THE ROLE OF THE UNIVERSITY RESEARCH PROFESSOR IN DEVELOPING AND SUSTAINING A KNOWLEDGE-BASED SOCIETY

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My professional role and practice is as university research professor in the life sciences. Therefore, the central aspect of my work is doing research that leads to new biological knowledge. In most developed countries, being a professor at a university is synonymous of being a research scientist in a particular field of knowledge. In contrast, in several Latin-American countries like Mexico, the role of a university professor is mainly understood as giving lectures on a subject about which the lecturer has at best a second-hand knowledge, derived from reading textbooks, with no foundation or direct experience on researching such domain. Thus, traditional non-research professors regurgitate but do not create or teach any new knowledge. Perhaps this situation results from the fact that most Latin-American countries share a common authoritarian tradition in which knowledge based on experience was regarded as suspicious given that cultivating an independent mind is to become not permeable or submissive to arguments based on tradition and authority. Our countries are run mostly by traditional politicians and bureaucrats that seldom ask for expert advice based on reliable knowledge to sustain their political decisions. Which goes in hand with the fact that our societies are largely constituted by undeveloped or incomplete citizens that may obey laws and orders as a matter of fact, but without any sense of personal responsibility that springs from informed consent or social commitment based on knowledge.

Without affirming a cause and effect relationship, it is a fact that the consolidation of modern democratic societies correlates in time with the establishment and dissemination of the modern research university as the privileged model for higher education. The consensus attributes to Wilhem von Humboldt the foundation in 1810 of the first research university (the current Humboldt University in Berlin) that had as first priority the generation of new knowledge and so it was staffed by full-time professors

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devoted to research and teaching based on their investigation experience. Some fifty years later, this model of university had inspired the foundation of new research universities in the USA, such as Berkeley or Johns Hopkins, and by the turn of the century older Anglo-American universities such as Oxford, Cambridge and Harvard had followed suit. The research university model, through the first half of the twentieth century became the standard for prestigious universities in the developed world [1] and is currently the gold-standard for higher education worldwide [2]. Moreover, by the end of the Second World War, Vannevar Bush, scientific advisor to the President of the USA, made public the famous document "Science: the endless frontier" in which he pleaded that the unprecedented gathering of scientific and technological resources that contributed to the success of the USA war effort should not be disbanded, but, on the contrary, it should be preserved as the foundation for a healthy, prosperous and secure society in peacetime [3]. Years later, the economist Robert Solow argued that that new capital is more valuable than old (vintage) capital since new capital is produced through modern technology that is constantly improving as a consequence of research and development (R&D) and so, the products of modern technology (the new capital) are expected to be more productive as well as more valuable [4]. The last third of the twentieth century saw the consolidation of knowledge-based economies in developed countries, and myriad studies have confirmed the positive correlation between national wealth and national expenditure in research and development. Even so, their cause and effect relationship remains a matter of debate, whether R&D is the source of national wealth or whether because there is already national wealth there is money for R&D [5, 6]. For example, in 1970 Mexico was wealthier than South Korea (SK), then in the next forty years SK increased its expenditure in R&D to more than 3 per cent of the GDP while in Mexico it has remained stuck at some 0.3 per cent of GDP. Currently, the per capita GDP of SK is 2.5 times that of Mexico [6], strongly suggesting that investment in R&D is a powerful receipt for social prosperity.

A knowledge-based economy requires the continuous creation of knowledge and thus research is the foundational engine of such economy. Indeed, a knowledge-based society requires trained problem-solvers that work out solutions to specific problems, either fundamental or applied, starting from the most updated knowledge available. A system of higher education directed at training and providing new generations of expert problem-solvers depends on research professors able to transmit and inform the habits of a critical and creative mind that from analysis proceeds to synthesis, one that is continuously involved in identifying interesting questions (problems) and devising and pursuing strategies for answering such questions. Such a frame of mind is the fundamental skill necessary for problem-solving, no matter if the students will become either

full-time researchers or devoted professionals that will practice their particular discipline as an ever-developing, problem-solving activity. In all developed societies there is leading elite of experts that continuously pushes forward the boundaries of knowledge and development in all disciplines, and such elite is selected and trained within the space of the research university. Obviously, not everybody is suitable for or desires to become part of such group, as this implies continuous dealing with uncertainty at the edge of knowledge. There should be separate learning and training options for a majority of students that want to fit usefully within the job market, yet without assuming the intellectual challenges posed to the thinking elite, in charge of furthering a knowledge-based society. Therefore, different models of institutions for higher education (IHE) exist, albeit no contemporary society can thrive and develop without a set of well-funded and recognized research universities that produce the necessary elite of problem-solving experts.

The dedicated research university is at the core of successful contemporary societies [8]. Sadly, despite the international consensus on the need and importance of the research universities [1, 2], in Mexico and some other Latin-American countries, the "academic authorities" continue to peddle the misguided opinion that our public universities should stick to their idiosyncratic tradition of mixing (rather non-efficiently) under a single roof several models of higher education, instead of supporting the establishment of separate types of IHEs with well-defined roles and purposes [9]. In Mexico, both the association of IHEs and the official body for advising the Mexican government on scientific and technological matters have shyly suggested in 2003 that current public universities should adopt the research university model [10]. A decade later, the traditional and inefficient hybrid model of multifarious, public university survives in Mexico unscathed, wasting enormous amounts of time, money and human resources, while producing (or expelling?) hosts of traditional *licenciados* bound for chronic unemployment, since their training and skills are redundant in a modern knowledge-based economy.

Considering that the university research professor has a major role in teaching and training the necessary elite of problem-solvers for a contemporary society that thrives on a knowledge-based economy, besides doing research that creates new knowledge which is the engine of such a society, it is worth a word of reflection on the nature of scientific research. The current debate on whether there should be more applied than fundamental research is a false one, sponsored by those who have no real idea of what knowledge is and means. It is naïve if not outright silly to think that somebody created cell phones, laptops or new cancer-treating drugs from scratch, or just by willfully going after them without any previous foundational knowledge. On the contrary, it is because there was already a lot

of fundamental knowledge derived from basic, fundamental research on physics, mathematics and molecular biology—"blue sky" research carried out just for the sake of finding out how nature or the intellect works—that then it became possible for some clever people to gather bits and pieces of such available knowledge in order to imagine, design and produce cell phones, lap-tops and new cancer-treating drugs. Fundamental research is the endless source of any real innovation and without it the goose that lays the golden eggs will go barren very soon [11]. As a matter of fact, the South Korean society that has remarkably developed during the last forty years based on large investments in applied research, has realized that it needs to become a major world-player in the generation of basic, fundamental knowledge, seeing this as the ultimate source of their autonomy and survival as a successful knowledge-based society. Therefore, the current SK government is starting an expensive crash program in order to duplicate within ten years the number of scientists involved in fundamental research [12]. I hope that my country, Mexico, will finally learn from the SK example and move positively towards becoming a further knowledge-based society instead of remaining atavistically attached to its fear of knowledge.

NOTES

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