

## **A Toolbox for Science in Transition**

Frank Miedema, 17 september 2013

### **A. Reflections**

#### **1. Science in Transition: a science of science project.**

The first tool we need is comprehensive scientific research on the current system of science. This involves multidisciplinary theoretical but also empirical work mainly on the sociology and economy of science, but also historical analyses of the changes that science has gone through since World War II. This project has started @SciTransit, website [www](http://www.sci-transit.nl).

### **B. Tools to start with now:**

#### **2. Impact**

The evaluation of research impact needs to change. We have to move on from the now used intrascience, self-referential metrics to integral evaluation. Measures both for in-science use and for societal impact, value attributed by potential users in society must be developed. Although many colleagues are still very cautious, this process has started already. Much ideas and material is being produced in several countries, including but especially UK and in NL. KNAW, VSNU en NFU are involved in what in the NFU is known as the 'Impact' project. At UMC Utrecht we are moving to hybrid fora, inviting representatives from outside science to participate in research evaluation and to more integral metrics in science excellence evaluation.

Internationally, the simple use of impact factors in funding, appointment and promotion considerations is on the way out, see the San Francisco Declaration on Research Assessment. This and the evolution of altmetrics will challenge the standard practice of commercial journals and they know it and are in anticipation taking all kinds of action.

#### **3. Incentives and rewards**

This comprehensive measurement of research impact thus has forward looking effects. Based on these '3.0 evaluations', we must manage and facilitate science. Research management will have to take into account the various types of impact and provide career opportunities for the different types of researchers. This is going on here and there already, but must become the dominant practice in public research management.

Grants from the respective institutions, NWO, ZONMW and charities should explicitly be awarded based on the same principles. The classical metrics using IF, citations and H factors should be complemented by an accepted list of measures of societal impact. This must result in a mix of basic and targeted research, where also basic science is judged in a wider context, since also pure basic science is a 'political' choice

#### **4. Dealing with Risk Avoidance**

NWO, ERC and other high profile personal grants tend to select classical researchers, based on the usual metrics, who produce knowledge for the internal science market mainly. Because of risk reduction, notwithstanding what the members of these panels say, and tend to believe, too much emphasis is on high impact publications. This results in too little diversification of leading investigators in the institutes.

In addition there is a skewed emphasis and overrated valuation of these laureates over many other non-laureates who are very good researchers as well, but just were not selected because of lack of funds at NWO or ERC. Many of these should be brought in university talent programs which may and should select for quite different capacities that are not detectable at a snap shot 10 minutes interview and from classical metrics. Universities are able to go for less risk avoidance and long term innovation and may and should invest in that. Real world problems are complex and require intense collaboration by several disciplines. Obviously, we have to work from and with realistic expectations regarding research output. If we start from excessive demands, researchers will be tempted to play the system in order to survive to the next level.

## **5. PhD Talent management and education**

As a recent Rathenau report bravely pointed out, granting organizations should give grants, but the university must take up the talent and career management of its staff, because getting prestigious grants clearly is only for the top 3%, but for the top 30% getting funded is a random and subjective process indeed. Talent management in general is a problem given the huge PhD factories we have established and the poor prospects these PhDs and postdocs have to make a career in academia. Indeed as Solla Price 50 years ago predicted, science breeds scientists faster than economy wants to pay for. See Stephan's recent book 'How economics shapes Science'. We have to rethink and redesign these streams to better coach the careers of our students for careers in and outside science. This is a major challenge for universities. How much PhD should we produce? Do MD's in those high numbers need a PhD at all. How are we to promote transdisciplinary work via the talent programs? We have to promote scientific literacy among our Master and PhD students by courses like 'That Thing Called Science' that we started in Utrecht in 2009. This education of scientific literacy has recently started in many of our universities.

## **6. Targeting societal problems**

As the KNAW advice Vertrouwen/Trust correctly points out, trust in science and scientists is not only about how trustworthy and careful we do and report our science, it is as much about the question whether we do the right things. For charities and other targeted science funding this is not problematic. These funders are already changing practice in that they steer for large problem-oriented multidisciplinary programs involving teams from several institutes. This in most cases is a mix of lab and patient-oriented translational work.

For universities that fortunately still have their own intramural funding, this calls for change. They have to relate more with stakeholders in society to (re)orient their research, both basic and targeted in a mode-2 fashion. Not only in Utrecht this has already started to varying degrees, in anticipation of EU HORIZON 2020 which targets the so-called Societal Grand Challenges.

Also NWO has been advised by a recent committee to take this programmatic/thematic orientation. NWO because of its inward-looking, rather positivistic & reductionist orientation is not trusted by societal partners for starting programs on real world problems. This of course is played out not even subtle by parties from the private sector who wants to try to secure a bigger piece of the pie. It is to me a question still, whether and how NWO could do programming of science.

## **7. Communication**

Finally, how to tell and sell the story of modern science to improve our relations with and trust by the public. My proposal is to be honest and open, also to our students and young researchers about how science in practice really works. Let's do away with our stories about the myth of science as a perfect method performed by individuals with high moral values without any bias or interests. Let's explain how science does make objective facts but that a lot of uncertainty remains. Let's tell about science as a job, as a career and how the economy of science shapes science and the content of our science. Be honest, that in particular regarding complex real-world problems a lot of uncertainty remains and scientists have personal beliefs that shape their scientific ideas. I recommend Paul Wouters' paper in Dijstelbloem and Hagendijk's book.

## **C. The bigger societal picture**

### **8. Problem choice**

Finally the problem of agenda setting in a democratic society presents itself. How are we organizing this process designated by Kitcher the 'ideal deliberation'. In our country, as probably elsewhere, this is an imperfect and haphazard process that is not really transparent and not really democratic. How did we arrive at the TOP SECTORS? How ideal were these deliberations? Is there in the future a role for the KNAW? The KNAW has produced in 2011 a little book with 49 big questions coming up from

the scientific fields, as sort of a national research agenda. This was, however, not in deliberation with representatives from society. Much change is needed....but this is very complex indeed.