Q&A Helga Nowotny

Embrace uncertainty

Austrian social scientist Helga Nowotny was president of the European Research Council between 2010 and 2013. Now a professor emerita of ETH Zurich and author of *The Cunning of Uncertainty* (Polity, 2015), Nowotny discusses the growing pressure to capitalize on academic research, and how countries can get it right in the absence of a universal recipe.

What are the factors that drive the push for more technology transfer and commercialization?

Entrepreneurship has become infectious. Young people dream of setting up a company. The idea of bringing their scientific skills and knowledge to the market is gaining traction. I see two driving forces behind this. The first is that many more opportunities exist at the interface of science, technology and innovation today than there were 15 years ago. The second is the realization by the young that if they want to have jobs in the future, they must engage in creating them.

How is this push changing how science is done?

It is not so much about changing scientific fields, but about crossing fields. A new kind of practical interdisciplinarity is in the making. I saw it happen with the European Research Council (ERC) Proof of Concept scheme. These grants allow researchers who are already being funded by the ERC to explore the innovation potential of their research and to move towards its commercialization. The scheme awards up to €150,000 (US\$169,500) per grant. Recent winning projects include super-hard fibres

produced by bionic silkworms and artificial veins inspired by marine sponges. We also saw that it is not so much the ERC grantees who want to set up their own firms, but their talented PhD students and postdocs, and the scheme provides great opportunities for those people to do so. Young researchers understand that the boundaries between academic research and its practical uses are more porous than often thought. We need to provide the training to help them to make the leap to the other side.

What are the pitfalls of commercializing research? How can they be avoided?

I don't think there's one right way to go about promoting technology transfer, but there are common pitfalls. Timing is obviously important — one can be too early or come too late. Another factor is how to obtain financing between the initial phase, when it is easy to obtain money because the sums are small, and the later phase, when funders are rare and hesitant because the sums are larger. The barriers to scaling up have been highlighted as a problem. How can one move from having many small

firms to having a few with the real capacity to grow? Young people must realize that neither their technological know-how nor their enthusiasm are sufficient. To have an idea is only the beginning. They also need knowledge of business models, modes of financing and what the market looks like.

How can a small country, such as Austria, encourage research commercialization?

Small countries often feature hidden champions — companies that do extremely well by operating at a global level in a technological niche. Doppelmayr/Garaventa is an Austrian example. It makes ski lifts in Austria and is now providing horizontal lifts for cable cars in cities around the world. The European Research Area Council Forum Austria was concerned that Austrian research and innovation systems were losing their dynamism, so it commissioned a study. The report (see go.nature.com/ugnlju), which it presented in November 2015, compared Austria's research, higher-education and innovation system with those of Denmark and Sweden.

What did you conclude?

First, there is no recipe for how to become an innovation leader. But the report helped us to see the interconnections in the research–education–innovation ecosystem more clearly. It recommended a more systemic evaluation of the effects that the present mix of policies generates. Better alignment of the well-intentioned, but often separate, efforts of the many players will be necessary if a small country is to succeed in a global world. Sweden and Denmark invest more in higher education than does Austria, and they do a better job at linking funding of higher-education institutions to the number of student places. Is the Austrian division between the general education offered by universities and the professional training offered by the *Fachhochschulen* (vocational universities) optimal?

The Cunning of Uncertainty calls for scientists to embrace uncertainty. But how can they do that when under pressure to seek profits?

Politicians think in the short-term. They want to see predictable and almost immediate results with high economic impact. But fundamental research is an inherently uncertain process. It reaches out into the unknown, discovering what nobody thought existed or would be possible. Innovation is also an inherently uncertain process. It is important to see that uncertainty is the invisible ally of both fundamental research and innovation, and, if we embrace it, we have nothing to fear from it. Funders must make room for the different types of uncertainty and encourage scientists to capture the opportunities that they offer. Profit-seeking comes later, and it belongs to the market. ■

INTERVIEW BY CHELSEA WALD

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