STORING ENERGY IN TURBULENT EDDIES

COMPRESSING TURBULENCE TO IMPROVE INERTIAL CONFINEMENT FUSION EXPERIMENTS

March 15, 2016

Article describes possible new paradigm for inertial confinement fusion experiments. Full Story

Source
DOE/Princeton Plasma Physics Laboratory

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PRL 116, 105004 (2016) PHYSICAL REVIEW LETTERS

Sudden Viscous Dissipation of Compressing Turbulence

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Compression of turbulent plasma can amplify the turbulent kinetic energy, if the compression is fast compared to the viscous dissipation time of the turbulent eddies. A sudden viscous dissipation mechanism is demonstrated, whereby this amplified turbulent kinetic energy is rapidly converted into thermal energy, suggesting a new paradigm for fast ignition inertial fusion.

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Curiosity-Driven Research: an Unsolved Problem in Plasma Physics

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Solved and Unsolved Problems in Plasma Physics
A symposium in honor of Nathaniel J. Fisch
March 29, 2016
Prequel: Another Unsolved Problem

8.5%
Female fraction of the APS Division of Plasma Physics membership as of January 2016:

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8.5% is the lowest of any APS Unit

Prequel: Another Unsolved Problem
“...does science, or knowledge, really need a justification? It is hard to imagine that any man or woman since the dawn of intelligent life has not gazed out at the sky on a moonless night, wondering how it came to be and what is our place in this vast and wondrous firmament. And each time science has advanced our understanding of those countless dots of light, it has uncovered more mysteries, more questions. **The curiosity of our species knows no bounds**; more remarkably, neither does our capacity for satisfying it. **And that is truly wonderful in itself, even if it doesn’t lead to a better toaster.**"
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By NYT Editorial Board [Feb 16, 2016] commenting on the press coverage of LIGO detection of gravitational waves
“Recently, news broke of the discovery of gravitational waves, as first predicted by Albert Einstein. The National Science Foundation’s support for the LIGO project that led this effort is a perfect example of pursuing breakthrough science that is in the national interest...”
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NYT, To the Editor [Feb 25, 2016]
LAMAR SMITH
Chairman, House Committee on Science, Space and Technology
Patents as Proxies for Innovation, 2000-2013
Battelle (March, 2015)

Patents

$ 100 M
of R&D
funding

Mean Citations / Patent

0 5 10 15

DOD
DOE
NIH
NSF
NASA

USDA
VA
DHS
EPA
DOT
NIST

Size of circle shows number of patents
Curiosity-Driven Research

Patents as Proxies for Innovation, 2000-2013
Battelle (March, 2015)

- Patents
- $100 M of R&D funding

Mean Citations / Patent

Size of circle shows number of patents
What is Curiosity-Driven Plasma Physics?
Plasma Physics is a study of matter and physical systems whose intrinsic properties are governed by collective interactions of large ensembles of free charged particles.

Such physical systems are thought to encompass 99.9% of the visible Universe, where the collective behavior in plasmas leads to phenomena as varied as magnetization from cosmic to planetary scales, particle energization throughout the Universe, and light shows from extragalactic gamma ray bursts to aurorae here on Earth.

Statistical mechanics of ultracold quantum plasmas, wave-particle interactions in ultra-intense electro-magnetic fields, and dusty plasma crystallization are just a few of the topics of current interest that exemplify the breadth of Plasma Physics.

with input from many members of plasma physics community
Plasma Physics has applications to Space Physics and Astrophysics, Materials Science, Fusion Science, Accelerator Science, Medicine, and many branches of Engineering.

Many fundamental results in Plasma Physics have been inspired by these disciplines.
Final Thought

Plasma Science

= Plasma Physics + Applications

where:

Plasma Physics is a study of matter and physical systems whose intrinsic properties are governed by collective interactions of large ensembles of free charged particles. 99.9% of the visible Universe is thought to consist of plasmas. The underlying physics of the collective behavior in plasmas has applications to space physics and astrophysics, materials science, fusion science, accelerator science, medicine, and many branches of engineering.

The next Plasma Science Decadal Survey is soon to be initiated. Per above, it should address plasma physics and the full set of its applications, and involve representatives of all the stakeholder communities.