



Fascinating Hive Mind

Max Planck scientists cooperate with partners in around 120 countries worldwide. Here they relate their personal experiences and impressions.

Materials scientist Jiali Zhang from the Max-Planck-Institut für Eisenforschung in Düsseldorf did a nine-month postdoctoral exchange at the Massachusetts Institute of Technology in the US. She was fascinated by the hive mind that prevails there.

I grew up in a small city in China, in a district with a large population and thus tough competition to be accepted to one of the really good universities. Unlike other Chinese families, my parents encouraged me to completely follow my own interests and not necessarily become a doctor or lawyer – so I finally found my true passion in metals and their sustainability.

Manufacturing new metal parts entails high carbon dioxide emissions. To prevent this and protect the environment, it makes sense to increase the lifespan of metal parts and thus avoid having to continually replace them. This can be done by enabling them to heal themselves. In fact, there are already a number of self-healing materials. At the Max-Planck-Institut für Eisenforschung (MPIE), we want to incorporate nano-sized particles into metals to heal cracks the moment they occur at the microstructure level. These particles are made up of a shape memory alloy – an alloy that reassumes its original shape when subjected to a specific temperature, even after it's been deformed.



Jiali Zhang, 28, studied metallurgy at the University of Science & Technology Beijing and at RWTH Aachen University before joining Prof. Dierk Raabe's Microstructure Physics and Alloy Design department at the MPI für Eisenforschung in Düsseldorf in 2011. There, she completed her master's thesis, then later wrote her PhD dissertation on self-healing materials on titanium-based alloys. Jiali Zhang has been conducting research as a postdoc at the Max Planck Institute in Düsseldorf since 2016, and spent nine months in the new MIT group headed by Cem Tasan, who was formerly a Group Leader at the Institute in Düsseldorf.

I've been at the Max-Planck-Institut für Eisenforschung for six years now, so I know exactly where to go and whom to speak to – I was trained to work in a very structured way and following a certain routine. The atmosphere at the Massachusetts Institute of Technology (MIT) stands in stark contrast to this. As MIT is a university, it brings together numerous people working on completely different projects. Everyone has their own individual working style. To get the information I needed, I had to tap into this hive mind. I like both working styles: the very focused one at the Max Planck Institute, where I work only on materials science and can follow a certain structure, and in contrast, the diversity inherent in the hive mind.

My conversations with the technical assistants, in particular, were very interesting because they use the same facilities for such a variety of projects and experiments. It can happen that samples are being analyzed for one group that is studying the influence of temperature on chocolate – how it melts and how its taste changes – just as I'm studying the influence of temperature in my self-healing alloys. I found this really intriguing and again, I spent a long time talking to the technician – just imagine the new flavors that could be created ...

But there are also innovative things that I found only at MIT. The library online chatting system, for instance. During business hours, you can write to the library staff to find out if a certain publication is available and they would answer in real time. I found that very efficient and comfortable.

I also found it interesting to watch the outcome of the US election live on campus and to see how students reacted to it. The student body is very active and reaches out to the president of the university when they need help. MIT actually drafted a series of guidelines that protect international students and employees against the Muslim ban so they can focus on their research.