How our lasers are helping to shape the future

From the Central Laser Facility at Rutherford Appleton Laboratories.

Environment

With our lasers, we are able to see and capture microscopic objects. This allows us to understand more about the environment in which we live. We use 'tweezers' made from laser light to hold particles: Like science fiction, but smaller.

Impact

Our work is helping to inspire solutions to everyday problems; from developing future energy sources and security technologies, to finding new ways to see beneath the skin to diagnose cancer and bone disease.

Extremes

Lasers can be used to replicate extreme conditions only naturally found in space, such as tremendous magnetic fields and the centres of suns. By using our high-powered lasers we can help to develop a greater understanding of the extreme world around us.

Using laser light, we can hold individual minute droplets which make up clouds and mimic their behaviours in controlled laboratory conditions, to reveal some of the complex chemistry behind climate change.

Gamma ray bursts (GRBs) occur naturally in space and are huge bursts of the most energetic type of light (gamma rays). Our high power laser, Gemini, can replicate these astronomical phenomena. This is important because to study a real one up-close would mean travelling millions to billions of light-years across space!

In the effort to find new ways to understand the environment, we are using our lasers to identify, manipulate and study individual microbes that are good at eating certain types of pollution.

We have been able to use our high-power lasers to make electrons travel faster than light through glass. This phenomenon creates some of the most exotic states of matter known to man and could help us to develop new techniques for industrial and medical application.

Learning more about the world around us is vital for scientists because it can lead to new ideas and inventions. Our lasers can be used to manipulate structures inside plant cells so that we can watch and understand how plants transport nutrients during growth.

Using our high-power lasers, we are developing micro-sized, turbo charged X-ray beams that can see through steel. Harnessing this technique could allow us to safely examine potential hazards such as old nuclear waste barrels.

Plasma is the fourth state of matter after solid, liquid and gas. It is what 99.9% of the universe is made of, and is a part our lives in ways many of us may not be aware of. For example: lightning, the Sun, and the Northern Lights are all made of plasma.

You need a lot of heat and pressure to create plasma, and our high-power lasers are able produce a petawatt (1,000,000,000,000,000 watts) of energy. By creating plasma, we can examine what happens within astronomical phenomena up-close.

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