11 Real knowledge please!

Science and democracy

Since the formation of a new Dutch government in 2010, we have witnessed the revival of an old debate in all its glory: how and when can science help solve the great problems we face in modern societies? As part of its new take on innovation policy, the incoming administration immediately appointed nine so-called 'top teams' and asked them to report back within a couple of months with proposals for government investments to stimulate social innovation or progress in a particular domain. Each team had four members, overwhelmingly men recruited from universities, SMEs, Dutch-based multinationals and ministries relevant to the 'top field' in question. How did the teams tackle this assignment, where did they seek advice and who lobbied them about specific issues and wishes? To take one example, the Life Sciences Top Team toured the country talking to public officials and entrepreneurs active in local networks for secondary and higher education, knowledge production, innovation and knowledge exploitation. It also invited senior representatives from universities and medical research centres, the Netherlands Organisation for Health Research and Development, the Netherlands Organisation for Scientific Research, health charities and patient groups to The Hague. All nine teams reported back as instructed, with the relevant ministries then distilling the findings for life sciences into a chapter of the resulting policy statement with the ominous subtitle 'Business policy in action'. The entire in-

novation program is dominated by economic objectives. Although that was only to be expected given the task assignment, the ministry leading the exercise (Economic Affairs, Agriculture and Innovation) and the new government's known stance towards the arts and sciences, it is still disappointing because it totally overlooks the role they play in the broader development of society: shaping our well-being and quality of life, as well as indirectly fostering a creative and innovative climate which, in turn, encourages entrepreneurship.

Despite the fact that *To the Top* is the product of a modern and interactive process, it raises questions as to how, in a democratic nation, we decide which problems should be prioritised and what scientific research is needed to address them. This is also about the research we are not doing, without apparently having taken explicit decisions in that respect. In determining the R&D agenda, do we have procedures in place which have proven their worth? Did the Life Sciences Top Team apply such a democratic procedure to talk to all relevant interested parties? No, it did not! Nor do we have a procedure that matches or connects demand from society to the supply of research in an ideal and integrated manner. This is increasingly problematic, since a growing number of issues require extensive and expensive scientific investigation if we are to find a solution for them, whilst the resources available for research and education are limited and declining.

From blank cheque to co-creation

If science has to prove its worth in tackling the real problems facing society, how then does it deal with the game of supply and demand? Not very well is the answer, although it is steadily improving. I say not very well because traditional science would still rather steer well of the really complex issues. In the reductionist

science we were trained in, choosing the 'right' problem is hugely important. After all, concrete results have to be achieved in the form of publications in leading journals, which for the individual researcher translate into credits towards further career development in the form of research grants, more articles, recognition and appointments. To achieve such results, complex real-life problems are simplified down to small, manageable ones which can be reproduced and studied in an artificial laboratory setting. Not without reason did Sir Peter Medawar call scientific research 'the art of the soluble'.[1] The choice of topics is usually investigator driven, supply-led, therefore, and largely determined by the internal values of the discipline in question. This remained the dominant model for the conduct of science at universities until well into the 1980s. Up until that point, sociologists and philosophers of science regarded it as a process at arm's length from society, at least in substantive terms. They assumed that the omnipresent 'invisible hand' would ensure that researchers' individual actions and motivations would guide them towards the best possible result for science as a whole. And why should anyone doubt that? Science had, after all, delivered so many fantastic things.

As a result of mass access to higher education, the public has become much more well-informed over the past thirty years. It is excited and interested by science as never before, but also far less overawed and certainly more critical towards it. Like other institutions, science today has less natural authority. And because research has become far more expensive and capital-intensive, those responsible for it are expected to be more accountable to the outside world about what they want to study, why and with what potential deliverables. No longer can we fall back on the classic positivistic attitude of old, with researchers demanding unconditional trust and credit on the grounds that all science is worthwhile and represents a 'public good' which advances society and 'makes man truly free'. That can be pretty disconcerting if, like the current chair-

man of the *Netherlands Organisation for Scientific Research* and both the president and the director-general of the Royal Netherlands Academy of Arts and Sciences (KNAW), you worked in physics, a field in which you could always count on a near-blank cheque worth hundreds of millions from the government. We in the life sciences, in particular, have seen how this traditionally dominant supply-led model of university research has given way to a new one based upon demand from society, with external factors exerting a huge influence over the choice of topics and with research plans being tested ex-ante for both inherent scientific worth and actual value to the demanding party, and the same tests then applied again to the eventual results and products. In this process, researchers and stakeholders, potential users and other interested parties in wider society, form a team. To achieve that, researchers go out into what Nowotny et al. call the 'agora' – the marketplace – to encourage discussion and feedback about their work.[2] Knowledge production thus becomes coproduction, with its generation, testing and application also externalised in the same way. This process brings about not only good science, as measured by internal standards, but also robust public knowledge with utility for society. The significance of research has become context-dependent rather than absolute, a factor of societal wishes that differ with culture, place and time.

Disciplines hinder innovation

Tackling the actual and complex issues facing society requires a working relationship with the real world, then, but that is not the only thing universities and research institutes need to improve if they are to position themselves better for a new public role. In his book *The Marketplace of Ideas*, Louis Menand explores a number of the problems which hamper such organisations in making the best possible contribution to modern society.[3] Menand teaches

English Language and Literature at Harvard and looks at 'the university' or 'the college' from that perspective. Despite the fact the 'the university' as such does not exist, simply because the different faculties making up today's institutions vary enormously in their relationship with the issues Menand identifies, his book is still an excellent reflection on what is going on there. The essays read like analyses, not shying away from great leaps, but they also have the feel of a pamphlet, a warning. He first presents a historical analysis of the problems in the humanities, which were all to do with public doubts about the return on investment from that research and the post-war struggle to exclude ideology and politics from it, so that these disciplines might acquire an independent, neutral and more scientific reputation. As regards the widely-felt lack of public appreciation for the humanities, Menand comes out with an interesting revelation when he comments that he actually envies scientists working in biomedical or technical disciplines, who have to join battle with the market in society on an almost daily basis in order to carry on doing their research. At least that shows that their work has some relevance to the real world, where there are stakeholders who need to appreciate it.

Menand highlights two interrelated problems concerning the lack of interdisciplinary academic schooling received by students today. The first is the resistance to broad training at the undergraduate level, the second the far-reaching compartmentalisation of scientific education and research into narrow professional disciplines. He very concisely relates the history of the Liberal Arts Bachelor's degree and the negative reactions it has provoked down the years. The antecedants of this wide-ranging programme first appeared as a response to the rise of specialist research universities with a strong focus upon practical courses with direct benefits for society. Columbia and Harvard were the first institutions to offer Liberal Arts degrees, from 1919 and 1945 respectively, and many others have followed their example since. Even at Harvard, though, with

its intellectual high flyers, only 10 percent of graduates go on to read for a related PhD, with another 50 transferring to medicine, law or engineering, or going straight into the business world. The idea behind the programme was later refined by famous Harvard president James Conant and others, who wanted it to give students intellectual equipment that would be of use to them in solving the problems of modern society, such as growing socio-economic inequality, and in facing up to moral relativism. Reading the same classic works as their illustrious forebears would connect them intellectually to the legacy of the great thinkers and provide a common grounding from which they could make their contribution to the world. It would also enable them to understand the various intellectual and political forces which shape the established order and set the tone of public debate within it. Courses making up the programme had such evocative titles as Problems of Citizenship, Western Civilisation and Contemporary Civilisation. Conant explicitly referred back to the work done by a previous president of his university, Charles Eliot, almost a century earlier. According to Menand, Eliot not only introduced a more 'elective' format for the undergraduate programme, something other universities had already done, he also made sure that from 1900 onwards a Bachelor's degree became a prerequisite for students wanting to study medicine, law or technical sciences at Harvard. This enhanced the prestige of those professional courses, ensuring that they were no longer populated by teenagers looking for the fastest route to a comfortable job. Harvard's trainee doctors, lawyers and engineers were now graduates with a broad intellectual grounding, who had already learned to think and write in an academic way. Menand goes on to describe the internal forces, arising out of professionals' desire to teach 'their own discipline', which continue to threaten the provision of Liberal Arts programmes. Economists, for example, would like to see Accountancy taught at the undergraduate level, but according to Menand that is not an academic subject and so belongs in a voca-

tional programme. On the other hand, the history and theory of accountancy might well find a place in the Liberal Arts curriculum: exploring these aspects helps the student to understand why things are as they are and what assumptions underlie our thinking and our institutions, thus enabling them to function more effectively within the system called society. The US has in recent years seen a revival in appreciation for such broad-based Bachelor's degrees, which stand in stark contrast to the European approach to education with its focus upon plunging students straight into 'a real subject' so that they can enter the labour market and thus start generating an economic return on investment as quickly as possible. Not long ago, Martha Nussbaum stated that – in theory, at least – a broad-based first degree in the Liberal Arts provides a student with the best basis from which to function as a citizen of the world. She even suggested that much of the strength of the US economy rests on such programmes, which deliver flexible, broad-minded and creative individuals.

Almost without exception, the problems modern society wants to see solved require a co-ordinated multidisciplinary approach. This means that researchers from different backgrounds have to learn to work together. In the life sciences we no longer think just in terms of collaborations with chemists and medical practitioners, but also about the engineers and social scientists who can join forces with medical researchers to improve healthcare and make it more affordable. To achieve this, though, we need to tempt scientists to look beyond the boundaries of their own disciplines and specialisations and to forge working relationships with colleagues proficient in totally different fields and fluent in totally different jargon. Menand outlines the history of scientific professionalisation and specialisation, and describes how it has affected education and research. Although specialisation was originally devised as a means of protecting professional practitioners from detrimental outside influences, he notes that compartmentalised disciplines

have found it all too easy to fall into an excessive drive for greater autonomy and self-promotion. Rather than generating new knowledge, it sometimes seems as if they are more interested in churning out the next generation of carbon-copy specialists, their abilities, behaviour and skills all moulded by a set of internal standards and values. Menand calls this the 'production of producers'. As a result, the generation of knowledge is also guided too much by those same standards and values and not enough by its potential contribution to solutions outside the discipline, in the real world. And that is before we have even come to the ability and willingness to join multidisciplinary collaborations. Menand describes all this with palpable irritation, but also with an empathy for the issues which reveals the applicability of his book's subtitle, 'Reform and resistance in the American university'. The problem has been around for a long time, he says, but our academic socialisation is stubborn and often deep-seated. One interesting idea he raises is that pressure from the market – that is, the demand side – confronts scientists with 'the reality checks of life outside the university' and so forces them to look beyond their own discipline and leave the safe harbours of their own making in order to 'stay in business'. Menand's main focus is the humanities, but if readers from the life sciences think that his analyses do not apply to them then they are deluding themselves. Wherever there is specialisation, walls exist – or will rise sooner or later – to hinder external interaction. We see instances of that every day at modern research institutes, which have to be actively managed to keep them decisive and competitive. It is where innovation occurs that interdisciplinary collaborations are forged and sometimes even so-called 'transdisciplines' emerge: the convergence of, say, engineering, physics and medical biology in an effort to solve complex problems. This situation is placing new demands upon the researchers of today, in terms of their ability to think and work in a generalistic, multidisciplinary fashion and to develop teamworking, communication, commercial and manage-

rial skills. As it is something we now encounter frequently at the modern university, that should inevitably force us to ask ourselves whether we are giving our students the right education to equip them for the complex multicultural society they are going to have to operate in later on.

Relevant knowledge please!

Menand analyses the current state of university teaching and research in the light of external developments, but he says nothing about the structure of universities' relationships with the third parties making demands of them. In other words, he does not explore how the research agenda is or should be set, how we can ensure that it retains scope for 'public' activities – fundamental research, for example – and how relevant, preferably multidisciplinary education might find a place in it. This thorny topic has been tackled by the philosopher of science Philip Kitcher, however, in a book published some years ago, *Science, Truth and Democracy*.[4] Employing a sociological analysis, Kitcher argues that the researcher's own curiosity is an important driving force, and even a critical success factor, but that every investigative project, however basic, is always conducted within a framework of wider external interests. All research is subject to concerns of a practical and fundamental nature. He illustrates this through the development of Dolly the sheep, created by cloning, a trick of molecular biology. Dolly was made possible by knowledge and expertise acquired over many years of research, pure as well as applied. The whole idea of pure scientific investigation is very largely a myth, then, because social and moral values always have a part to play and they, according to Kitcher, are intrinsic components of science. He sees a role for external influences, without them destroying the objectivity of science and its products. In this vision, the goal is not to find some absolute and

timeless truth – many truths are worthless, after all, especially to society at large – but to seek 'significant truth', which is scientifically and socially or practically relevant, has value and is recognised and acknowledged accordingly by the outside world.

This immediately raises a problem: agenda setting. There are more than enough topics we as scientists could investigate, but choosing those worthy of research cannot – and in practice is not – left to science acting autonomously. Kitcher comes to the conclusion that there are serious issues with this situation as it currently stands. Science, he says, is still controlled far too much by a combination of academic and societal elites, 'the rich and the powerful', as a result of which the needs and wishes of the economically and socially weak are underrepresented in the overall research portfolio. He believes that what he calls 'ideal deliberations' between scientists and stakeholders are needed to optimise the situation, the optimum for him meaning a portfolio that reflects our collective values as accurately as possible. And they are not objective, timeless values, but subjective ones shaped by person, time and place; values which, in a democracy, should be actively coached by means of what he beautifully describes as the 'tutoring of preferences'. The ideal deliberations, he explains, provide a democratic basis for a programme of research that does justice to all the various wishes extant in society. In this 'well-ordered science', possible research topics are assessed holistically, bearing in mind their cost and method, feasibility, impact and potential, practical utility, risks and ethical factors. Scientific experts, the government, politicians, businesspeople and well-informed lay participants all contribute to a discussion weighing up the interests of everyone concerned, including the less fortunate and future generations. If applied faithfully and consistently, this process would do away with such concerns as whether work on medicines to fight tropical diseases in the developing world is being neglected in favour of more lucrative treatments for the lifestyle ailments of rich patients in the West.

Kitcher, follows the classical linear model of science, regarding scientific advise as distinct from policy advise which implies a particular role for scientists in these ideal deliberations. The scientist in this traditionale role acts as arbitor and provides information about the current state of scienctific understanding regarding the problem on which scientific advise is requested. This somehow assumes that for policy issues science has consensus to offer, which however is not always the case. In science consensus is presented in text books which summarize the broadly accepted knowledge and are used for teaching undergraduates to make them familiar with the broader concepts and ideas of a particular research field. Experts and insiders who know the frontiers of the field or actively contribute new knowledge realize that knowledge in text books may be already obsolete. At the frontiers, new knowledge claims are being made at meetings and published in the literature which is in many cases accompanied by vigorous debates about the quality of data and the plausibility of the interpretations that are being presented. Thus at the frontier of science many different views may co-exist and this pluralism sometimes may take considerable time to resolve. Moreover, for more complex policy issues scientific knowledge may not be unambiguous and scientists may not simply offer one advise, but a variety of scientific insights may be relevant which may of course lead to different policy choices. In such cases scientists based on their scientific insights may choose to support a specific policy option and link up to a specific political interest group. Scientist-advisers in that case may thus give different and even contradictory advise all based on current scientific understanding. This makes science and the scientists vulnerable to claims by opponents, both lay and scientists alike, that science is not independent and even colored by non-scientific beliefs and aims. This 'issue advocacy' by scientists which is increasingly observed, thus is problematic since it rapidly undermines the integrity of science and scientific advise to policy as Pielke has correctly pointed out.[5]

Pielke has suggested that scientific advise in more complex policy issues may be more valuable and effective if scientists consciencely chose to provide integrated advise and do not limit their advise to the one option they personally find most reasonable, but present and evaluate based on the available scientific insights a variety of policy options from which the stake holders can then chose. In that role of 'the honest broker', as Pielke named it, science and scientific advise does not limit, but expand the options for policy choice and allows the stakeholders to make the choice that fits their aims and world views best. As 'honest brokers', scientists thus make it explicitly clear that at the frontier of science there is not always consensus but there may be pluralism and they do not need to make a choice which science is best. As honest brokers they certainly do not adopt the role of the 'policy advocates' with the risk to be played out against each other. Pielke argues correctly that as honest brokers scientists will strongly enhance the integrity of science in the (ideal) deliberations that may lead to a policy of choices. In such a process, scientists advisers and politicians will clearly have different tasks and responsibilities and politicians can not, as they often do when they are criticized for their decisions, simply point to the scientific advisor.

Science and democracy

Kitcher realises that this idealistic vision might for several reasons be perceived as threatening by a scientific community afraid that the public would deem many of its research proposals irrelevant and that in a winner-take-all game, what he calls 'vulgar democracy', a lot of important work would be voted down because the greater social interests associated with it are not regarded as a priority. It is also conceivable that the relevance of a lot of fundamental research is simply incomprehensible to lay people, so that they are

unlikely to be enthused by it even when it is of major underlying importance in tackling relevant social issues. Kitcher terms this 'the tyranny of the ignorant'. In the Netherlands we have a populist political party which views science per se as the hobby of a left-wing elite. This it accuses of organising an international conspiracy around a wide range of social issues in order to finance that private pastime with public money. Concerned scientists point to the knowledge gap between experts and lay people highlighted by such opinions. To avoid problems and placate the public, in this situation scientists easily fall prey to the old reflex of making promises about the likely results of their work. Promises they might be unable to keep, causing further loss of confidence. The fears scientists have are well-founded and need to be tackled effectively by them and their institutions, through substantial investment in interaction with the public and politicians.

In this form of 'well-ordered science', the government has a role to play as guardian of the deliberations' democratic credentials and of the interests of all its citizens, now and in the future. In the battles in the US over 'Obamacare' and the massive budget of the National Institutes of Health (NIH), there are political lobbies at work which hold extreme views and have no qualms about deliberately spreading misinformation and false accusations that make not just American scientists shudder.[6] In our social democracy, economic interests must be weighed against those of health, welfare, prosperity and sustainability in such a way that, rather than the strongest players or the loudest voices always prevailing, all concerned engage in good faith in an ongoing dialogue founded upon sound argumentation. There can be no doubt that this is a delicate process, involving public and private interests that are poles apart. It is also why Kitcher believes that the privatisation of science should be fought tooth and nail, because it serves only the uncontrolled, unmanageable and 'untutored' preferences of rich and powerful players. This clash of interests is familiar to us from everyday practice,

but it also teaches us that, despite the very real dangers highlighted by Kitcher, private partnerships in conjunction with a strong public science sector can act as a powerful catalyst of research and innovation. I believe that the wishes of private and wealthy parties can and should be given a fair hearing and that it is the process of well-ordered science proposed by Kitcher that is badly needed to provide that, and so should be organised to do so. These ideas should of course shape the university and medical research portfolio, but they should also be conveyed in education. The majority of the general public, current and prospective university students included, still view science along traditional lines as a reductionist, supply-led activity organised into the classic disciplines. Neither science nor the world is perfect, of course, but I agree with Kitcher that the task of researchers, institutions and their managers is to come as close as we can to this ideal of well-ordered science. In fact, it is one of our democratic duties.