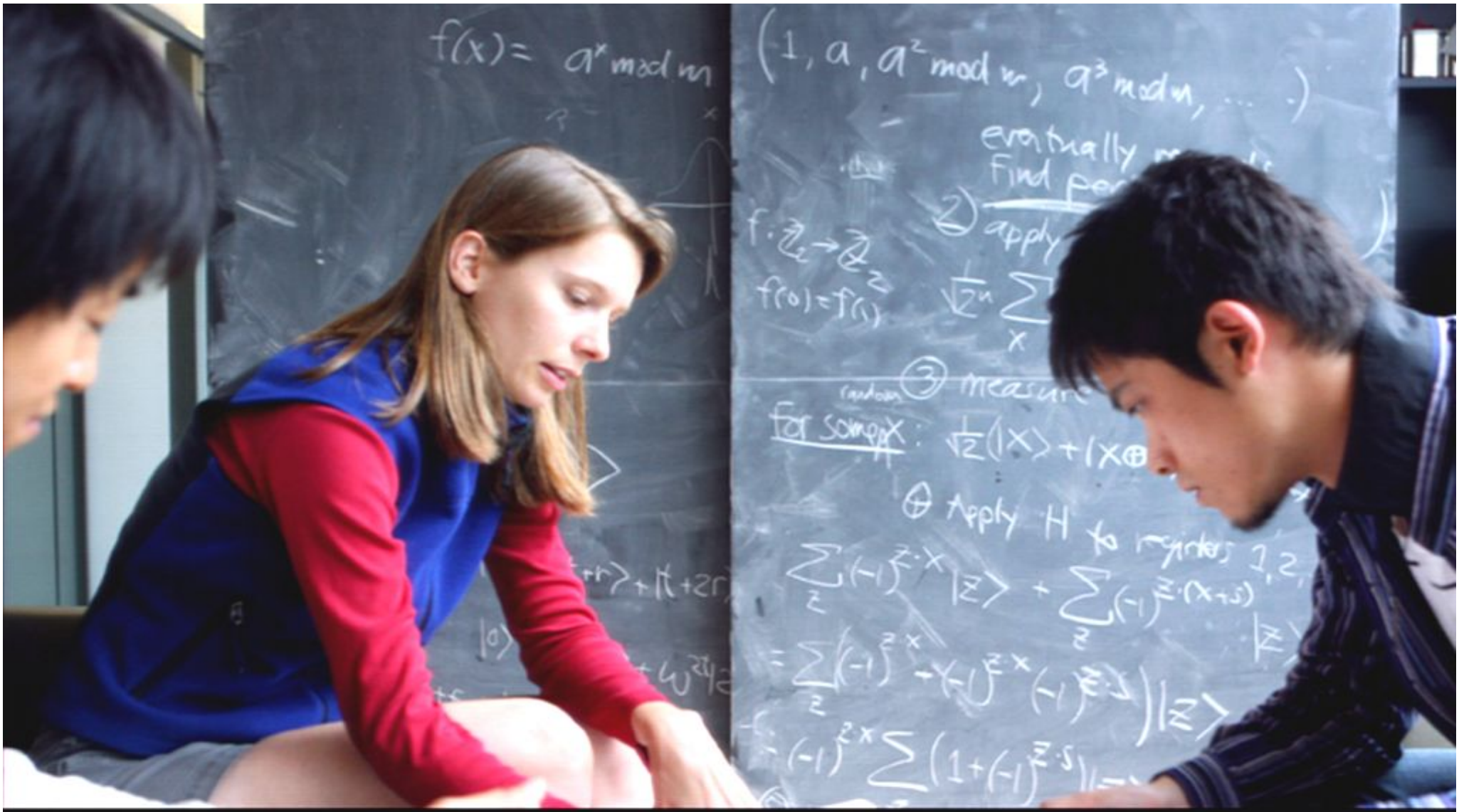
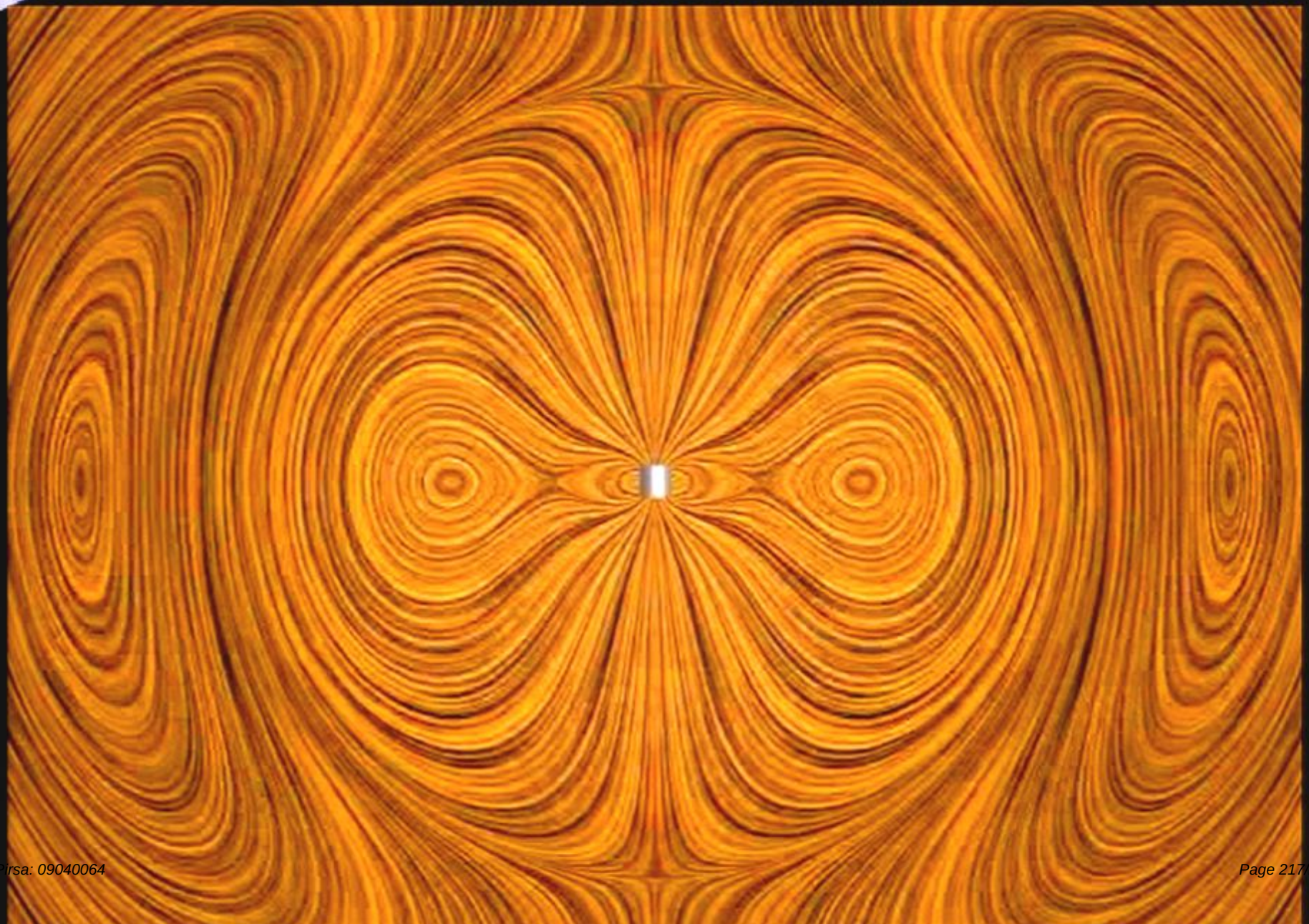
Thank you to Science Superheroes!


PERIMETER
INSTITUTE
FOR THEORETICAL PHYSICS


PERIMETER
INSTITUTE
FOR THEORETICAL PHYSICS



understand: electromagnetism



Discussion:

1. Would you use this presentation in your classroom? How?

2. How could it be improved?

3. What additional resources would make this presentation more useful to you and your students?

Business Education Partnership

OF WATERLOO REGION

COMMUNITECH

Today's Science Superhero

Our thanks to...

Dr. Richard Epp
Outreach Scientific Manager
Perimeter Institute

Business Education Partnership

OF WATERLOO REGION

COMMUNITECH

Science Superheroes

Benefits to educators…

- Learn about STEM industry trends
- Connect curriculum to required STEM skill sets
- Discover new ways to encourage students to explore STEM career opportunities

- Online/DVD Resources available
  - Review material any time
  - Share with students!
  - Present to other educators

www.bus-edpartnership.org

Business Education Partnership OF WATERLOO REGION

COMMUNITECH

Science Superheroes

Program Elements

- Speakers Bureau - STEM related speakers
- Business Visitation - STEM related tours
- Student Conference – celebrating STEM and entrepreneurship

- Lecture Series

Helping Educators Bring Curriculum to Life

A series aimed at STEM teachers where real-life local technology leaders share their insights about where technology is heading, how to connect curriculum to required skills and create excitement about STEM career opportunities.

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Business Education Partnership

OF WATERLOO REGION

COMMUNITECH

About the Business & Education Partnership of Waterloo Region

Speakers Bureau
Business Visitation
Science Superheroes
First Time, Full Time - School to Work Conference
Leading Edge Youth Entrepreneurship Conference

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Business Education Partnership

OF WATERLOO REGION

COMMUNITECH

Science Superheroes

Lecture Series –Next Date

May 27, 2009 - **BlackBerry Workshop (RIM)**

- Brief history of telecommunications up to wireless technology including an introduction to radio waves as signals and how BlackBerry uses them
- Complete a scavenger hunt on the BlackBerry
- Dissection of a BlackBerry (and put it back together)
- Discussion re: future of computing technology
- ** workshop will highlight curriculum connections **

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Business Education Partnership

OF WATERLOO REGION

COMMUNITECH

Science Superheroes

Lecture Series –Future Date

November 18, 2009

Opportunities for Ag/Bio: Food, Health & the Bio Economy

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With thanks to our Science Superheroes Partners

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Business Education Partnership

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Contact the Business & Education Partnership of Waterloo Region today!

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Email: info@bus-edpartnership.org

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Speakers Bureau/
Business Visitation - Julie Dreisinger x27

School Board Liaison/
Partnership Opportunities - Avvey Peters x25

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