

Ronin, PhD

In feudal Japan, a ronin was a warrior, a samurai without a master, who travelled the country offering his service to anyone in need of a sword to hire. But unlike the lonesome cowboy or gunman in Western movies, the ronin in Japanese culture has always had a tragic dimension, a sense of failure. In medieval Japan, finding one's proper place in society and feudal hierarchy was extremely important, so a ronin—without master, home or family—was not a popular role model for an aspiring samurai apprentice. Academic science, in many aspects, resembles feudal Japan. Students must spend years of training and practice, often moving from master to master to refine the art, learn new techniques and constantly acquire knowledge in a well-defined hierarchy, before eventually being trusted enough to become masters themselves and start teaching new students. To stick with the Japanese analogy, only long years of labour and practice can produce true warriors and eventual masters, trusted by their lords to lead men into battle; only long years of labour and practice can produce senior scientists who are entrusted with research grants and the education of students.

But the scientific system is creating too many ronin. A large number of graduate students and postdocs are disappearing from the academic world to use their knowledge elsewhere. The main reason for the high drop-out rate in the academic system is a career path that quickly narrows when moving from graduate student to independent researcher to professor. As universities and research institutions offer significantly fewer group leader or professor positions than the number of researchers they train, many junior researchers face the consequences: they leave to become journalists, public relations professionals, business consultants, patent lawyers—or even gas fitters (Moore A (2004) *EMBO Rep* 5: 660–662). Some argue that this is the price academia has to pay for ensuring that only the most brilliant and productive scientists eventually ascend to the highest

positions within this world (Wiesel T (2004) *EMBO Rep* 5: 747–750). In the meantime, the job market offers plenty of opportunities outside academia, and having more science-trained people working in other fields ultimately leads to a better appreciation and understanding of science in general. It also benefits the private sector if employers can choose from a highly educated labour pool. But, apart from the personal frustration experienced by those who are forced to leave academia for lack of jobs, the disappearance of scientists from academia is a deficit for society at large, leading to a loss in economic growth opportunities, investments and enthusiasm.

The beginning of the twenty-first century is seeing an increasing trend towards globalization of goods, services and information. As trade barriers fall, industries are no longer limited to certain countries. In this global village, anything can be produced anywhere, preferably where labour costs are low. European, Japanese and American industries are taking advantage of these opportunities, moving traditional manufacturing and service jobs to Eastern Europe, South America and Asia. As cars, drugs, computers, software and most other goods can now be made more cheaply by developing nations, knowledge and information become increasingly valuable commodities for the advanced countries—but they require more investment to produce than do cars or computers. Countries moving from industrialized to knowledge-based economies therefore have to invest even more in knowledge production to keep their competitive edge in the global market, which, in turn, means a greater demand for people to produce this knowledge, namely scientists. Thus, from an economic point of view, it does not make any sense for a growing number of scientists to be forced out of academia for lack of jobs, if many of them could be put to better use, producing knowledge.

This loss is also a bad investment in the future, in light of the massive cost of educating

scientists. Society spends tens of thousands of dollars or euros to train someone up to PhD level, not to mention the countless hours of manpower invested by teachers, lecturers and professors. Of course, this training is not completely lost if a scientist leaves academia, as it enables him or her to find a qualified job elsewhere. But given the low number of people who eventually stay at the bench, it raises the question whether academic science is not wasting a valuable human resource.

Finally, it is a major loss of enthusiasm. Everyone who studies the natural sciences knows what he or she faces: countless hours in lecture rooms and at the laboratory bench, usually without adequate compensation. Their main motivation for staying on track is their enthusiasm for science, the drive to unravel nature's mysteries and to understand what makes things tick. Having to leave this world for financial reasons is certainly frustrating for many, and they may not carry their enthusiasm into their new jobs.

Politicians therefore have to realize that establishing and nurturing a knowledge-based economy requires significantly more financial support for the knowledge-producing institutions in their country. And if they continue to spend more money on agricultural subsidies than research, while wasting highly trained human resources, they will diminish future growth opportunities. Universities and other research institutions may also have to expand their traditional hierarchies to create new positions and accommodate more research personnel, such as the long-term professional researcher largely unburdened by administrative and teaching assignments. Last but not least, society itself has to realize that if knowledge and information are valuable commodities, it needs to support and feed those who produce it. In the end, it is not a question of how much science we can afford, but rather how many scientists we cannot afford to waste.

Holger Breithaupt

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