

A farmer or a hunter?

Should researchers be driven by pre-determined goals or by sheer curiosity? This historical topic is still actively debated among the research community.

Fundamental research is often driven by the quest for knowledge and the desire to understand more about nature and the universe. Major breakthroughs such as the recent discovery of the Higgs boson¹ can capture the imagination of scientists and the public alike, and may eventually provide new solutions to old problems. Unexpected or surprising research outcomes can also lead to life-changing technological breakthroughs. However, by the same token, such outcomes can also be underwhelming.

The principal aim of applied research is to examine and solve a particular problem for a real-world application. Prime examples in optics include LEDs for water purification, sunlight for generating electricity, optical fibres for high-data-rate transmission, lasers for high-capacity optical data storage, high-definition displays and high-resolution imaging, and optical sensors for non-invasive health monitoring, to name just a few.

Some believe that more emphasis should be placed on applied research, in an intensive effort to improve standards of living around the world. However, others stress that we should not back away from fundamental research because it represents a primary route towards future applications. Both types of research are equally important to the scientific process and have their own roles to play in the research world: to solve practical problems and to stimulate new directions of research. It would certainly be a mistake to pit them against each other or to evaluate them by the same benchmark.

The question is: should researchers be more bold and adventurous, driven by curiosity, or should they be conservative and cautious, following standard procedures for achieving predetermined goals? Most researchers would agree that both approaches are needed to advance science and apply research breakthroughs for the good of society.

In the autobiography for his Nobel Prize in Physics 2005², Theodor Hänsch from the Max Planck Institute of Quantum Optics in Germany said: “at the heart of budding Silicon Valley, one could sense a ‘can do’ atmosphere that seemed immensely liberating,” which means that scientists “did



TOM WILSON

not have to be afraid of research results that made all planning obsolete.” He also commented that “if our German approach to research had resembled well-planned agriculture, the work at Stanford could be compared to game hunting.” It was under this research environment that Hänsch and his co-workers found themselves at the heart of a revolution in laser spectroscopy.

Taking Hänsch’s simile, researchers can be thought of as being either ‘hunters’ or ‘farmers’. Both paths benefit the advancement of science; the question is whether researchers are free to choose their own path.

The goals of a research project can be determined by the agenda of the funding body. Some researchers follow a particular research direction because it is ‘in fashion’ or can lead to immediate applications, which may help to secure further funding. These constraints ultimately deny researchers the freedom to investigate unexpected observations, which often represent gateways to new discoveries. Eventually this may force ‘hunters’ towards farming. Although the need for funding may sometimes seem to suppress the ‘hunter’ instinct of researchers, it can be quite difficult for funding bodies to justify providing financial support to potentially groundbreaking projects, owing to their unpredictable nature.

Hänsch told *Nature Photonics* that there are no simple solutions to this issue. He explained that in Germany, as is also

the case elsewhere, success is unlikely to be achieved through one ‘ideal’ style of research. “Applied research with a definite goal and deadline requires a disciplined and well-planned effort, often by large team, following a conservative path. Fundamental research sometimes has to follow the same approach, particularly if some well-defined complex instruments or facilities need to be constructed.”

“It is very important for a healthy research enterprise that creative and gifted individuals have the freedom and resources to dream up new questions and to pursue new research directions, following their intuition through unexplored territory,” explained Hänsch. “This is not easy because, naturally, funding agencies favour research that is in fashion or promises a tangible payoff.”

“To be successful, researchers should consider their own personal strengths and weaknesses. They should choose a field and a research style that they enjoy. If they become obsessed with an interesting problem, the chances for success are quite large,” Hänsch advised.

As a researcher, are you a hunter or a farmer? Perhaps a more important question is: are you allowed to follow your scientific instinct? □

References

1. <http://press.web.cern.ch/press/PressReleases/Releases2012/PR17.12E.html>
2. http://www.nobelprize.org/nobel_prizes/physics/laureates/2005/hansch.html