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OIST/ 2015.3.19

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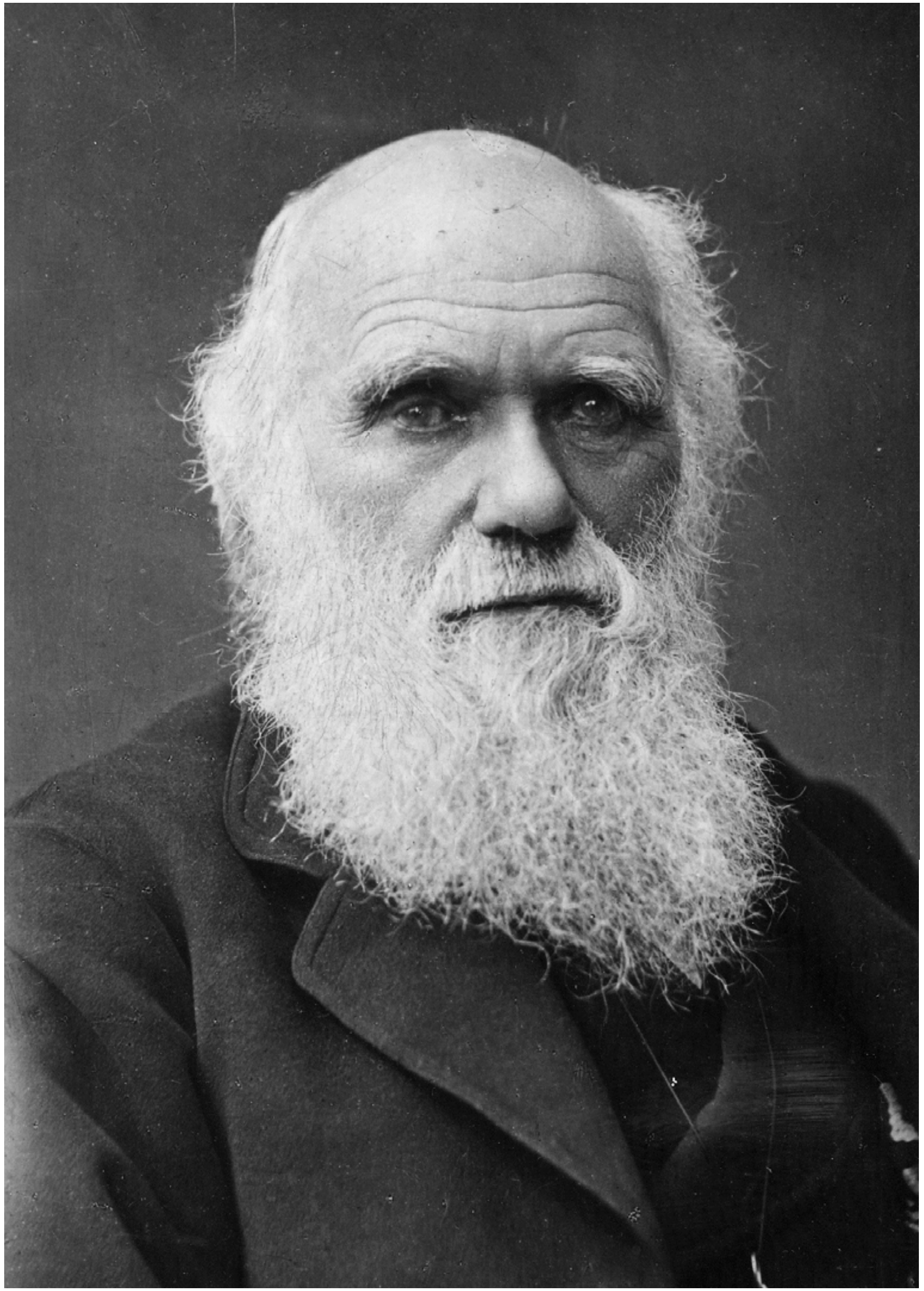

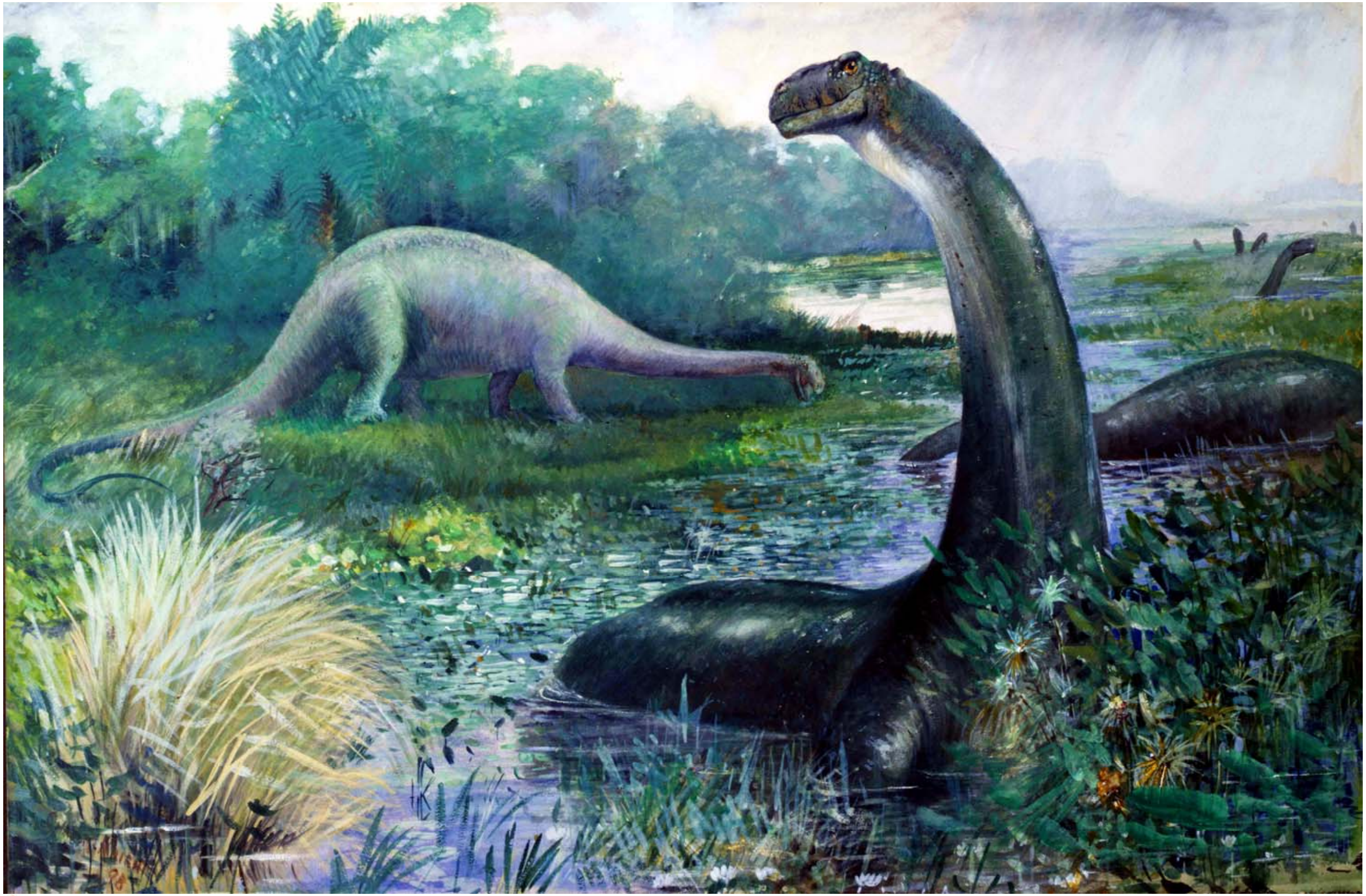

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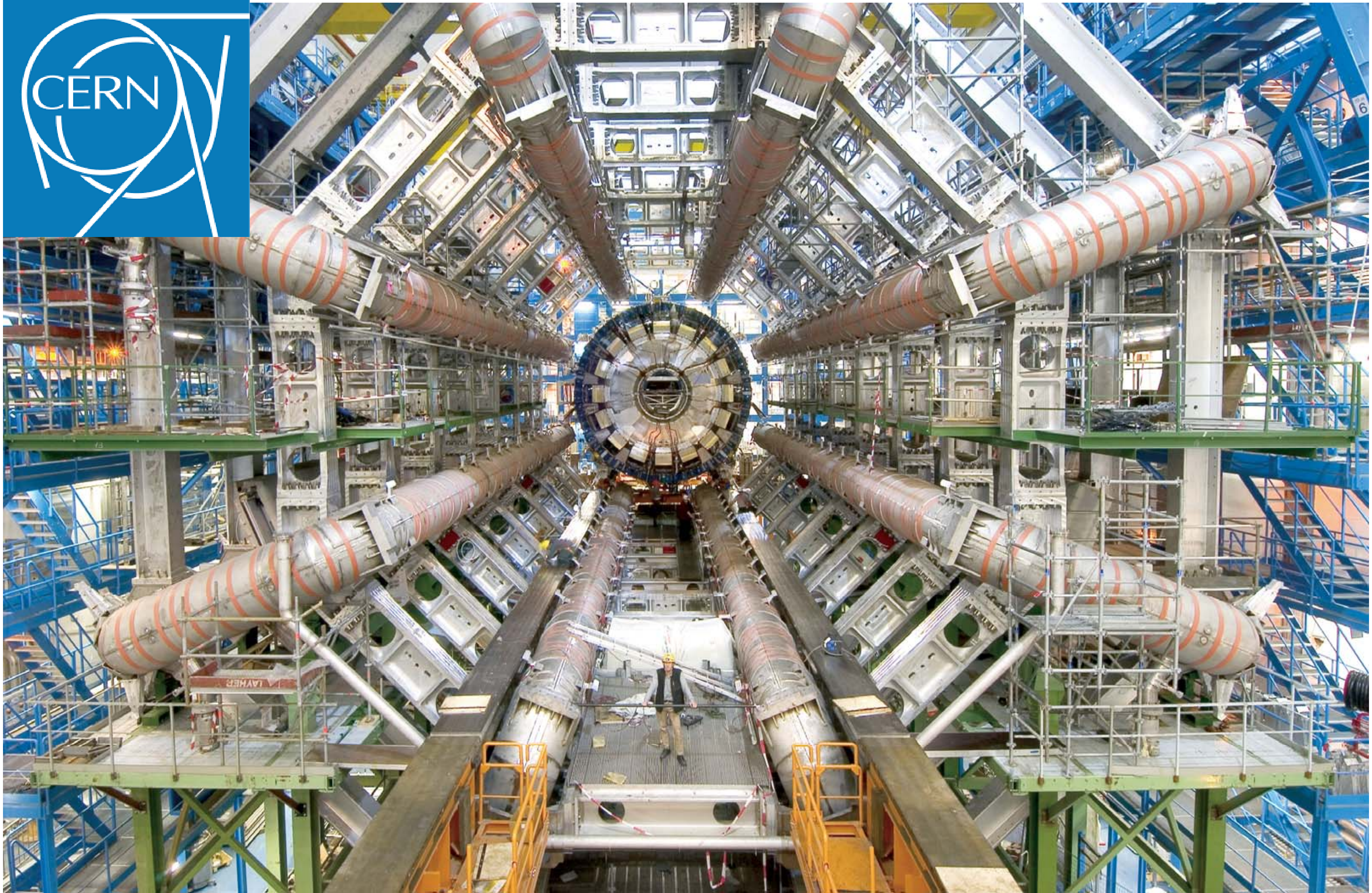


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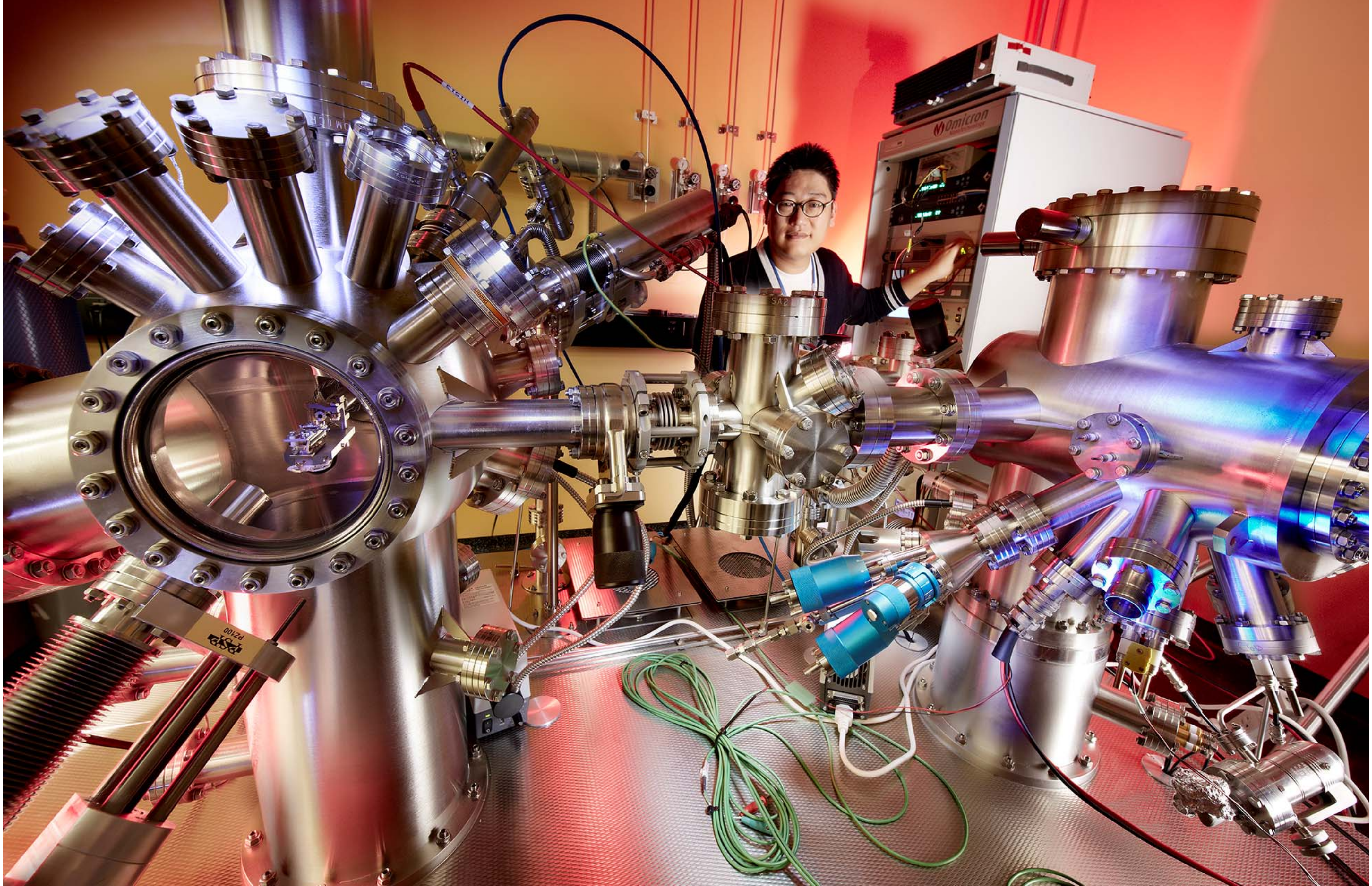

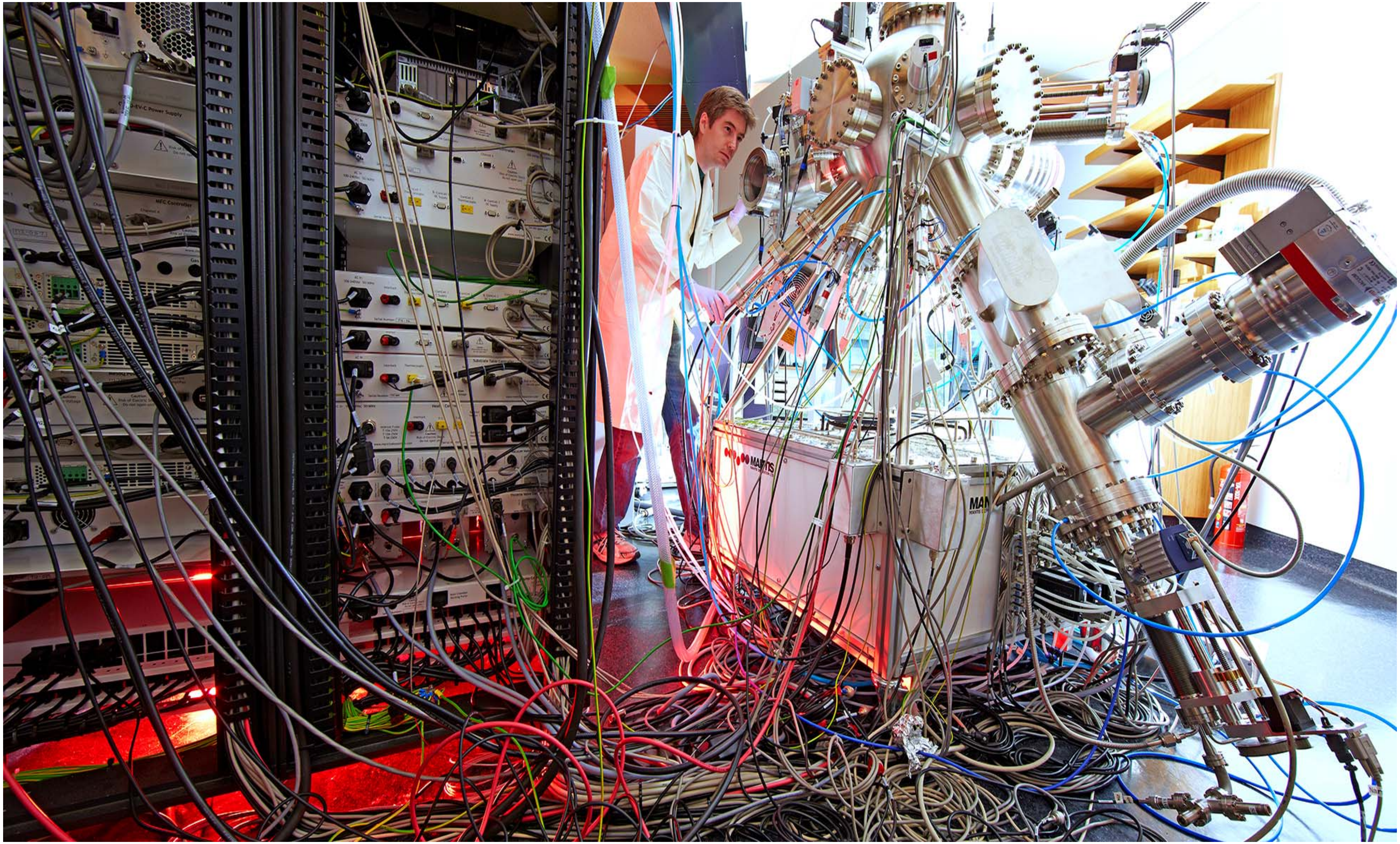

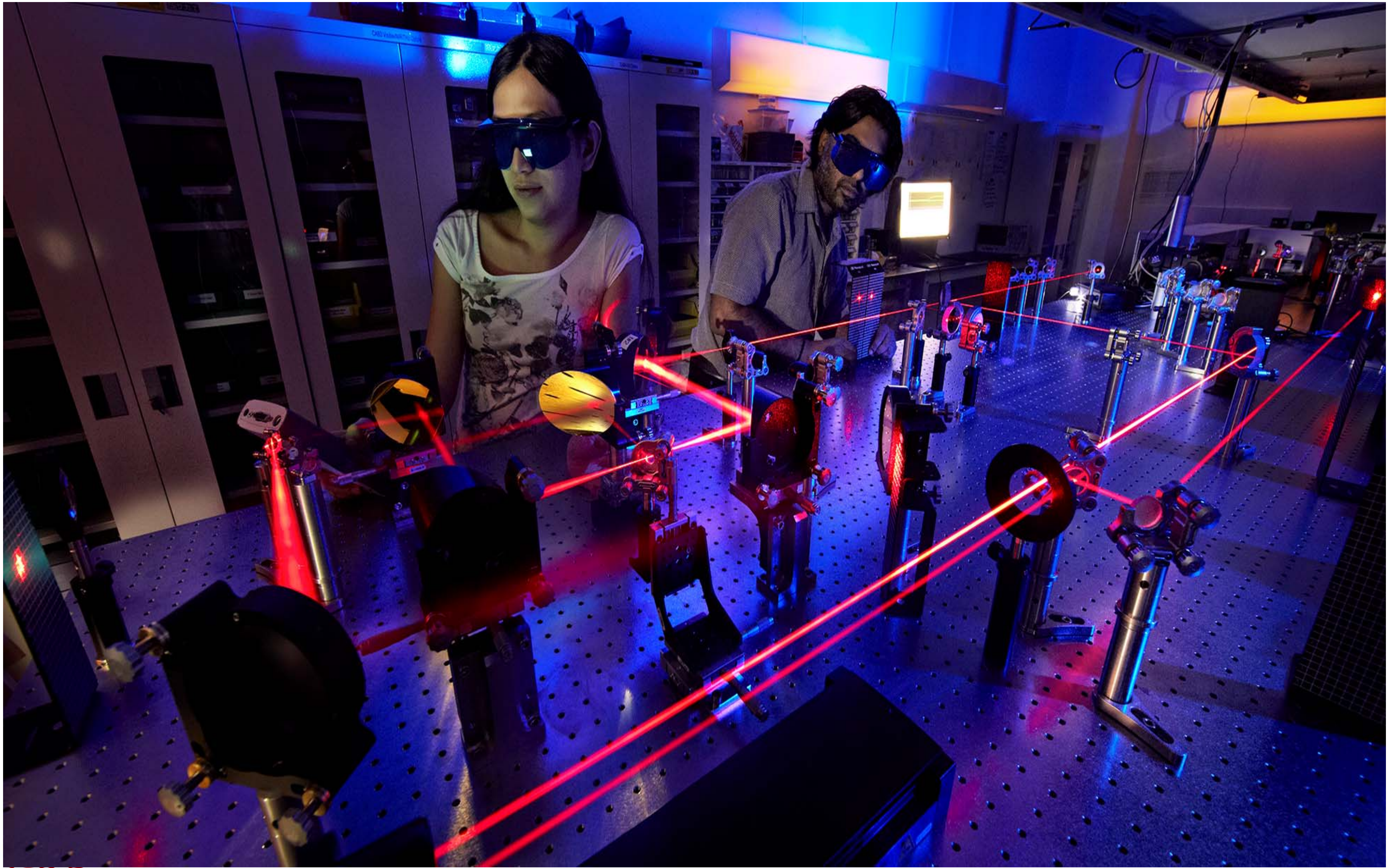


CHANGE!
Gender Equality Task Force
OIST

Research Collaboration 【29 Countries／156 institutions】

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- Townsville City : James Cook University
- Clayton : Monash University
- Melbourne : Swinburne University of Technology
- Victoria : Museum Victoria

Belgium
- Antwerp : University of Antwerp

Brazil
- Sao Paulo : Children's Institute, Hospital das Clinicas
- Rio de Janeiro : D'Or Institute for Research and Education
  University of State of Rio de Janeiro

Canada
- Montréal : McGill University
- Ottawa : University of Ottawa
- Trotto : University of Toronto
- Waterloo : University of Waterloo

China
- Dongguan : Dongguan LITEWELL Technology Incorporation

- Paris : Ecole Normale Superieure
  Institut de Biologie Physico-Chimique
  Pasteur Institute
  Université Paris Diderot, Paris 7
  University Pierre and Marie Curie
- Lyon : Ecole Normale Superieure de Lyon
- Grenoble cedex : Institute Neel
- Grenoble : Institute of Laue-Langevin
- Marseille : Institute of Structural Biology and Microbiology
- Bordeaux : University of Bordeaux
- Lausanne : University of Lausanne
- Parice : University of Paris IV

Germany
- Frankfurt am Main : Goethe University
- Dresden : MPI-PKS Dresden
- Jülich : Peter Grünberg Institute, Research Centre Jülich
- Berlin : Technische Universität Berlin
- Munich : Technische Universität München
- Saarbrücken : Universitaet des Saarlandes

Japan
- Akita : Akita University
- Fukui : University of Fukui
- Fukuoka : Kyushu University
- Fukushima : Fukushima Medical University
- Hikone : Shiga University
- Hiroshima : Hiroshima University
- Kitakyushu : Kyushu Institute of Technolog
- Kurume : Kurume University
- Kobe : Kobe University
- Kyoto : ATR Computational Neuroscience Laboratories
  Doshisha University
  Kyoto Prefectural University
  Kyoto University
  Rikkyo University
  Ritsumeikan University
- Mishima : National Institute of Genetics
- Matsumoto : Shinshu University
- Nagasaki : AVSS (Anti Viral Screening System)(Company)

- Tokyo : Astellas Foundation for Research on Metabolic Disorders
  Institute for Medical Sciences University of Tokyo
  Japanese Foundation for Cancer Research
  Meiji Seika Pharma
  Meiji University
  National Institute of Informatics
  Research Institute for Solid State Physics
  Rigaku (Company)
  Systems Biology Institute
  Tamagawa University
  Tokyo University
  University of Tokyo
- Tsukuba : University of Tsuku
  University of Tsukuba
- Wako : Honda Research Institute Japan Co., Ltd
  RIKEN
- Yamagata : Yamagata University
- Yokohama : Yokohama National University
- Yokosuka : Japan Agency for Marine-Earth Science and Technology

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  University of Lisbon

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- Barcelona : Autonomous University of Barcelona
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- Providence : Brown University, School of Engineering
- San Francisco : California Academy of Sciences
- Los Alamos : Center for Integrated Nanotechnologies
- Ithaca : Cornell University
- Cambridge : Harvard University
- Gambier : Kenyon College
- Los Alamos : Los Alamos National Laboratory
- Mountain View : NASA Ames Research Center
- Boston : Northeastern University
- Princeton : Princeton University
- Houston : Rice University
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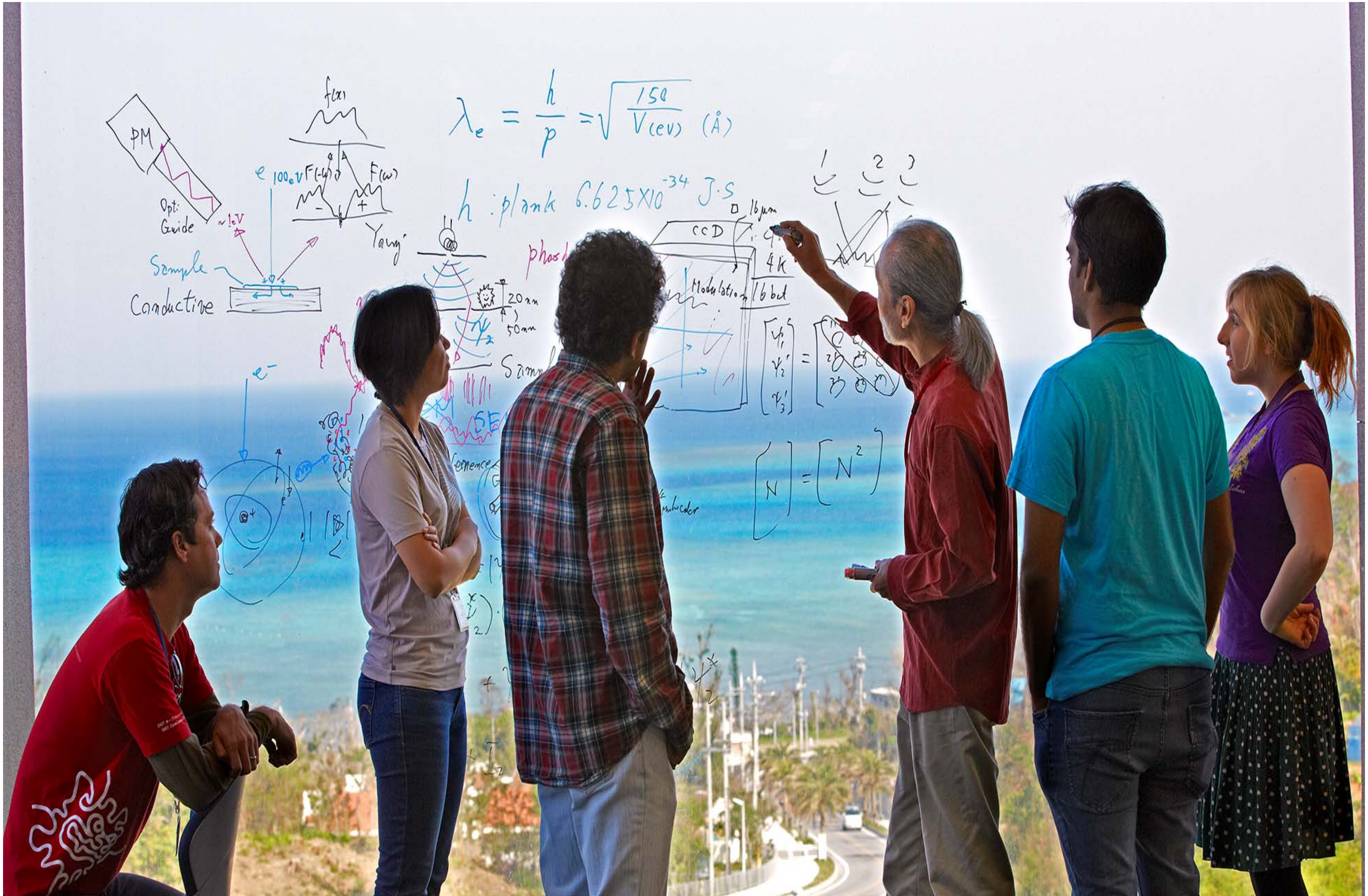
- Boulder : University of Colorado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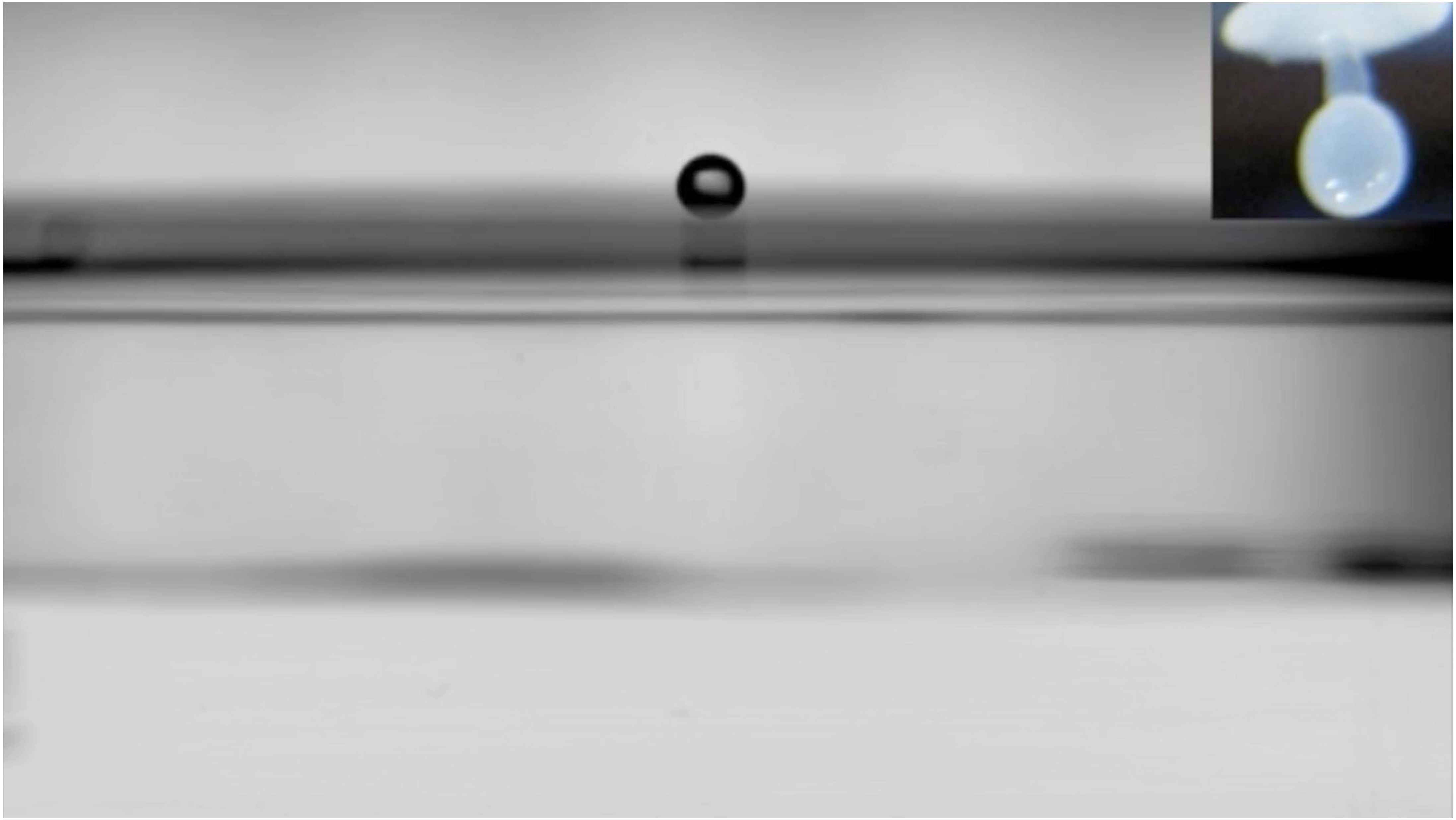


Light as Puppeteer

18 Mar 2015

Researchers at the Okinawa Institute of Science and Technology Graduate University (OIST) have demonstrated a more robust method for controlling single, micron-sized particles with light.

Passing light along optical microfibers or nanofibers to manipulate particles has gained popularity in the past decade and has an array of promising applications in physics and biology. Most research has focused on using this technique with the basic profile of light, known as the fundamental mode. Researchers in the OIST Light-Matter Interactions Unit successfully demonstrated that changing the profile of the light distribution into "higher order modes" provides a stronger optical force that can be used to trap and propel tiny polystyrene beads along a microfiber much faster than if they use the fundamental mode. Their findings were recently published in *Scientific Reports*.

"While it was theoretically proposed that higher order modes would produce stronger forces, this is the first time, to our knowledge, that three-dimensional particle manipulation has been experimentally demonstrated," said Dr. Viet Giang Truong, a physicist at OIST and paper co-author.

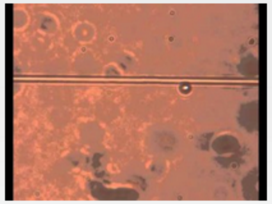
Light can take different shapes. Usually, in the fundamental mode, the energy is most intense at the center and gradually fades towards the edge of the beam. Any other light shape is called a higher order mode. For example, the energy pattern can look like a doughnut, with most of the energy contained in a ring, and none in the hole or middle. Scientists can create higher order modes by shining light through crystals.

To control particles with optical microfibers submerged in water, scientists guide a laser beam through the fiber. The fiber itself starts with a well-defined diameter at each end, but narrows dramatically in the middle "waist" region. As the light travels through the fiber, it cannot fit inside the extremely thin waist, so it spreads out creating an evanescent field around the fiber. This light field can trap particles close to the fiber surface, allowing scientists to control their position and movement. The light propels the particle in the direction the light is moving.

OIST researchers compared how particles react to light in the fundamental mode versus higher order modes, which create larger evanescent fields. They observed that when higher order modes were used, the particles moved up to eight times faster along the microfiber.

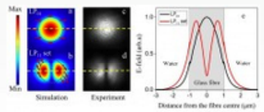
An increase in speed was expected. Part of the increase is likely due to microfluidic dynamics, explained Aili Maimaiti, lead paper author, and a PhD student from University College Cork, Ireland who is conducting his doctoral research at OIST under the supervision of Prof. Síle Nic Chormaic. As the particle picks up speed, it lifts slightly away from the fiber, reducing drag and allowing it to move even faster.

Related Video(s):

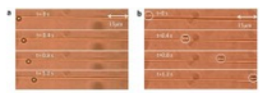


Higher Order Mode Video

Related Photo(s):



Left: The shape of light in the fundamental mode (top) versus a higher order mode (bottom) is shown as a diagram (color, left) and in the experiment (black and white, right).



A three micron polystyrene particle (white dot or circle) is propelled along a microfiber by light in the fundamental mode (left) and a higher order mode (right).

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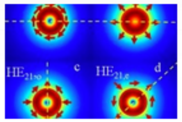

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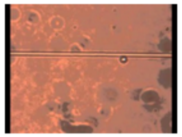

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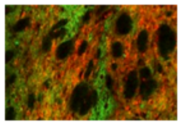

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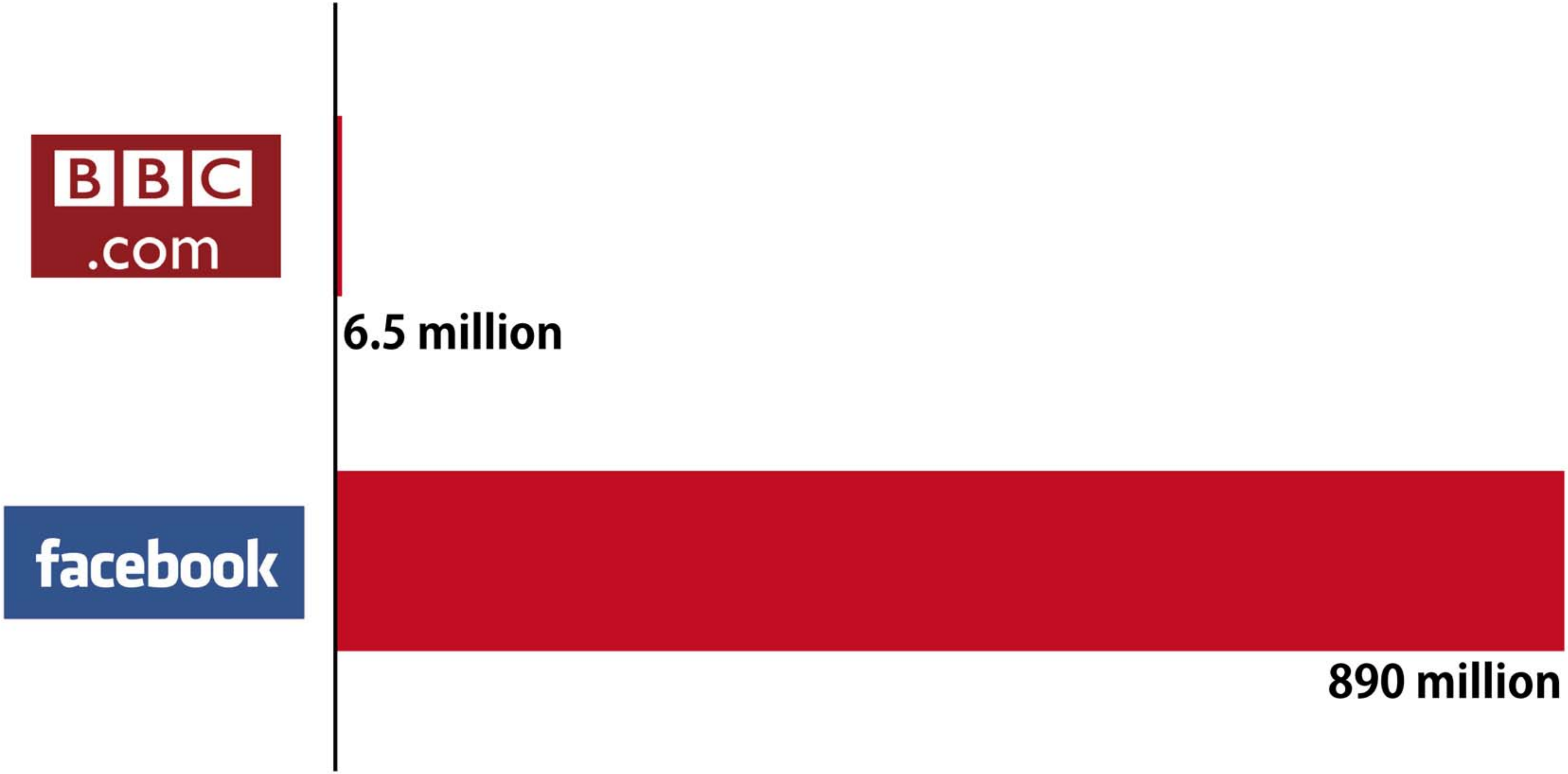
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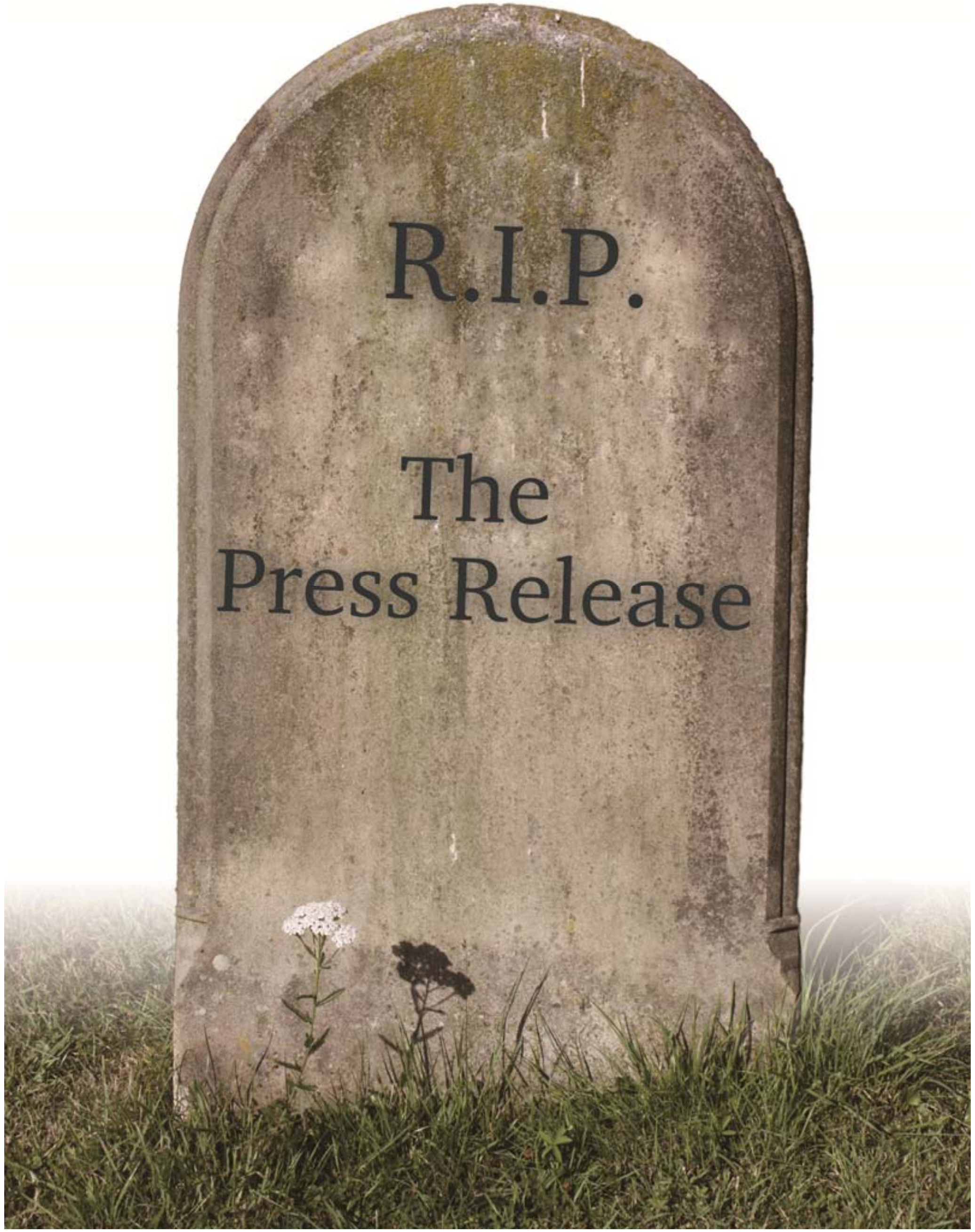
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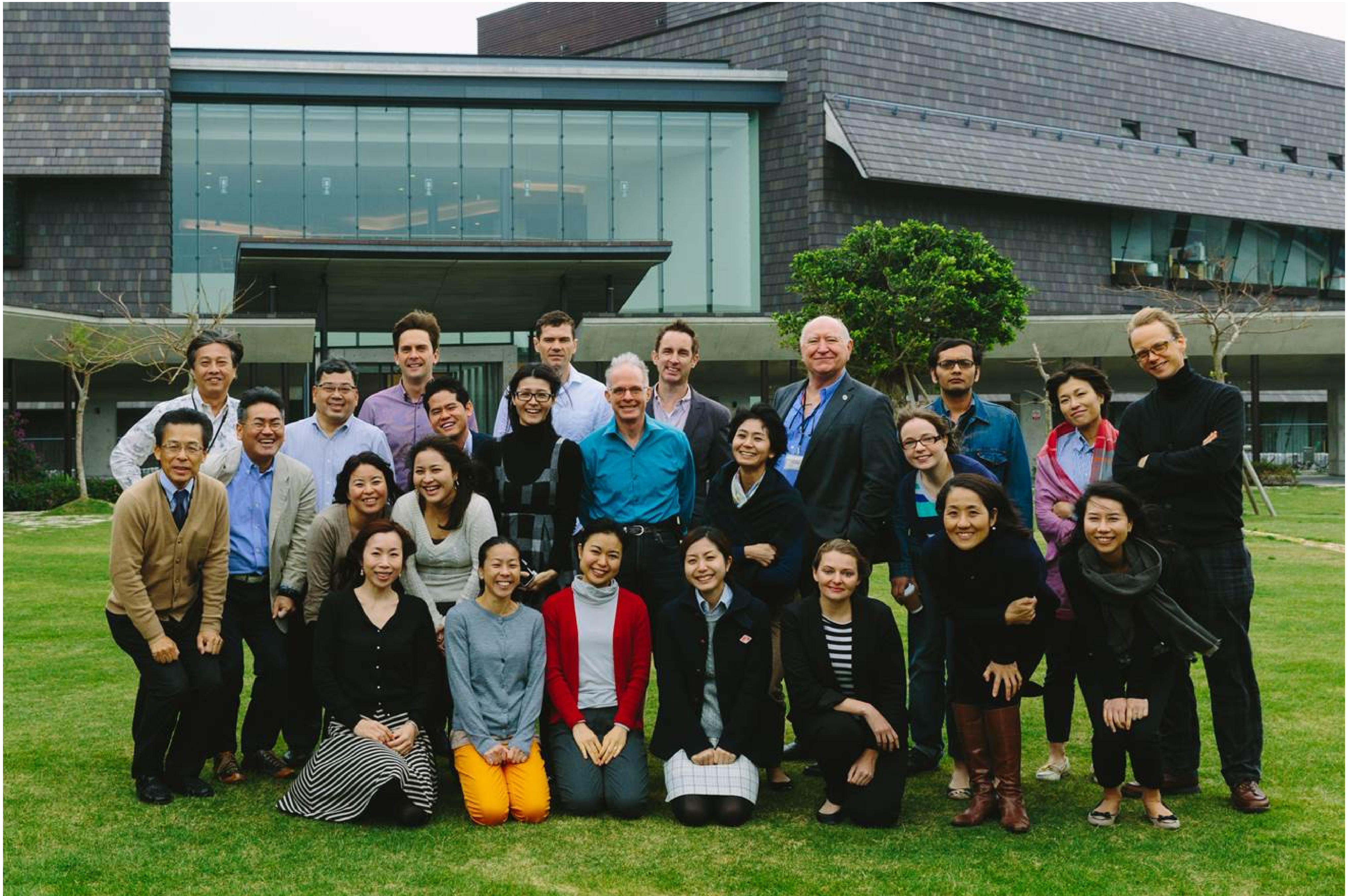

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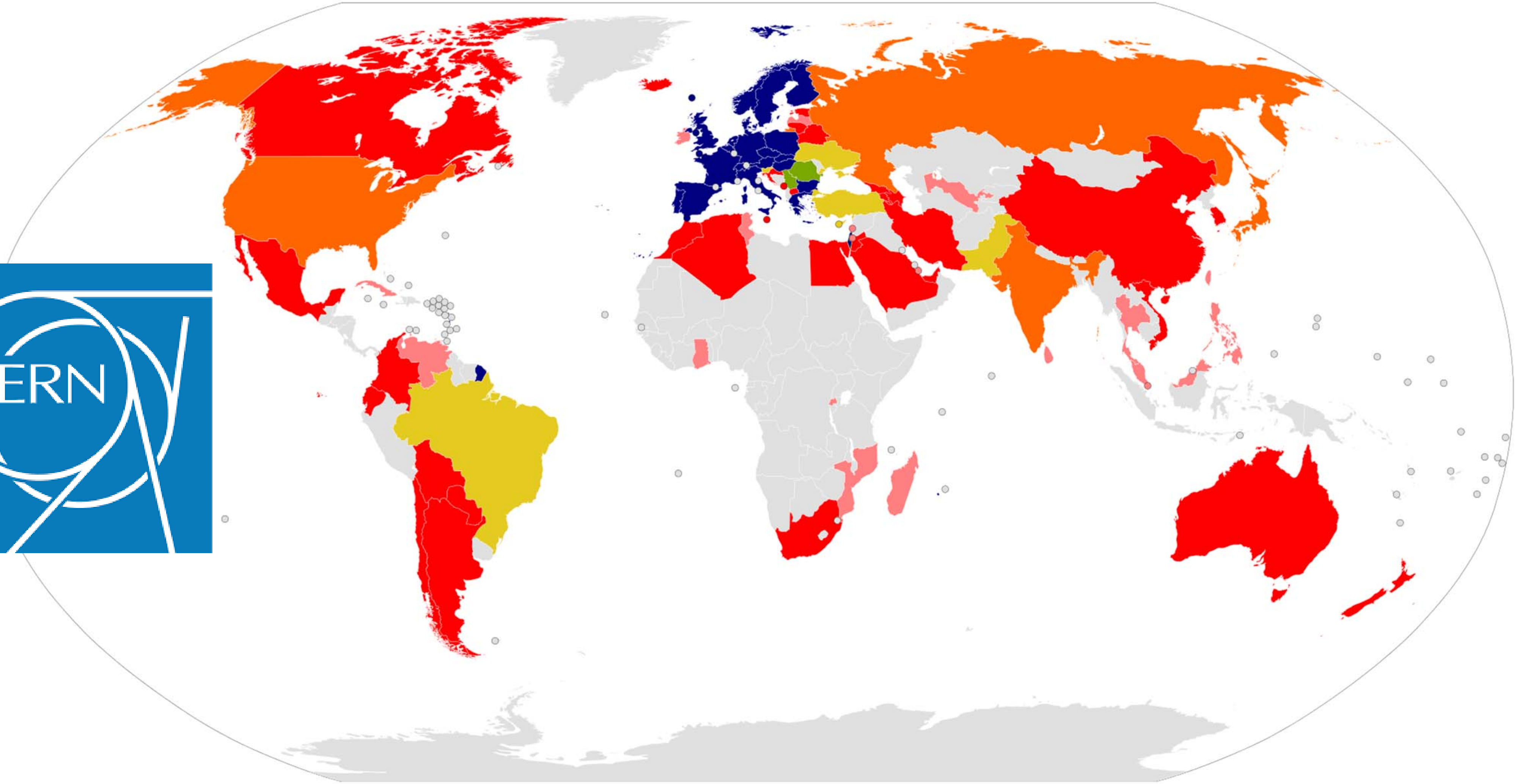
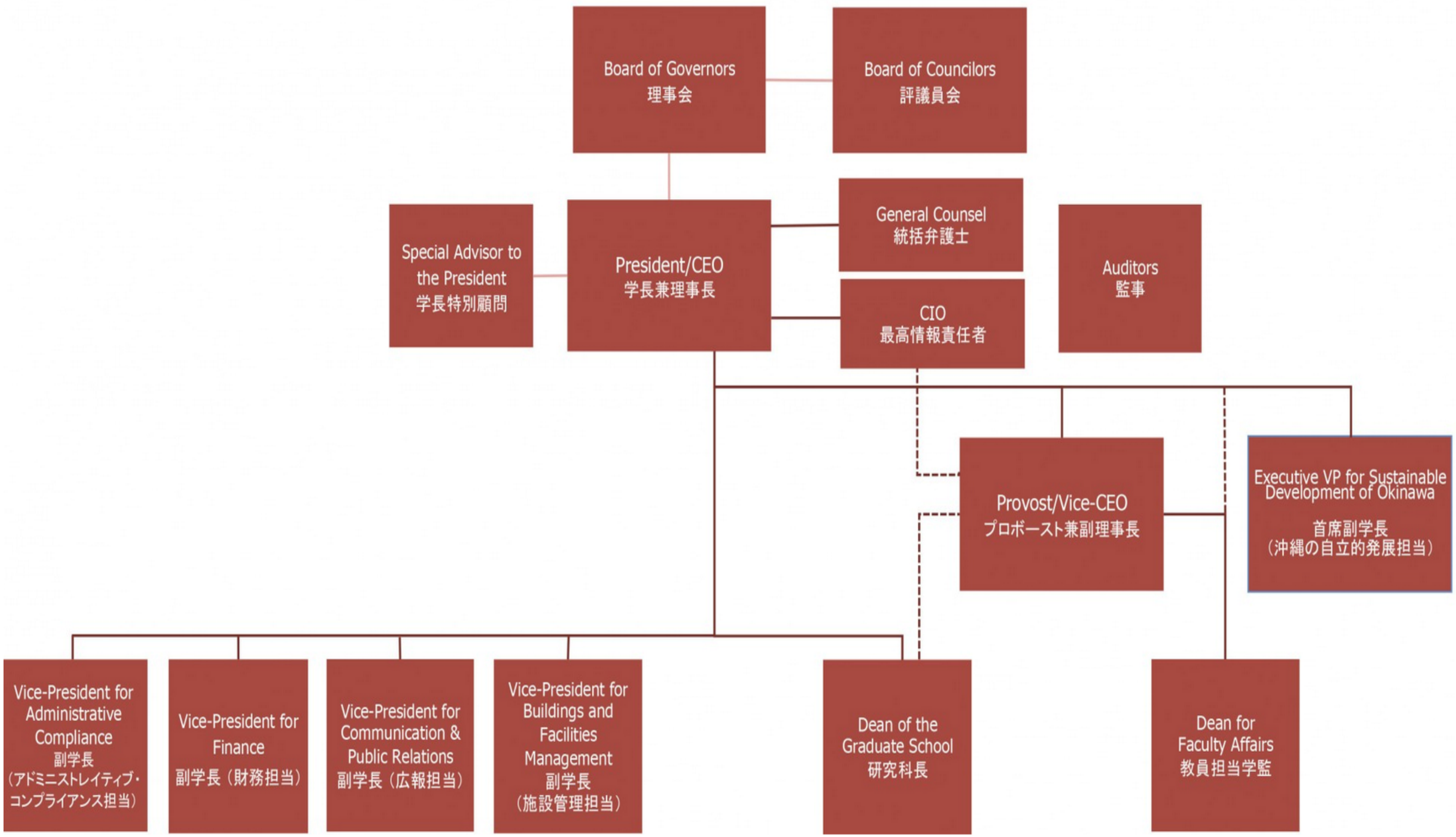
The Elephant in the Room

English is not their first language. **126 countries**
10 have English as first language.



Kazuto

OIST Graduate University Organization
沖縄科学技術大学院大学組織図



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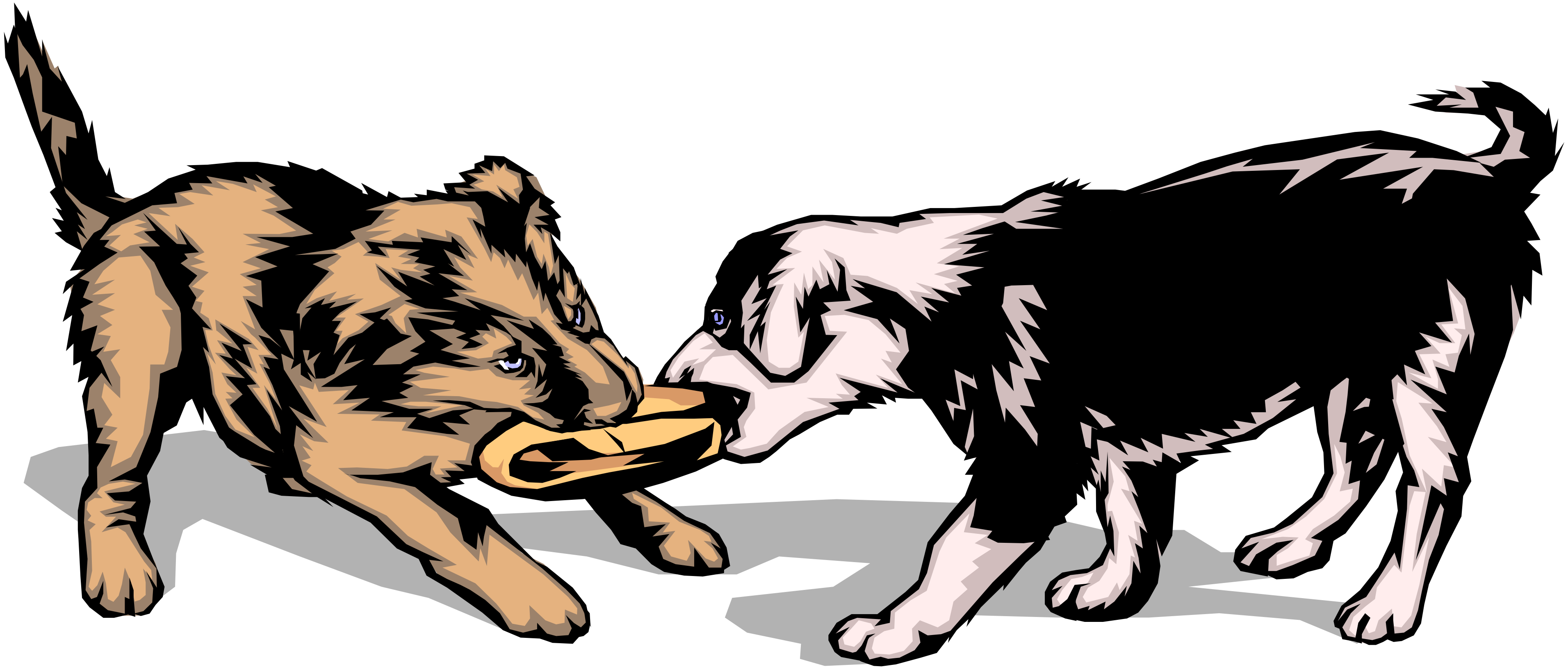

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