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RATHER THE POISONED CHALICE: ON UNIVERSITIES AND THE MARKET

The seeds of great discoveries are constantly floating around us, but they only take root and germinate in minds well prepared to receive them. (Joseph Henry)

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Dutch universities have been on a rollercoaster ride for at least half a century now, making it difficult to get a clear picture of the situation. Nevertheless, it is possible to create a measure of clarity by reducing the apparent complexity into a number of simpler factors. The main cause of the current commotion has been the expansion of the universities, with the vast increase in student numbers caused by the democratization of admissions policies in the late 1960s. Secondly, there is the trend towards social engagement, at first determined by the opening of the universities ivory towers to society in the broadest sense, and later by channeling this into the more limited direction of the corporate world and other markets based on supply and demand. These two processes are of course related: when student numbers increase, expenses rise. Retrenchments must be made, or income from financial sources other than government must be found. A third development involves the lowering of scientific education and research standards. Retrenchments usually mean a reduction in the length of courses and in the introduction of mass education. Moreover the market is only interested in research that leads immediately to practically applicable and profitable results.

In an economy that depends highly on scientific knowledge, as is the case in the Netherlands, only one of these three developments seems worth striving for: the increase in student numbers. After all, this ensures that the knowledge potential is better exploited. Of the other two, market-orientation is dubious, but the lowering of academic standards is obviously objectionable. In order to elaborate on these statements and elucidate them, let us look at the history of science over the last couple of centuries: while the developments I have mentioned above may have become very

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problematic recently, they are certainly not exclusive to our own days. It was the Dutch physical-chemist Jacobus van 't Hoff who said in his inaugural speech at the University of Amsterdam in 1878:

> "The number of people involved in scientific research is increasing; it used to take insatiable thirst of knowledge and outstanding talent to conquer the obstacles that stood in the way of a scientific career; nowadays this road is wide open. It is for this reason that increasing student numbers are forcing standards down; special talents like imagination, are poorly represented compared to the more general ones. This has altered the way science is practiced."

The increase in number of students meant by Van 't Hoff was a doubling from four to eight. Happily for him, Van 't Hoff had no idea at all of today's student numbers. Indeed, it was during Van 't Hoff's time – the Fin de Siècle 1900 - that scientific developments started occurring with greater frequency.

The Fin de Siècle was an era with two totally distinct aspects. On the one hand there was a sense that science, and physics in particular, was almost completed. Newton's laws of motion excellently described and predicted the behavior of the material world. James Clerk Maxwell's laws did the same for electromagnetic radiation, for example light, and the four fundamental laws of thermodynamics gave us insight in the processes of energy transfer. These laws together constituted what was seen as the solid foundation for an almost complete structure of physics. Almost, because there were a couple of problematic phenomena – for example unsolvable mathematical equations, black body radiation, the photoelectric effect, the atomic model and the constant speed of light – but these were considered to be of minor importance, and it was thought that it would be just a matter of time to fit these phenomena into the existing framework. In 1894, the physicist Albert Michelson proclaimed in a lecture that further progress in physical science in the twentieth century would be confined to the sixth figure after the decimal point.

However, the physical sciences have never undergone more changes and progress than during the fin de siècle. In 1892 the mathematician Henri Poincaré laid down the basis for chaos theory. Then, in 1900, Max Planck, who had hesitated to study physics for lack of future prospects, stumbled by accident on quantum theory. Albert Einstein formulated his theory of relativity in the years 1905 and 1915. In less than 25 years, a whole new theoretical basis for modern physical science was laid out. Further more, spectacular developments were not restricted to theory. The field of experimentation produced many surprises too. In 1895 Wilhelm Conrad Röntgen accidentally discovered the x-rays, which would later be given his name. A couple of months later, in February of 1896, Henri Becquerel, together with Marie and Pierre Curie, also accidentally discovered natural radioactivity. Irene Curie, the daughter of Marie and Pierre, and her husband

Frederic Joliot managed to produce artificial radioactivity in 1934. Otto Hahn and Lise Meitner stumbled on nuclear fission in 1938. It was this last discovery that opened up a new range of perspectives as Western society found itself on the brink of the Second World War. What is essential, and therefore must be emphasized here, is that all these discoveries were not sought after, but were accidently stumbled upon in a wide range of scientific research.

Important developments in the late nineteenth century occurred in many more fields than just the physical sciences. In medicine, rapid progress was made through the development of the first painkillers and remedies for infections. Sociology gathered momentum through the work of Emile Durkheim and Max Weber, psychology through Freud's psychoanalysis, cultural studies were transformed by revolutionary developments in the field of literature and other arts, while Friedrich Nietzsche changed the face of philosophy forever. But let's follow the course of history a little further and make a jump in time of half an age. In spite of the scientific and technological successes that for most part resulted from the Second World War – such as the rapid development of nuclear energy, computer technology and synthetic fibers – academic science still appeared to be isolated from the rest of society. In paving its own autonomous paths of research, it was principally driven by curiosity and the thirst for knowledge of individual researchers and students. A fundamental change occurred in the 1960s and 70s, when critical students and researchers became fed up with the so-called elitist obsessive indulgence in scientific navel gazing in ivory towers, and campaigned to put science in the service of society. Science had to care about society and to occupy itself with solving concrete and actual social and technical problems. Moreover, universities had to open up to students from the lower social classes who were traditionally poorly represented, which would allow the social weaker groups to rise economically from their lowly status and share the power and the responsibility that comes with the possession of scientific knowledge. In an attempt to ensure that these ideas were implemented, the university was democratized. Demonstrations and sit-inns resulted in students and workers gaining a say in academic policy and decision-making in the new university councils.

The mistake these students made was the same one Karl Marx had made 120 years earlier. Ivory tower science may be arrogant and elitist, but it is also arrogant and elitist to think that there are groups in society who need to be liberated: most people prefer to bend under the rule of another's power above carrying their own responsibility. Consequently, when power, in the shape of scientific knowledge was displayed in the academic shops and stores, it was not the people it was meant for who were buying, but the well-known faces in government and industry who were buying wholesale! And the problem with these people is that they want power badly, but they can only think in terms of political, economic and military power, resulting in an immediate translation of scientific knowledge in those terms. Let me give you

a few famous examples: our physical knowledge is translated into a high-tech war machine, our medical knowledge into a billion-dollar pharmaceutical industry, and how our genetic knowledge will be translated in the near future, the devil only knows. So, while science did end up serving society, it wasn't exactly the society that yesterday's student demonstrators had in mind.

The supposed need to control costs and the sale of scientific knowledge have led to an increasing hold by government and the corporate world on the process of academic education and research. It is a development that the shortly deceased Dutch writer Rudy Kousbroek has described rather accurately as the 'gentle, shabby destruction', in a borrowed line of poetry. For one thing, it has led to a separation of management on the one hand, and education and research on the other. The professionalized university management is concerned more with the *management* of the university than with the management of the *university*.

This may seem a marginal difference, but in reality the result is the complete reversal in the vision of what a university has to be, changing the laboratories and workrooms from creative workshops and breeding grounds for scientific knowledge into company offices where knowledge is manufactured as a product. This is illustrated by the considerable growth of types of education and research with short-term economic prospects commissioned by the government and the business world, and that emphasizes practical use and profitability rather than scientific quality. As far as research is concerned, one in every four professors now occupies an endowed chair, appointed and paid for by a company or institution. Shell, Philips, Nedlloyd, KLM, Vroom & Dreesman, the pharmaceutical companies and Smith's Snackfood Company, all have their own chair, like a skybox in a soccer stadium, as if Friedrich Nietzsche had never written: 'Everything that can be paid for, is of no value. This truth I spit in the faces of the grocers.' A brand new development is the sponsoring of education by Microsoft, in exchange for a company-oriented training, a strategy that will certainly be copied on a large scale. Nowadays scientific knowledge is a product, with input, output, added value, efficiency and profit. The university has become a business, complete with a design manager and corporate identity, hardly distinguishable from a margarine or washing-powder plant. The academic study has been reprogrammed and restructured time and again, with the result that expenses have gone down for government, but have gone up for students; the length of courses has been shortened and content reduced, yet the responsible minister repeatedly states that the quality of the education has improved. Even at this very moment, the last irritating counter force, the students and workers, are losing their say in the university. The councils are being dismantled and replaced by boards of inspectors with a high-profile representation of top managers from the corporate world.

But most disconcerting of all, the ongoing expansion of market-oriented research is robbing the universities of their critical function, which, as Karl Popper has taught us, is what lies at the heart of science. One typical example

is the case of the physicist who, as a professor occupying an endowed chair, worked for the company that owns nuclear reactors. He claimed that nuclear reactors were slightly less safe than usually suggested, and thereafter was ordered to stop publication on punishment of dismissal. Another significant case is that of the geologist who was forbidden to publish the connection he had found between earthquakes in North Holland and the drilling for gas by the Dutch oil company NAM. There are many more examples in this vein which can be found in the recently published book The Unwelcome Message, by Dutch sociologist Andre Köbben. These are only the cases that are known, and they may be only the tip of the iceberg, as we have no way of knowing how many scientists fail to take their academic integrity seriously by keeping their mouths shut. In practice, many of these cases are not blatant lies or public fraud. Usually the truth is not really violated, just manipulated and fine tuned into some form or direction, as required: if the results are favorable to those who commissioned the research they are readily accepted and if they are not favorable, a second opinion is requested in the hope of better results. A recent meta-investigation brought to light that the investigations of the effect of new medicines sponsored by the pharmaceutical industry showed considerable better results than the same investigations that were not sponsored.

In order to show that this plead for free scientific research and education is not just criticism for the sake of criticism, but that we are dealing with an essential and important matter, let us look at a recent study by the French historian Alain Renaut on the consequences of market-oriented research for society as a whole. Around 1800, French universities were reformed to 'Grandes Écoles' that were supposed to focus completely on concrete applicable research. But while Napoleon's army had easily defeated the Prussian army at the battle of Jena in 1806, French science and technology trailed behind the rest of Europe to such an extent in the next 65 years that the French were defeated by a mile in the war of 1870 with the Germans of the Humboldt university, where free research was still practiced. This may seem strange, yet it is really not surprising at all, considering the fact that the history of science proves that almost all great discoveries and findings are not the result of research programs oriented on the government or the world of business, but are accidental discoveries that rise to the surface in the broad spectrum of research at autonomous universities. Apparently, science is at its most creative and productive and at its most applicable and profitable when research can freely develop in time and space.

Although it doesn't immediately follow from the names and examples given before, Dutch researchers were responsible for a relatively large chunk of the developments in the physical sciences at the fin de siècle. In the years 1901 to 1913, as many as five Nobel prizes were handed out to Dutch scientists: Van 't Hoff, Lorentz, Zeeman, Van der Waals and Kamerlingh Onnes. Recently, historian Bastiaan Willink has published a study on this significant phenomenon, including twenty portraits of eminent Dutch physical scientists

who conducted their research between 1870 and 1940. Willink calls this period preferably the 'Second Golden Age' because of the striking similarities with the cultural, scientific and economic high water mark two centuries earlier that fills the Dutch with so much pride: Van Gogh and Mondrian compared with Rembrandt and Vermeer, Van 't Hoff, Zeeman and Lorentz compared with Huygens and Stevin, Shell, Philips and Unilever compared with the Dutch East India and West India Companies. But Willink is concerned with more than just biographies. The rest of the book is dedicated to a discussion of the causes of the Dutch scientific prosperity of the fin de siècle, in order to give a new impulse to contemporary research. The main cause, in Willink's view, is Thorbecke's education law of 1863, which resulted in the formation of the pre-academic secondary education system. This was meant for the upcoming bourgeois class, and offered an education and training with a high percentage of mathematics and natural sciences, providing a rich source of new talent. All the mentioned Nobel prize laureates had enjoyed much of their pre-academic training there, either as a teacher or as a student, moving on at a young age to appointments as professors at the fast growing universities. What Willink doesn't mention is that the founding of the secondary education system had important consequences on other fields of the culture than science alone. The whole literary generation of the 'Tachtigers' and *De Nieuwe Gids* – Jacques Perk, Willem Kloos and Albert Verwey – who are called the 'intellectual focus of their time', was shaped by their teacher, the inspiring literary critic Willem Doorenbos. That means that these poets on the list of Wilmink can be compared with Joost van den Vondel and Pieter Corneliszoon Hooft.

There was, however, another cause for the golden years: Thorbecke, having studied law and history in Germany, was familiar with the Humboldt university and brought this vision on academic structure to the Netherlands. He was convinced that commerce and industry would benefit more from research that was not directly focused on practical applicability, as was the case at the French Grandes Écoles. In the elucidation of the higher education law of 1876 it stated specifically that 'The minister has rightly chosen the German system, which on earlier occasions also won most support in parliament. The implementation of the French system would mean a general decline in the academic level which, given the practical social interests at stake here, would be most harmful.' The results of Renaut's research on the Grandes Écoles therefore coincide nicely with Thorbecke's ideas. Clearly today's developments in Dutch universities are dramatic and we must surely deplore the fact that politicians and other policy makers do not even know the history of their own country.

Indeed, if we focus our attention on the present state of science, we have to make the diagnosis that the last fundamental breakthroughs – the unraveling of the DNA-structure by James Watson and Francis Crick in 1953, the first (American) push to the start of the internet as forced by the launching of the (Russian) Sputnik in 1957, the development of the chip by Jack Kilby in

1958, the introduction of nanotechnology by Richard Feynman in 1959 an the production of the first operating ruby laser by Theodore Maiman in 1960 – took place in the years nineteen hundred and fifty. After that nothing interesting has happened, and it is not by accident that it exactly coincides with the period when the university changed into a commercial institution.

What would universities look like – where society as a whole and the market would profit the most – if we were to take the above history seriously? Firstly, fundamental research and the academic education that provides the training should not be interfered with by politics and business. Applied research is essential of course, possibly even on a much larger scale, but it should come under the umbrella of occupational schools and the corporate world. Secondly, higher education should generally be made as accessible as possible, in order to make even better use of the knowledge potential.

Both points lead to the one and only thing that caused all the changes in the university: the money. How and by whom is all this to be paid for? Although it is the question most asked, it is an unjust question in a society which owes almost everything to science and technology. All our systems of production, transport, communication and defense have been scientifically developed and set up; our health care, our water works, lighting and heating, our principal necessities of life and our luxury goods: we owe them all to science. Our government officials are counseled scientifically, just as our professional sportsmen are and everybody in between. In a word: the difference between the Netherlands and least developed countries, as wealth, health, welfare, comfort, safety and achievement are concerned, is generated by science. Of every euro earned in the Netherlands, at least 90 cents are owed to science, and this is not the result of putting science under the guardianship of politics and economy. In fact, the very reason why the story of science and technology became so successful in Western civilization, in contrast with the Chinese or Arab civilization, is the amount of money we could earn with it. What this argument comes down to is that the government should finance fundamental research without placing any restrictions on it, and a combination of government and business should finance applied research on the basis of market demand.

To conclude: One of the great discoveries of the Greeks, whose philosophy forms the cradle of modern science, was that of criticism: why is something the way it is and why is it not different? Socrates irritated so many people with his incessant query – 'why' – that he was condemned to the poisoned chalice. But the idea of criticism was born and it managed to take root in the heart of the success story that became science in Western society, and it is exactly this critical method of thinking that students at the university should learn when solving fundamental scientific and concrete social and technological problems. To capture the future of the universities in one phrase: teach the students and researchers to be critical in the first place, and

drink rather the poisoned chalice than keep silent because of personal, economical, political or religious reasons.

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