

## NATURAL SOLUTIONS TO GLOBAL PROBLEMS

PROFESSOR Ilse Gebeshuber takes groups of students of various disciplines into the jungle so that they can see how nature tackles various problems and the elegant solutions it comes up with. The professor of biomimetics, nanotechnology and tribology from the Institute of Applied Physics at the Vienna University of Technology has been in Malaysia since 2009, and is currently a visiting professor at Universiti Kebangsaan Malaysia.

Gebeshuber is one of the strongest advocates of biomimicry in Malaysia, having appeared on BFM Radio four times to talk about the subject and delivered a TED xKL Talk called "What is a physicist doing in the jungle? Biomimetics of the rainforest" in 2012.

But she is not just passionate about biomimetics, she is a strong advocate of rethinking how academia functions. "One of the biggest problems in current times is that we have a lot of specialist scientists, a lot of people who know about their tiny field of specialisation but have problems trying to communicate it to specialists in other fields," she says.

Gebeshuber considers this a wasted opportunity, so she takes students from a wide array of disciplines – veterinary medicine, engineering, biology, ecology, economics, architecture – into the jungle to let them observe natural solutions to commonly faced problems and how they can apply them to their own research projects.

When they go into the jungle, be it Taman Negara, Ulu Muda (Kedah) or the remote areas of Sabah or Sarawak, they are suddenly cut off from the Internet and have no service on their mobile phones. "When we are remote from digital information, people start talking to each other more and more. They start to realise that living nature is a great resource of knowledge and wisdom, and that there is a possibility to establish a common language where they talk across fields, where they realise their

research projects are not that different and that they can really learn from each other," says Gebeshuber.

As a result of this experience, a veterinary student working on chameleon tongues, cat teeth and cow udders (also known as auxetic materials because they become thicker perpendicular to the applied force when stretched) gave an engineering student an idea for a new kind of nail which would be easy to hammer into the wall but which, once inside, would get thicker and stabilise.

"She (the engineer) thought it would revolutionise the construction industry. So it's just a matter of sitting together and talking, and finding overlapping interests with an open mind," Gebeshuber points out.

Other ideas that have come out

of these jungle visits include how to build structural colours (where the colour is dependent on the structure of the item rather than on artificially introduced pigments) and a navigational system like that of honey bees, which is dependent on the light in the sky rather than by being connected to a satellite system.

However, she has had difficulty trying to commercialise these discoveries because the prospective funders do not understand the nature of biomimicry products. "The question I get asked a lot is 'How much money will I make in a year, two years, five years?'" she says.

This, Gebeshuber points out, is the wrong approach. "When you are providing a biomimetic solution, you are not just providing a faster and

cheaper product, but one that is environmentally benign and safe and which, in the best-case scenario, at the end of its lifecycle serves as food or fertiliser for other products or people."

These products take a lot longer to develop and may need more money at the outset. They catch on slowly because the world has been conditioned not to consider the effects of their consumption; faster and cheaper has always been given preference over what is more sustainable.

"The general approach of biomimicry is not just to use living nature as a source of ideas. It is to transfer the beautiful concept you have in living nature to every part of the process. For instance, in nature, all things work in cycles. You use things for their fabulous applications and then you bring them back into the circle where they can be reused or you can feed them to something else," Gebeshuber says.

She points out that conventional engineering is adverse to living nature. "So the more cars we have, the more smartphones we have, the more computers we have, the more pollution we have. It's not good for the forests if we have 10 million instead of one million cars. But the technology of nature is in parallel. The more trees you have, the more oxygen they produce for people. And the more people you have, the more carbon dioxide they produce for the trees.

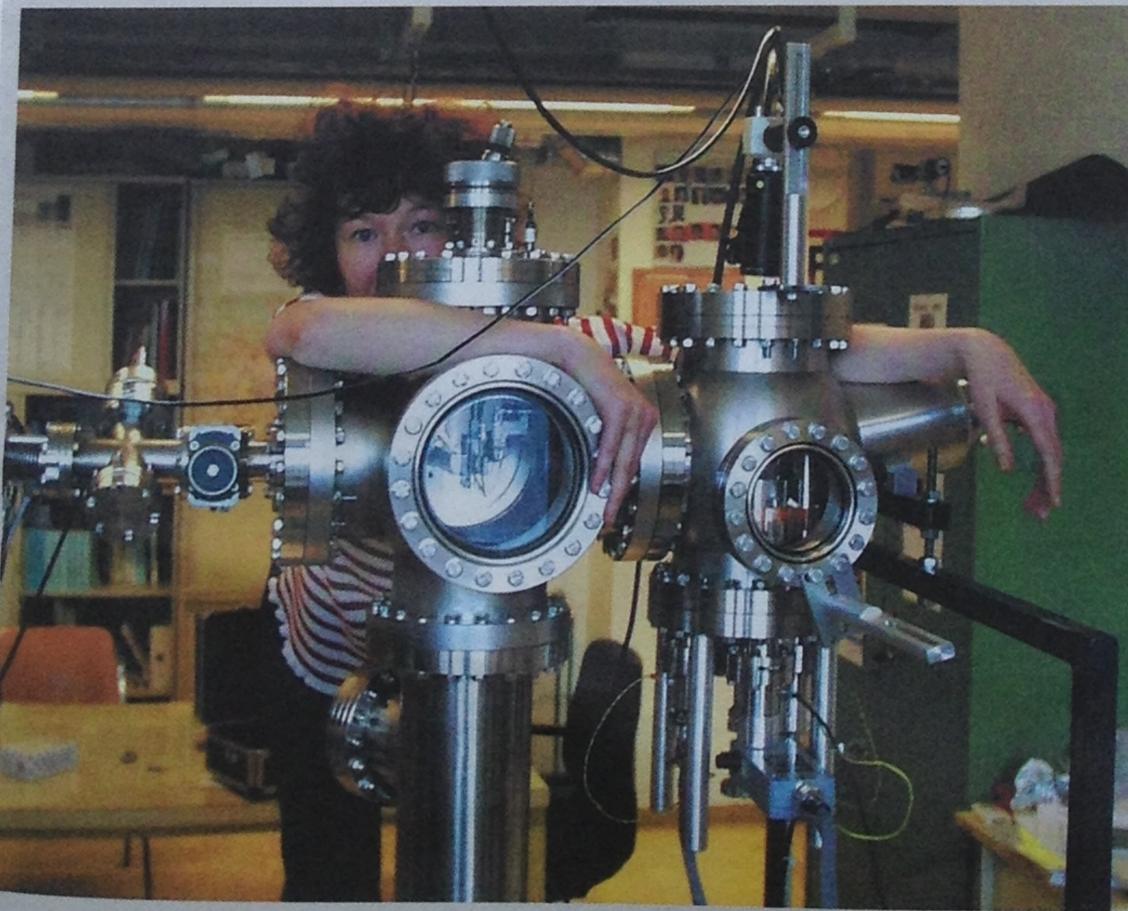
"I think one of the most exciting outcomes of life is that it does what is conducive to life. And I think it would be fabulous if we could come up with a human technology that is good for all life on earth. So when you are developing a biomimetic technology, you are not just selling something that is cheaper or faster. You are selling something that affects every living thing in a beneficial way."

This concept is something difficult for those holding the purse strings to get their heads around. It requires a longer-term perspective and some degree of wisdom.

Gebeshuber, nonetheless, has hope. She thinks it is absolutely possible for Malaysia to embrace this way of thinking and these technologies. "Malaysia has this huge biodiversity, amazing range of people with very good specialist education. But for biomimetics to take off, you need to give scientists and researchers more freedom to talk across fields."

The first step, she says, is to see biomimetics as a part of a solution to a bigger problem. "The most pressing problems we face, such as water shortages, climate change, sustainable development, the status of women and a lack of democracy, are not located in a single specialist field. They are very broad challenges and they are interconnected and interdependent.

"So, to address the most pressing problems, we would need a parallel layer to the university system, think tanks where people with broad approaches, with an understanding of complex relationships and of trends and developments are located; where they can think and talk across fields and where they are not so embedded in the 'publish or perish' system," she concludes.



by champion adapter animals and plants are posted by research scientists worldwide.

The database is organised by how organisms "break down; get, store or distribute resources; maintain community; maintain physical integrity; make or modify their own forms; move or stay put; and process information". Users can update, refine and connect with one another to further develop bio-inspired designs.

There are also regional networks and online groups such as Biomimicry Asia on LinkedIn, where industrialists or those in charge of R&D funding can find professionals who are already trained in biomimicry, says Harman.

And yes, government support would help. "Our research shows that countries in which the government supports biomimicry are getting the most success. Germany, for example, supports biomimicry research at the governmental level and, as a consequence, has a high number of products in the market compared with other countries," he says.

He adds that if Malaysia already has high-tech areas in which it supports research, that's a great place to start using the process of biomimicry to make those products even more effective, efficient and safe.

A company looking to get into biomimicry should be prepared for longer timelines. Which is why new funding models are needed. "The timelines for bio-inspired products are sometimes longer than 'overnight successes' like a new iPhone app. If a government provides early stage research grants to individuals, small companies and public/private partnerships (where a university and a company team up), that country is already way ahead.

"Then, providing loans or investment money that aims for a steady return over 10 to 15 years instead of three to five years is the next critical part. With these two overlapping models, a country can grow a very valuable biomimicry economy," Harman says.

Are there ways for Malaysian companies to identify and invest in projects abroad? "There are several ways Malaysian funders could identify prospective projects. AskNature.org is one excellent resource. The funder can enter a search term for an area of interest, such as electronics, and then contact researchers or companies that are mentioned in the AskNature articles."

For example, he says, if you enter the search terms "Smart electronics", there are 82 articles. And if you enter "How can nature provide ideas for electronics?", you come up with thousands of articles.

Harman also recommends that Malaysia establish a regional network or LinkedIn group to attract interest and attention from others around the world.

Venture capitalists have already recognised the growing importance of biomimicry. During the recession in 2010, US\$7.8 billion worth of venture capital investment went to clean technologies and US\$5.4 billion to biotech.

"While currently seen as a subset of these sectors, research suggests that venture capital investment in biomimicry as its own category could eclipse clean tech and biotech in the years to come. Some argue that this new industry could outpace other huge sectors to rapidly become a US\$100 billion market. I know of biomimetic technologies used in the fields of refrigeration, construction and water desalination alone that hold that potential," says Harman.

— By Jennifer Jacobs

**\*\*\* Natural solutions to global problems \*\*\***

Jennifer Jacobs

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**Source:**

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