The unexpected confluence of plasma physics and climate science: On the lives and legacies of Norman Rostoker and Sherry Rowland

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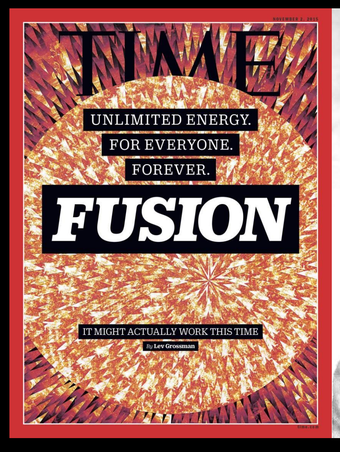
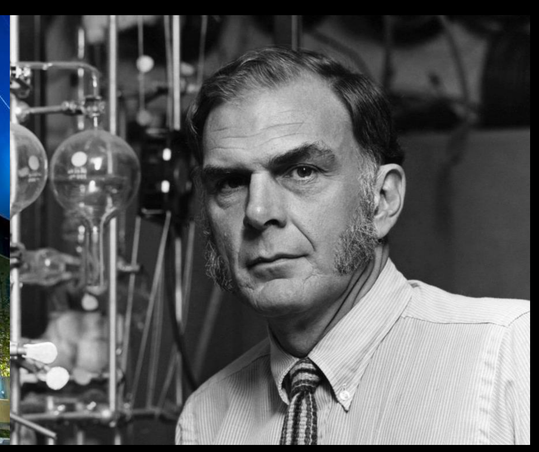
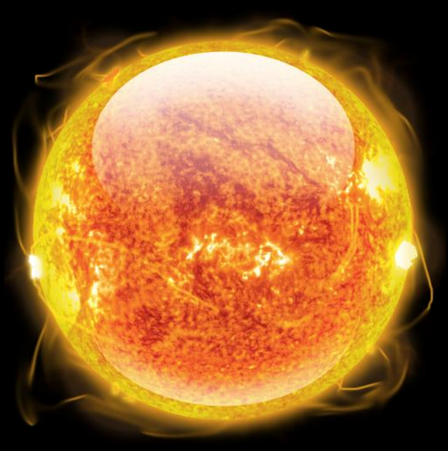
Enduring Legacies of Groundbreaking Science and Perseverance

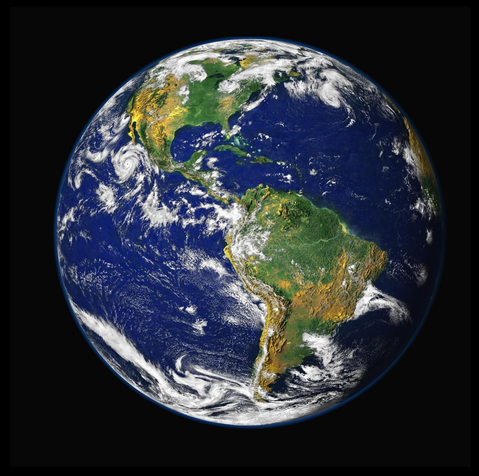


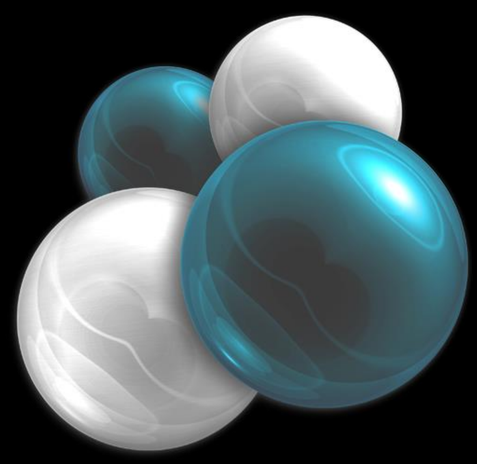
Norman Rostoker's vision that fusion technology could provide the world with abundant, clean energy challenged many long standing paradigms in the field. Initial theoretical discussions about fusion pointed toward the use of deuterium/tritium fuels, which require less energy input but utilize neutron producing reactions that require complex engineering controls to make safe and operable[1]. Rostoker saw an opportunity to reduce engineering complexity by developing technology that would utilize aneutronic proton/boron fusion reactions, essentially putting the challenge in the hands and minds of physicists. His vision was to see the physics community rise to the challenge of developing and realizing a new technology that many believed was not feasible.

One of the early discoveries of Earth system science was made by F. Sherwood (Sherry) Rowland, who in 1974 discovered that chlorofluorocarbons (CFC's) would accumulate globally and contribute to the depletion of stratospheric ozone, an atmospheric trace gas that protects Earth from damaging UV radiation. At the time, ozone depletion had not been observed, and the work was initially met with skepticism from some of the science community. But like Rostoker, Rowland persevered. His work ultimately led to the Montreal Protocol in 1987, an international agreement in which to date 196 countries have pledged to phase out CFC's. Rowland's story is one of the greatest success stories in the environmental movement, but it is worth noting that it took a decade or more for the tide of public opinion to change about his work.







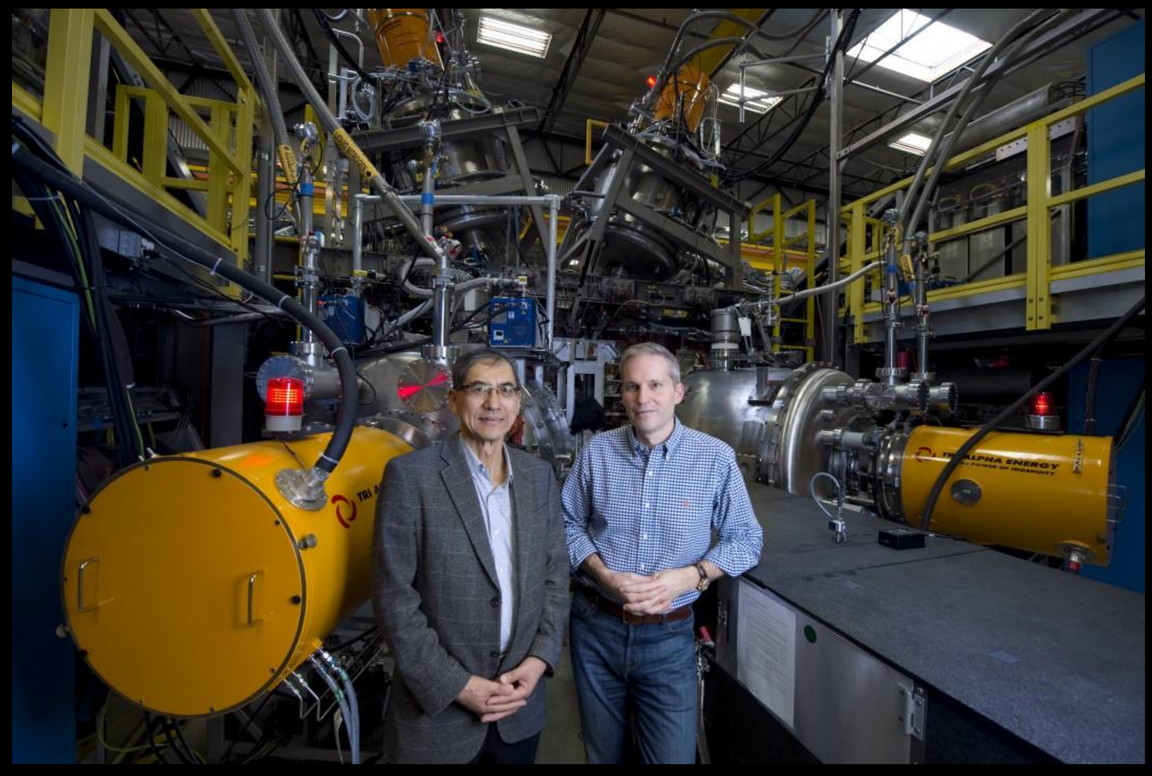


The threat of climate change: Toward a clean energy revolution

Climate change is a problem that is different from other threats humanity has faced before. The global scale and accelerating pace of climate change sets it apart from other problems that can be solved at a slower pace over the course of generations as new technologies develop and public understanding evolves. Additionally, there is no single technological or social solution for climate change, because many factors contribute to it. Climate change is a pressing, existential threat that requires rapid responses and bold solutions to be implemented now if the worst of the potential outcomes are to be averted. The extent to which we curb our emissions now will determine how much adaptation we will be required to do in the future.

Developing new technologies to curb climate change will require scientific vision and perseverance, traits that were exemplified by Norman Rostoker and Sherry Rowland decades ago when their ideas were first put forward. Though the technology is still undergoing refinement, the example of Rostoker's willingness to challenge accepted paradigms captures the type of bold innovation that will challenge existing assumptions about how energy is produced and help humanity take steps toward clean energy and a sustainable future. The climate crisis needs disruptive, transformational solutions to be developed through the type of technological innovation and perseverance exemplified in Rowland's and Rostoker's research. Many of these efforts are being undertaken by scientists who trained under Rostoker and Rowland, or who have been inspired by their legacies.

Norman Rostoker and Ralph Cicerone, founding member of ESS



Tri Alpha Energy Chief Science Officer Toshiki Tajima (left), a UCI professor and alumnus, and TAE Chief Technology Officer Michl Binderbauer, also a UCI alumnus.