

Outreach Project Wins National Award

A group of secondary school students supervised by ORC research lecturer, Dr. Eric Plum, have won a total of 6 awards culminating with the national Information Technology Award sponsored by the German Aerospace Center in recognition of their research on optical computing.

The students' project is part of a longstanding international collaboration between St. Michael-Gymnasium secondary school in Bad Münstereifel, Germany, and Southampton's ORC, which featured in Nature Nanotechnology last year. The collaboration benefits many groups of students that participate annually in Europe's biggest science competition, "Jugend forscht" (youth researches).

Under the initiative, students conduct their own independent research projects – much like postgraduate research projects. In 2016, 12,000 students are competing in 7 subject areas and 2 age groups. The work of the A-level students Adrian Lenkeit, Marvin Lohaus and Max Oehmichen from St. Michael-Gymnasium has already attracted a lot of attention at the regional competition in Düsseldorf and the state competition in Leverkusen. It won regional awards sponsored by the chamber of industry and commerce and the University of Düsseldorf as well as the regional first prize in Physics in February. It also won the first prize in Physics at the state competition in March, as well as the Minister for Schools' award for the most creative project, placing the students amongst the top 1% of participants.

The team was also able to impress the jury at the national competition, which took place from May 26th until May 29th in Paderborn, Germany. At this prestigious competition, the secondary school students won the Information Technology Award that is sponsored by the German Aerospace Center.

Adrian, Marvin and Max conducted successful proof-of-principle demonstrations of elementary logical operations for all-optical computing using microwaves and metamaterials. Their work is based on the realisation that the interaction of a thin functional material, a metasurface, with an electromagnetic wave can be controlled by a second electromagnetic wave. When both waves interfere constructively on the metasurface, its effect on the waves is amplified, while destructive interference renders the metasurface transparent. On this basis, the students have demonstrated various all-optical logical gates, the elementary building blocks of an optical computer.

ORC lecturer Eric Plum, who supervises the work in collaboration with teachers Veronika and Walter Stein, comments: "The project is inspired by research going on at the ORC. It brings aspects of our recent breakthroughs – in a simplified form – into the classroom and exposes it to the general public. At the same time, creative students also try new things that may feed back into our research. Furthermore, this collaboration makes some of the brightest



The winning team: Maximilian Oehmichen, Marvin Lohaus and Adrian Lenkeit with their metamaterials at the national competition in Paderborn, Germany (Image source: Jugend Forscht)

students aware of the University of Southampton at a time when they are choosing a university.”

The four day national competition was open to the public and attracted large numbers of students, teachers and parents, as well as wide media coverage.

- Find out more about the [metamaterials research](#) in Southampton.
- Find out more about student research projects at [St. Michael-Gymnasium](#)
- [Nature Nanotechnology article](#) about the outreach collaboration.