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## **40 years of science on ICF: Conception to Scientific Breakeven on the NIF**

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The recent achievement of scientific fusion gain with deuterium tritium (DT) fuel at the National Ignition Facility represents a milestone in the development of Inertial Fusion. In this experiment, fuel pressures well in excess of 100's of GBars were achieved in the compressed fuel. At these conditions heating of the fuel by the alpha particles more than doubled the plasma temperature and significantly increased the DT fusion rate. The fuel gain, defined as the fusion energy produced divided by the internal energy of the fuel due to the hydrodynamic work during the implosion was approximately 160! This achievement was made possible by over 4 decades of research at laser facilities around the world. Advances in laser technology both in frequency and precision, motivated by understanding laser-plasma interaction physics and the demands of targets, improvements in target fabrication inspired by the need to control and minimize hydrodynamic instabilities in the implosion and multi-dimensional simulations and diagnostics have been critical to this achievement. The scientific and technical advances, the surprises, and challenges and that had to be overcome to achieve this goal-the first time in more than 70 years of fusion research- and a perspective on the future will be presented.