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Sandia National Laboratories

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Plasmas: The Fourth State of Matter

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Sandia National Laboratories

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Georgia O'Keefee Elementary STEM Fair 2016

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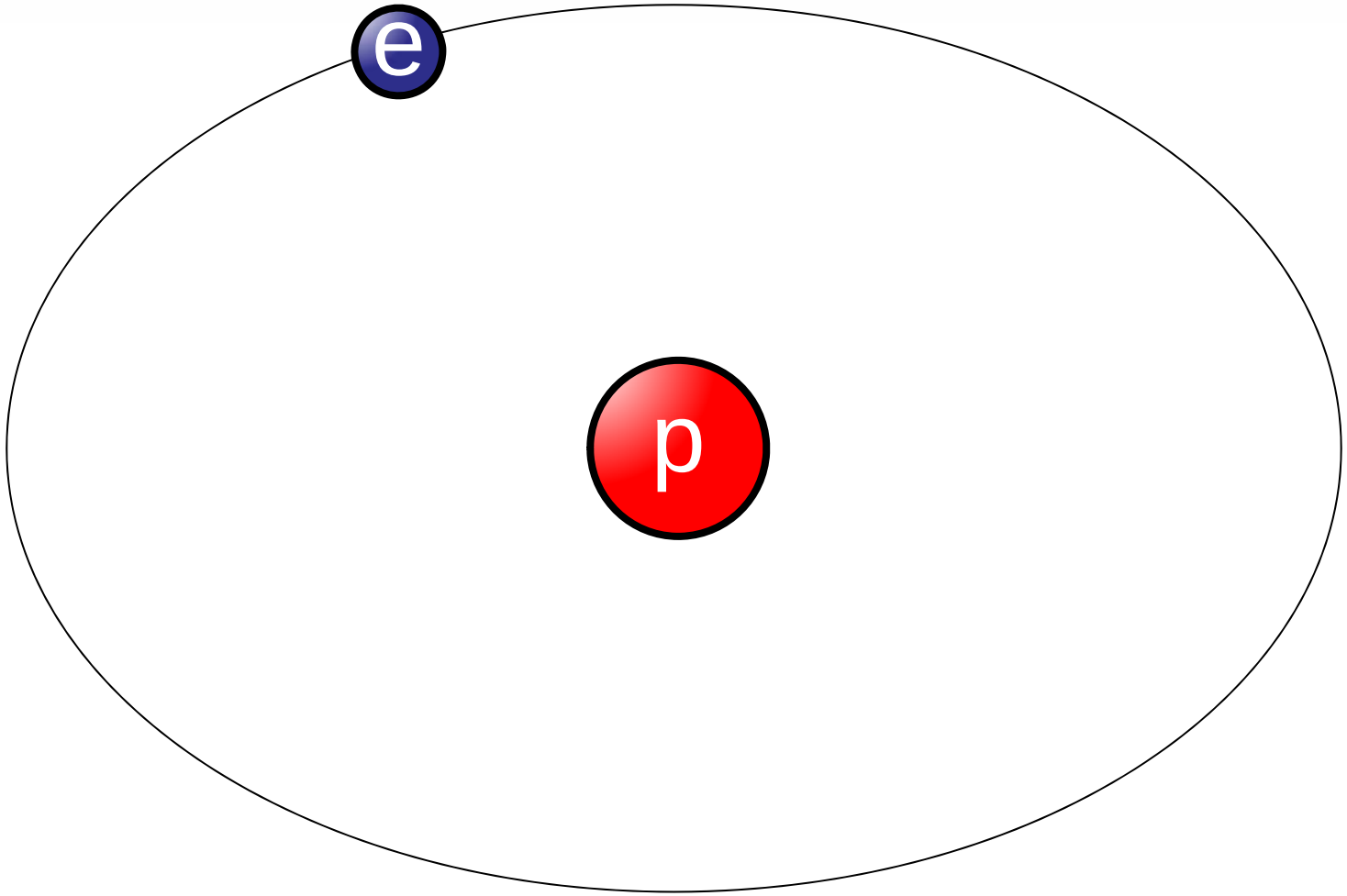
In atoms, negatively charged electrons orbit the positively charged nucleus



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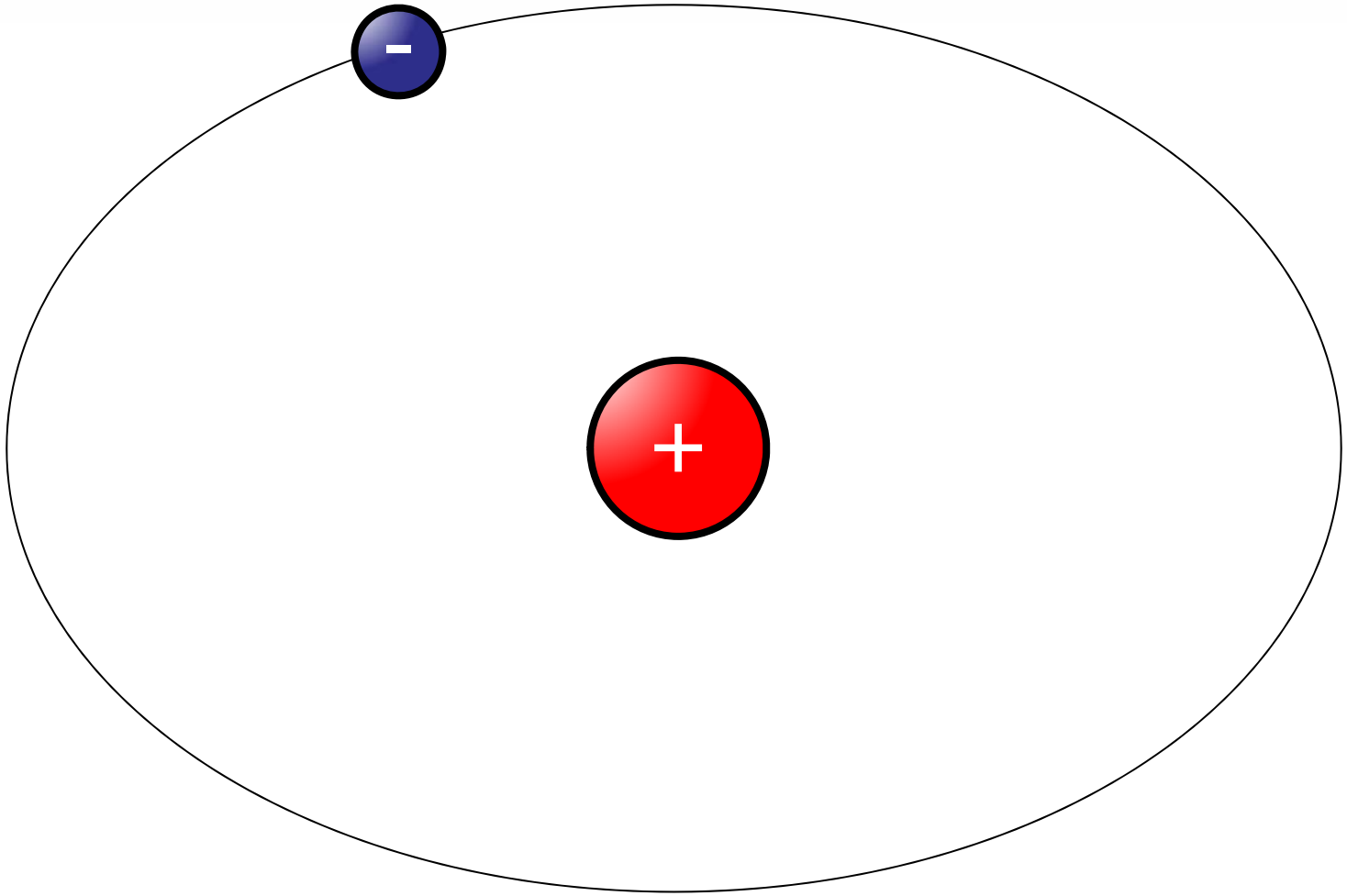
In atoms, negatively charged electrons orbit the positively charged nucleus



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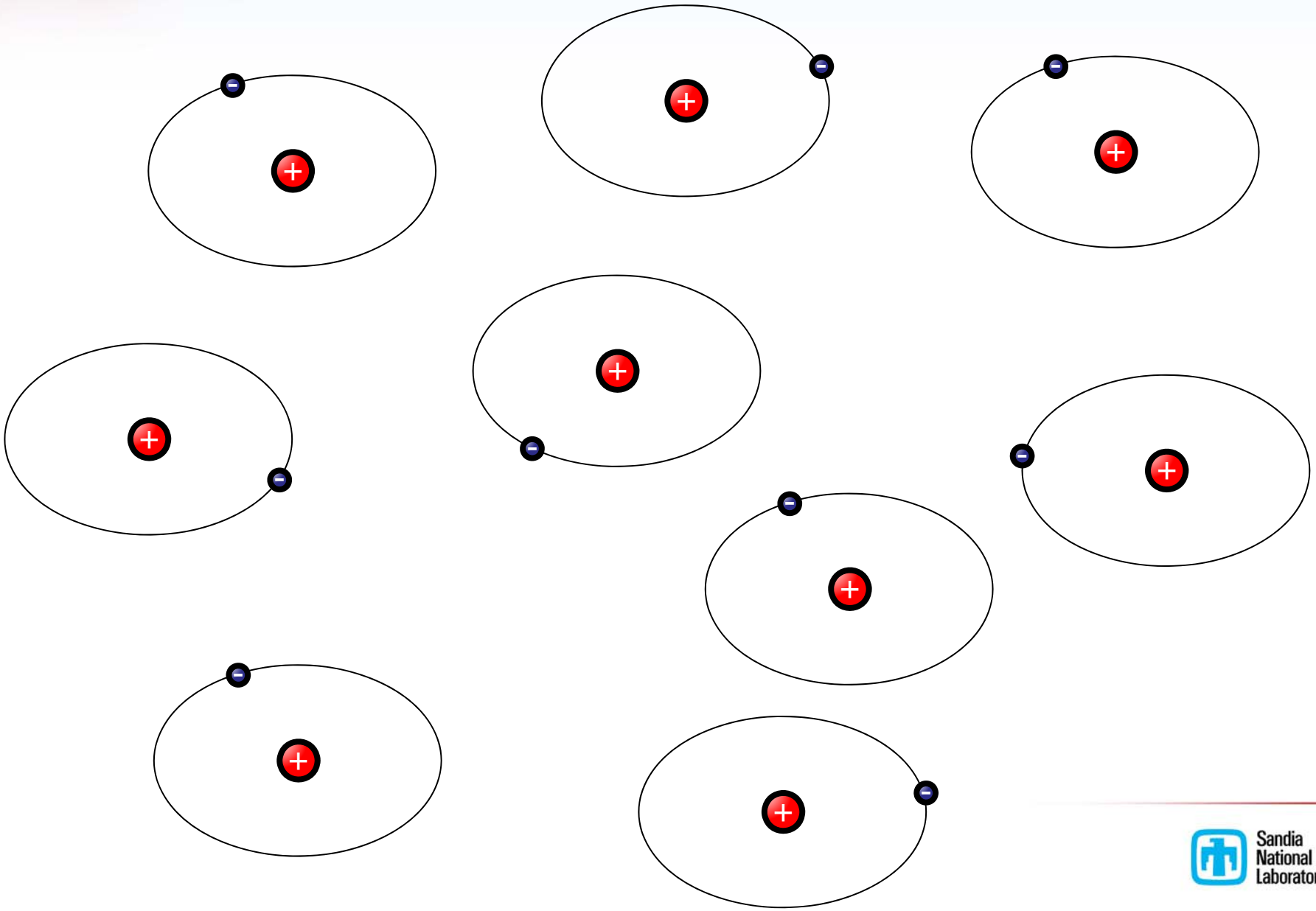
A gas consists of many neutral atoms



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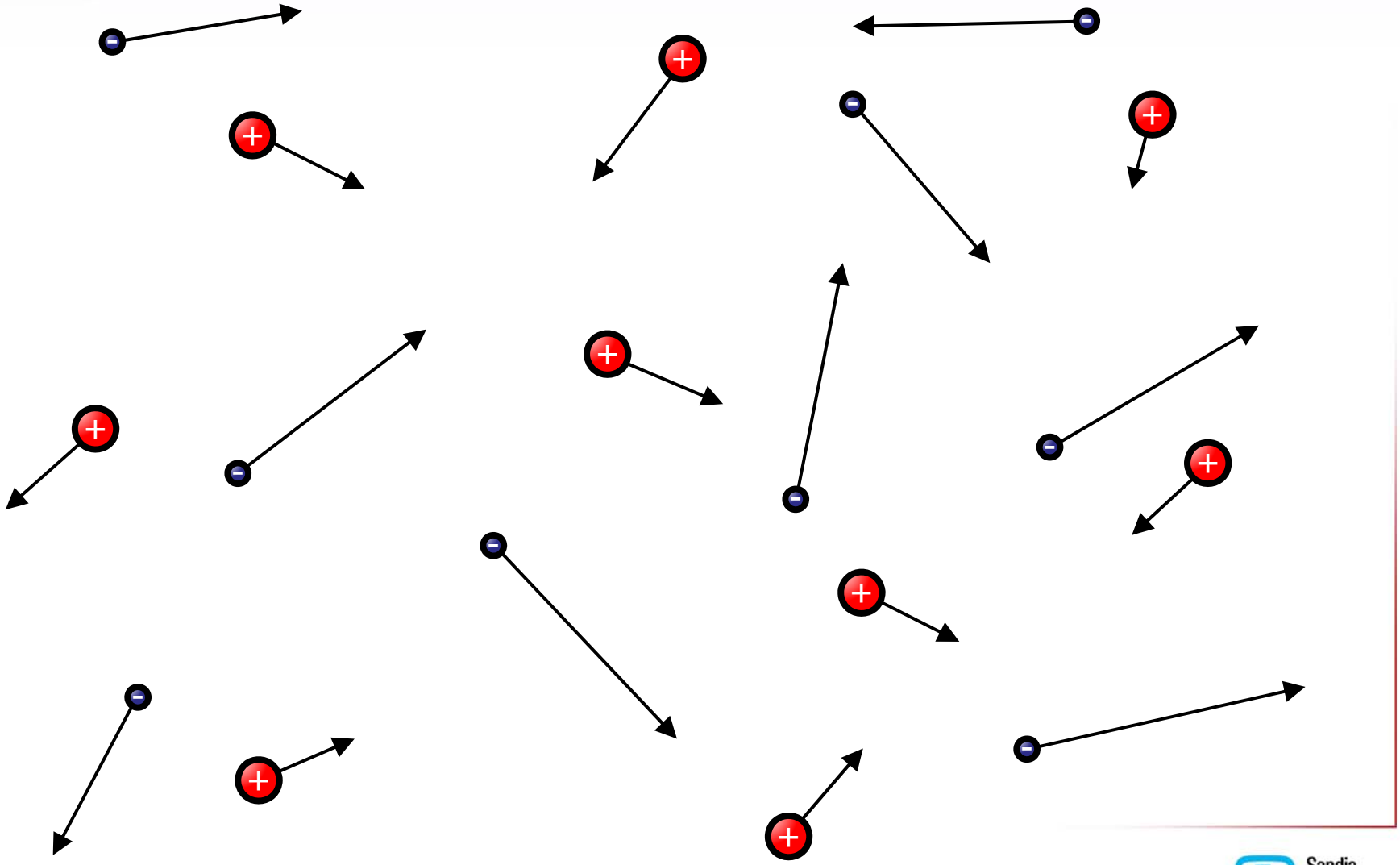
If matter gets hot enough (~10,000 ºC), the electrons break away from the ions, forming a plasma



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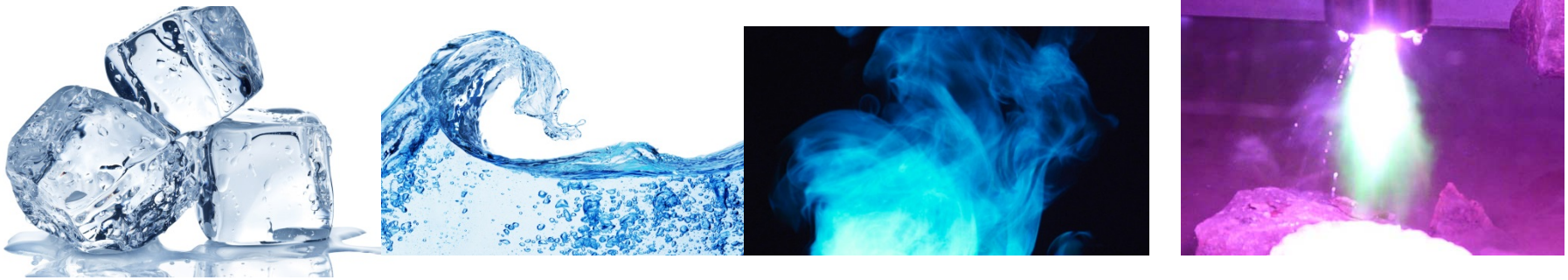
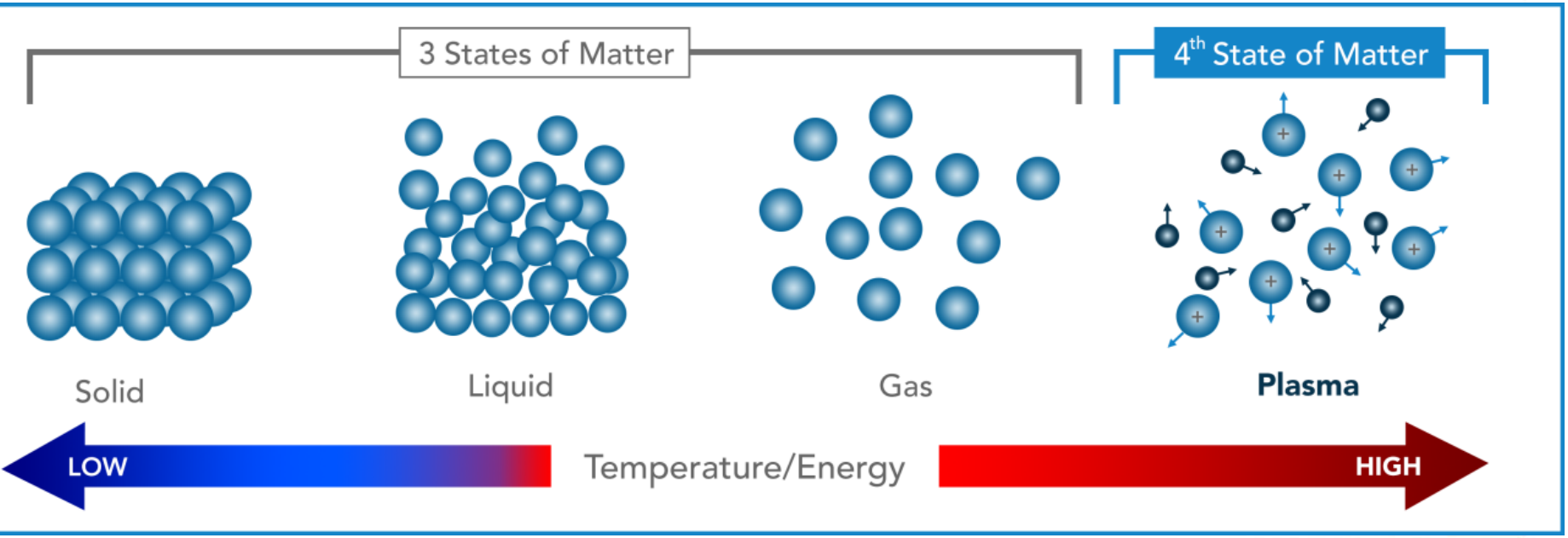
Plasma is the fourth state of matter





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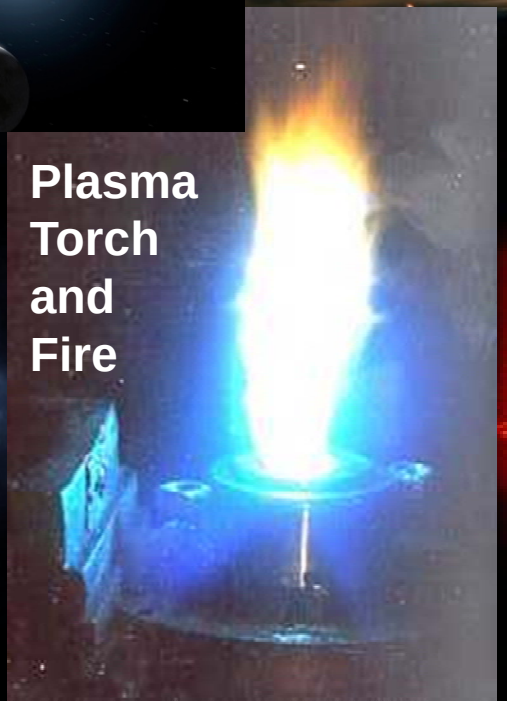
Plasmas are the most common state of matter in the universe

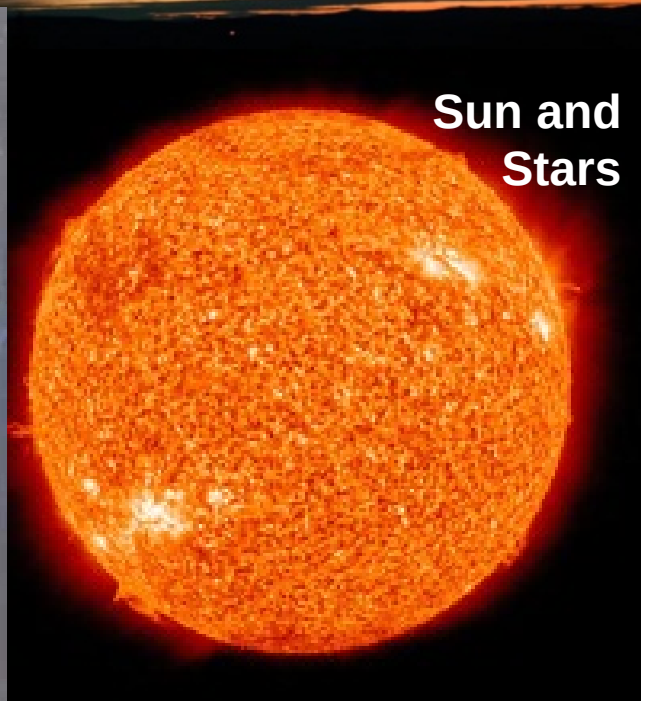

Fluorescent and Neon Lights


Plasma Thrusters

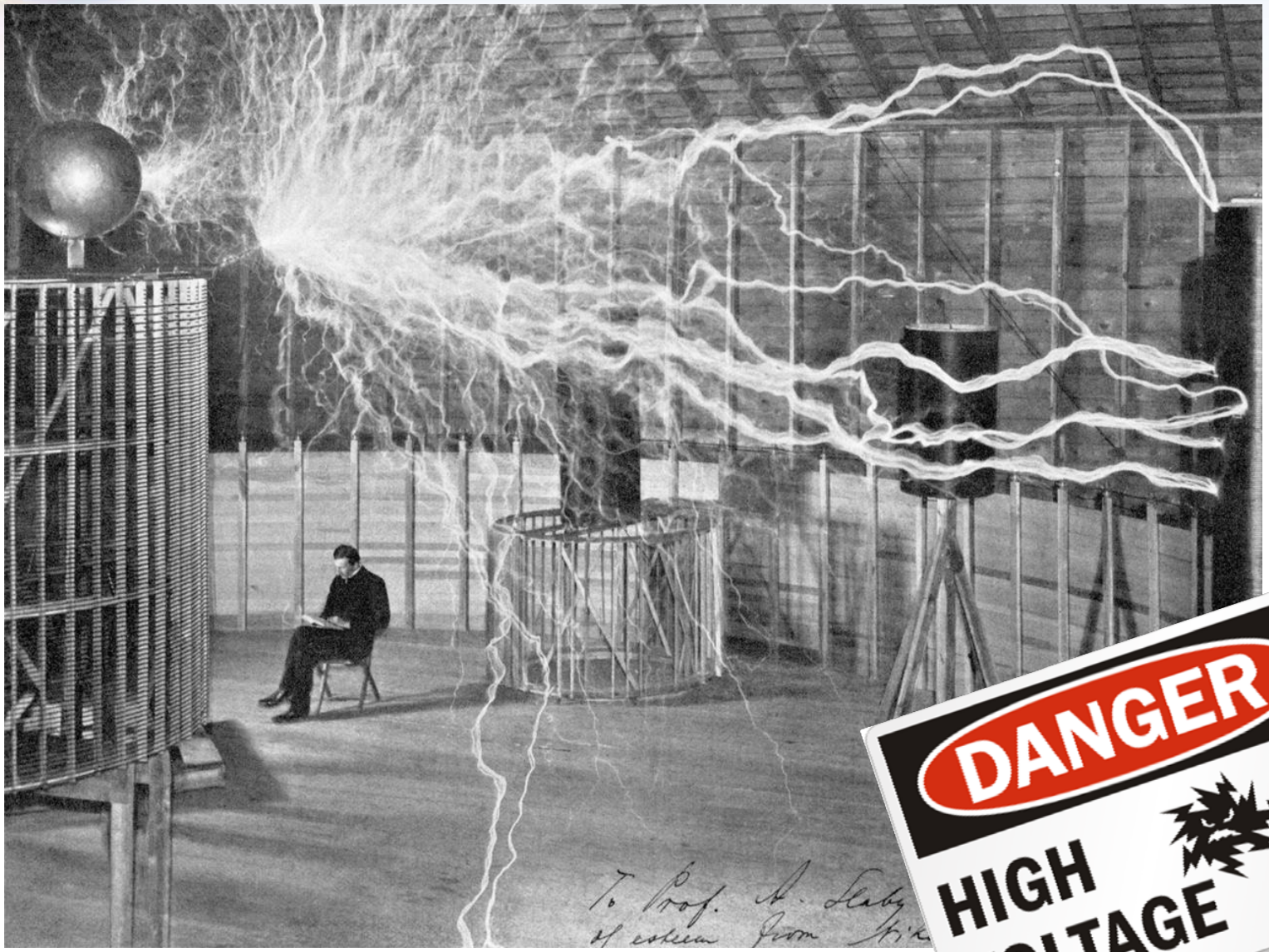

Aurora


Lightning


Plasma Torch and Fire


Sun and Stars

High voltage electricity can create plasma arcs



Nikola Tesla, Colorado Springs Laboratory, 1899

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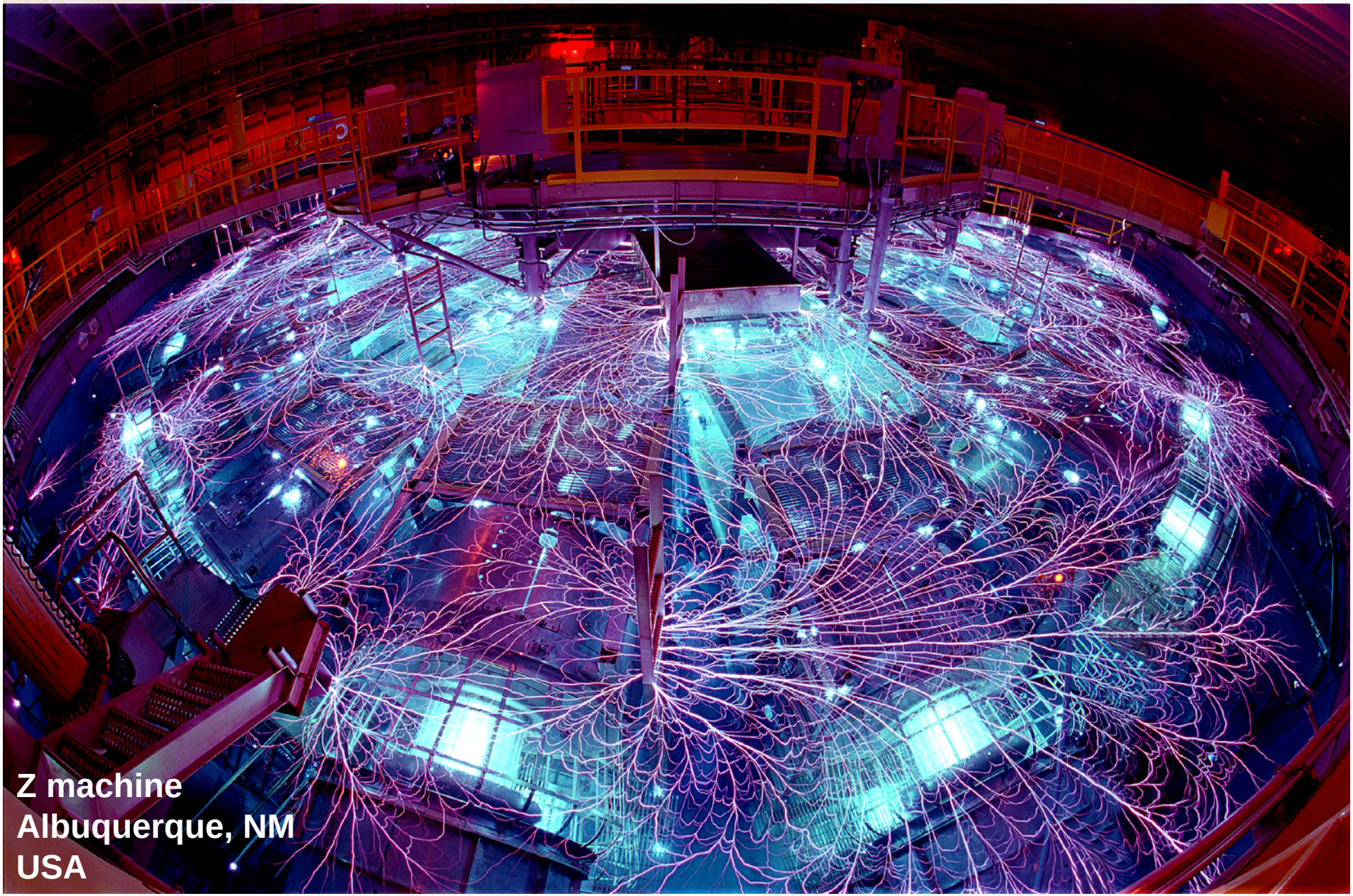
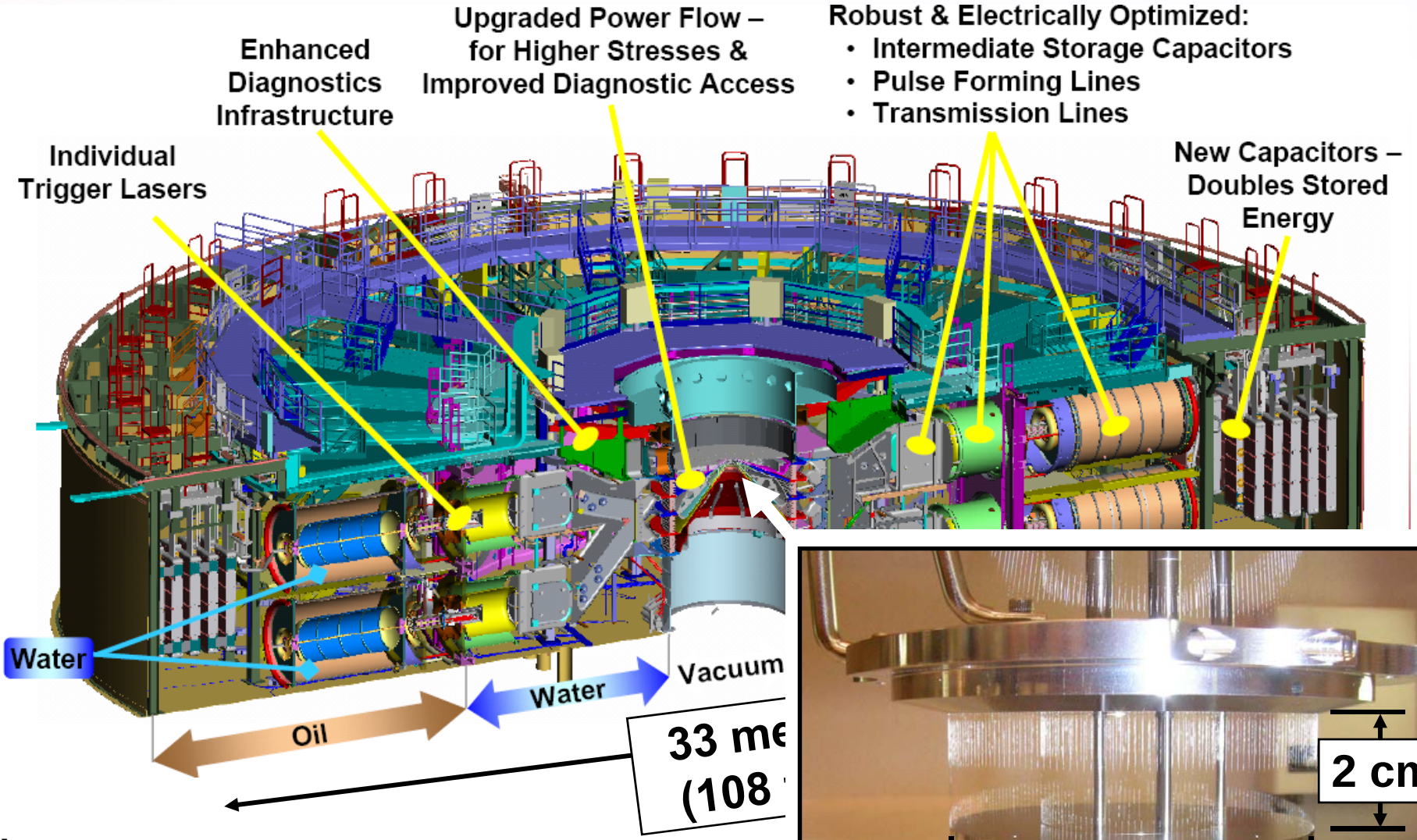
We study plasma physics with pulsed power at Sandia National Laboratories



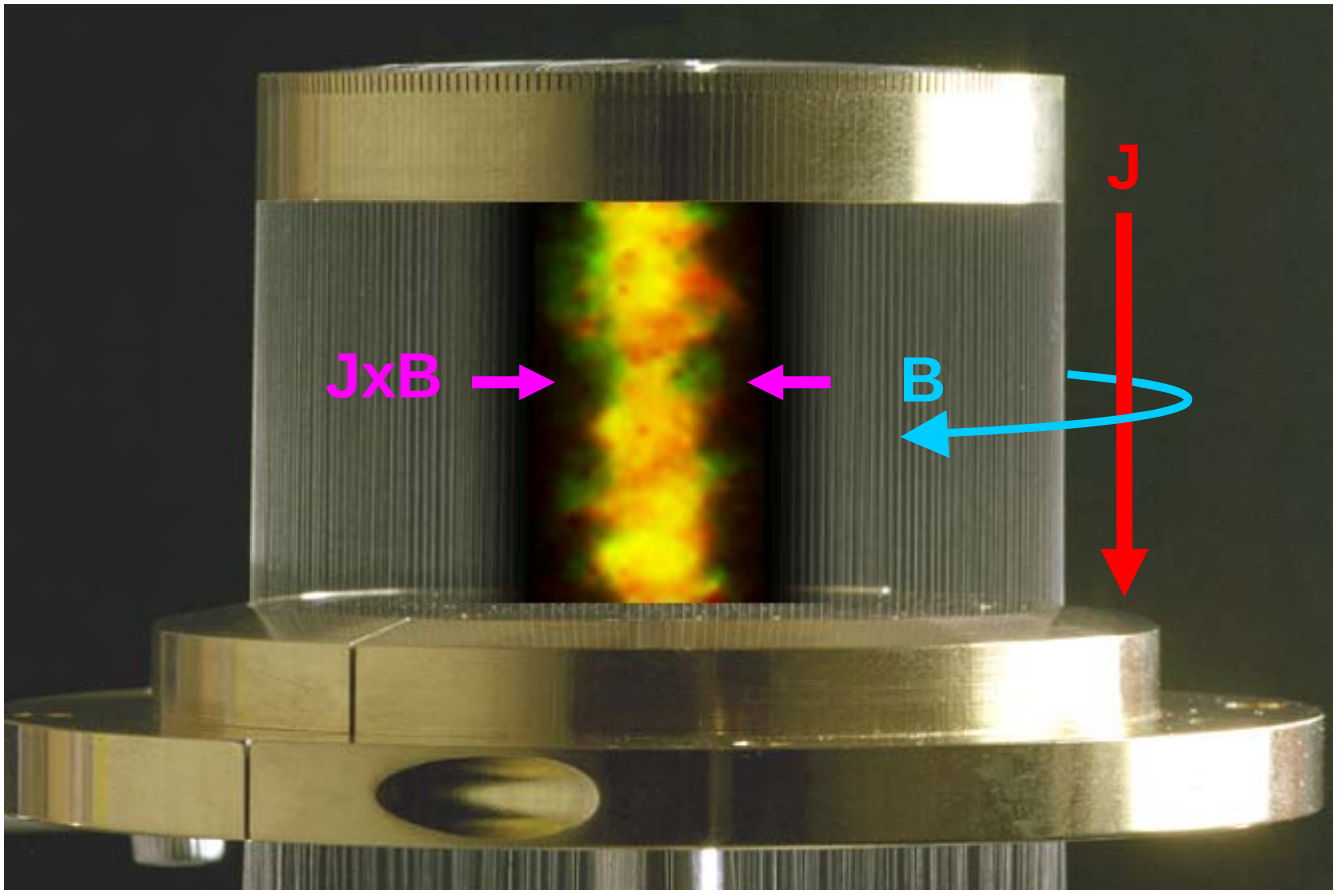
Z machine
Albuquerque, NM
USA

Pulsed power provides efficient compression of electrical energy in time and space



Z
Albuquerque, NM
USA

In a wire array z pinch, the huge magnetic forces pinch the metal into a hot plasma radiating x-rays



We also research fusion energy using z pinches

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Before these could ever be possible…

…many years of hard work and continued creative approaches to plasma physics research are required

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