

Two-way symmetry in molecular physics

May 30 2018

Until he completed his doctorate in chemical physics in 2012, Fábri had spent his entire life in his native Hungary. He studied at one of the country's most prestigious universities, Eötvös Loránd University, and developed chemistry software for Hungarian-based ChemAxon.

In 2013, the young researcher's career took him to the Swiss Federal Institute of Technology (ETH) in Zurich as a postdoctoral researcher. But he always wanted to return home. The 'Molecules in Action' (MOLIM) Action gave him that opportunity and helped him achieve a scientific breakthrough.

This network of researchers, which will end in March 2019, is developing new mathematical theories and computer code to predict movements of the nuclei in molecules.

"These theories are very important for understanding how chemicals react with each other and interact with light," Fábri explains. "This can help scientists steer chemical reactions to make new products, or to search for molecules in space from the Earth."

Fábri learned about MOLIM from its chair, Professor Attila Géza Császár, his supervisor at his old university, who went on to invite Fábri to join a short-term MOLIM research project back in Hungary. The project was to become a landmark in Fábri's scientific progress.

"We developed a method to make use of symmetry in nuclear motion theory," he says. "This is a big achievement. It is used for the puzzling

CH₅⁺ molecule and will be useful in helping chemists understand how other unusual molecules behave."

Fábri has since published a paper on his research in *The Journal of Chemical Physics*, with a second paper under consideration, and has been invited to present his research at MOLIM's third general meeting. "This is very important for my visibility," he says.

Brain drain reverse

Fábri stayed in contact with Császár. When his former supervisor told him about national grants for young scientists, it opened the door to a full-time return to Hungary.

"I could have found out about this in other ways, but face-to-face support was more helpful," the 33-year-old says. He applied for a grant and found that MOLIM helped again.

"The short-term project gives rise to ideas that were part of my grant proposal," says Fábri. His proposal was accepted and he is now a research fellow at his old university.

Since his return in 2016, he has taken part in another short-term MOLIM project – this time back in Switzerland at ETH Zurich. Both projects were positive experiences he says: "I had almost no red tape. I just booked everything, filled in a form and submitted a research plan."

MOLIM training courses on next-generation chemistry tools have also been welcome. "As a student, I had to learn from books," he adds. "It is more efficient to learn from the best in their field."

He praises the network's inclusiveness, recommending the COST programme to other scientists from his region: "Eastern and Central

European countries were involved in every sense, hosting meetings and training schools. The Action was a real two-way exchange and is helping Eastern Europe to strengthen its scientific resources."

Provided by European Cooperation in Science and Technology (COST)

Citation: Two-way symmetry in molecular physics (2018, May 30) retrieved 14 May 2024 from <https://phys.org/news/2018-05-two-way-symmetry-molecular-physics.html>

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