

SHIFTING GEARS IN THE RACE FOR HARNESSING FUSION ENERGY

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In this Studia Generalia presentation, my intention is to sketch the landscape in which the race for harnessing fusion energy is taking place. This includes justifying the need for fusion energy, what have been the major milestones in the related research until now, what are the main research lines today, and why activities in the field are now accelerating and who is stepping on the gas pedal.

The foreseen structure of the presentation is as follows: first, the role of fusion energy in the transition to carbon-free societies is established. This includes a comparison between different energy-production mechanisms. Then the different approaches to achieving fusion conditions are outlined, covering miniscule hydrogen bombs as well as approaches utilizing magnetic confinement in toroidal devices.

At this point, a brief history of the ups and downs in fusion research is given, followed by a cavalcade of fusion devices in operation today worldwide. The focus is then moved to the future: what are the critical open issues en route to a commercial fusion power plant, and what are the research facilities under construction to solve these problems and demonstrate the solutions.

Since this is a presentation given in the annual meeting of the Finnish Physical Society, the last part of it is dedicated to fusion activities in Finland under the FinnFusion consortium [1], with a description on what is our role in the international fusion community.

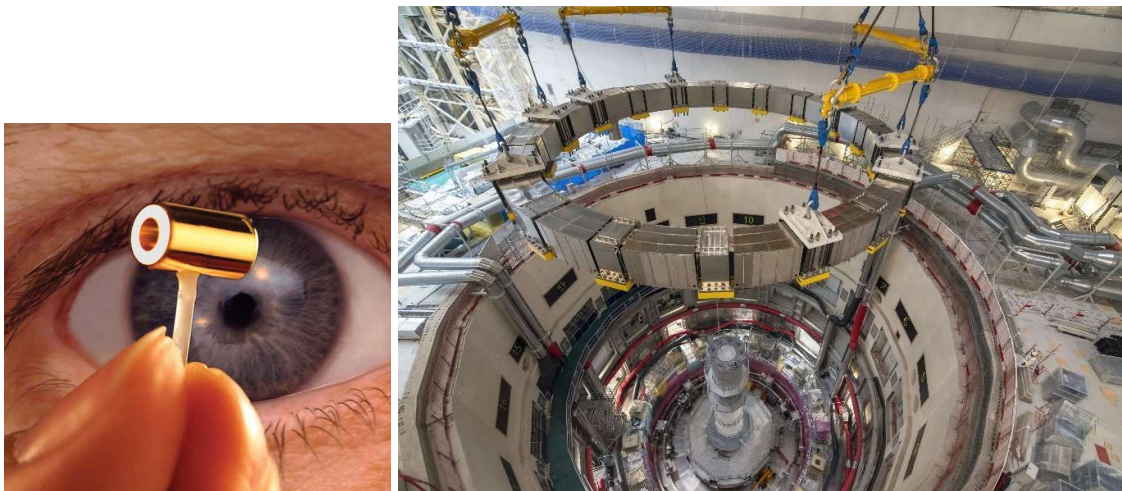


Figure 1: Left: A hohlraum ignition target containing a frozen DT pellet (Courtesy of Lawrence Livermore National Laboratory). Right: The installation of high-tech components is in full swing at ITER, the first fusion *reactor* in the world (iter.org).

[1] <https://projectsites.vtt.fi/sites/fukoord/www.vtt.fi/sites/fukoord/en.html>