THE FUTURE OF UNIVERSITIES

Jan W. Vasbinder, 20 November 2020

1 From then to now

1.1 The illusion of control

Among all the things it is doing, Covid-19 is puncturing the illusion that we, as individuals, organizations or governments, are in control[1]. That illusion created a pattern of thought that entices us to believe that we can control the emergence of our future. The uncertainty that results from puncturing this illusion, enables (and forces) us to think about our future *as a context* over the emergence of which we cannot have control.

Human societies and the ecosystems they depend on are going through momentous changes. How to understand these and meet the challenges they pose are existential questions for humanity. In trying to find answers to these questions, we have to deal with two key positions that present-day universities hold in our world. They are strongholds of education and bastions of science[2]. These positions developed over time, partly in response to slowly changing societal needs and partly as a continuous outgrowth of institutionalized efforts to collect, centralize, systematize and pass on human knowledge. When changes are slow, the future seems predictable, allowing us to build structures on the illusion of control.

Maybe because universities evolved as institutions where knowledge is advanced for the betterment of society, societal disruptions have had little influence on the evolution of its structure[3]. If so, universities, by their very nature, are shaping the future and thinking about the future of universities is actually: *thinking about the future of the future*.

The control illusion
At any time, a society is a collection of individuals with people that have ages between zero and "eighty plus". Through stories told by their parents and grandparents some of the "eighty plus" people may have an "emotionally loaded" memory that goes back as far as a hundred years. In traditional societies where stories are passed on from generation to generation, that memory span may be much longer, but one should make a difference between the memory (and wisdom) embedded in a story and the active memory about events and control that is passed on from grandparent to parent to child. And of course, memory, like knowledge, is a strange thing. It builds up as one grows in age and experience, it mixes what happened recently with what happened a long time ago, it tends to deteriorate as we grow older and it disappears when we die, or rather, most of it disappears while some of it is reshaped and transferred to those that survive us. It illustrates that people and the societies they form are complex adaptive systems. What can the notion of control be in such systems, other than an illusion?

Complexity and evolution
From the point in time that the big bang occurred, the laws of physics and complexity have been features of the evolving universe. The ***laws of physics*** *allow us to expose the history of the universe all the way to the big bang (reductionism allows us to look beyond the innumerable properties and features that emerged in the ever more diverse and complex universe). The* ***characteristics of complexity*** *such as emergence, adaptation and self-organization prevent us from knowing the future (we cannot know what new properties and features will emerge as the universe and all that is part of it continues to evolve).*

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1 Over time the control illusion has established thinking patterns in which equilibrium is seen as the inevitable outcome of a process, rather than a frozen moment in its continuously changing dynamics.

2 The latter position developed after the establishment of the Humboldt University in 1810 and the (implementation of the 1945) Vannevar Bush's report, *Science—the Endless Frontier*, that stated that it was *in the nation's best interest for the federal government to fund university research*.

3 At least that seems to be the case since the Humboldt University was established.

1.2 The growth of the disconnect between science, society and universities

Science is defined by the people working in it. It is also defined by the methods they use to find the true answer to a question.

These *scientific* methods were strongly inspired by René Descartes who believed that knowledge can be attained by reason only, thus eliminating the need of experience. This rationalism[4] was one of the concepts that guided the development of western science since some 400 years ago. Another concept was reductionism. Reductionism essentially refers to the practice that problems that cannot be solved with the tools and methods at our disposal, are decomposed into smaller problems that can be solved. We then trust that the solution of the original problem follows from a linear combination of the solutions to all the partial problems. But more and more we find that this trust is misplaced and that the solutions we construct by combining the partial solutions, do not match the problems we tried to solve. The reason is that we are ignoring the complexity[5] of the problems we want to solve.

The Nature of Complex Systems
In his review of John Holland's book: "Signals and Boundaries"), Cristoph Adams **) wrote: "Complex systems do not easily lend themselves to analysis, the process of taking apart a system and examining its components individually. If taken apart, many complex systems lose precisely the character that makes them complex. The essence of these systems then, seems to lie not in the nature of their components but in how the components interact—across different hierarchies, in synergistic and antagonistic manners."*
*) John H. Holland (2012), *Signals and Boundaries, Building Blocks for Complex Adaptive Systems*, MIT Press.
**) C. Adams, "*Boldly going beyond Mathematics*", Science Vol. 338, 14 December 2012.

In the last 400 years science did not address wholes, but, following the reductionist approach, looked at components and parts. As it did, **it split up into a large number of disciplines**. And, as it moved away from complexity[6], it strengthened the illusion that we are in control. Now, that the complexity of the world has become increasingly clear, the 400 years of reduced reality and living with an illusion has come to haunt us.

*Science is **not** about raising the right[7] questions.*

Somehow, during the last 400 years in the West[8], science evolved to become regarded as the only field of human activity that raises questions worth answering. Equally, the situation evolved in which it became overlooked that the choice of questions raised by scientists was predicated on the assumption that they could be answered by rigorous scientific methods. In other words: because science has methods to find true answers to

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4 Rationalism is the epistemological view that "regards *reason* as the chief source and test of knowledge" or "*any view appealing to reason* as a source of knowledge or justification".

5 Even though there is a whole scientific field studying complexity and complex systems, there is still no clear or generally accepted definition of complexity (see e.g. Melanie Mitchell (2009), *Complexity, a guided tour,* Chapter 7). However, there are tell-tale behavioral patterns of systems that "designate" them as complex, such as emergence, self-organization or adaptive interaction (John H. Holland, (2014), *Complexity, a very short introduction,* Oxford University Press).

6 Although not the subject of this note, it is noted that governance of most countries, international organizations, companies and institutes have followed a very similar path.

7 By "right questions" are meant questions to which the answer is relevant for mankind. Somehow "right" seems a wrong word to indicate what relevant questions are. At the same time "relevant" seems to be a wrong word to indicate what right questions are.

8 The West defined as Western Europe and, in the last 150 years, the US and Canada.

questions, it became accepted (by scientists and non-scientists) that the right questions to ask are those that can be answered using such methods[9]. To scientists the only relevant questions are those that can be tackled by scientific methods. These questions mostly originate and are addressed within the boundaries of one discipline, where we can believe that control is real instead of an illusion. But most questions that occupy the minds of individual people and are relevant to mankind in general, cannot be answered using scientific methods. They do not originate in scientific disciplines, but in the real, messy and complex world.

As science developed its rigorous methods to produce true answers to questions, universities developed into institutes that educate the young generation to use and further develop these methods[10].
Throughout the ages, science and universities co-evolved, and so did their relationship with society. Until WW-II, this co-evolution seemed to benefit everyone. But in the 2nd half of the 20th century that slowly but irreversibly stopped being the case. Following WW-II a transformation took place that changed the relationships between science, universities and society. With day-to day changes too small to be noticed[11], science transformed from a passion to understand the laws of nature (and society) and make those work for humanity[12], into a mechanism to support greed[13] and special interests.

Similar to science becoming the only field of human activity that raises questions worth answering, universities became the chosen places for studying these questions. And like science, universities moved away from the complexities of our world and the questions and concerns of common people. Instead they evolved into discipline-based organizations that promote and defend discipline-based interests and ignore or outright discourage interdisciplinary explorations[14]. Society did not take notice until the fourth quarter of the 20th century. By then the damage was done.

In the last decennia co-evolution between science and universities has been subjected to a growing pressure to serve the economy, to use business models that show profitability and exploit the applicability of its science. This confluence of co-evolution with unfamiliar outside pressure has led science and universities to adopt value systems that have little to do anymore with their original value to society as a whole[15].

Universities changed from institutes of education where knowledge is transferred and where groundbreaking questions challenge the best young minds to be creative, into

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9 Karl Popper made this quite explicit in his book *Conjectures and Refutations* (1963).

10 In searching for true answers to questions, universities also became a moral mirror to society, by questioning and at the same time upholding the moral values of society.

11 François Jullien (2011) called this *Silent Transformations*. Examples are growing old, passionate love turning into indifference and climate change.

12 See for an historical parallel: *Epicurus, The Art of Happiness*, Penguin Classics (2012). Epicurus was one of the early atomists. For him the physical aspects of atomism were never allowed to remain purely theoretical but were always directed towards human ends.

13 See also: Martha Nussbaum (19 August 2011), *Educating for profit, educating for Freedom* – ABC Religion & Ethics, http://www.abc.net.au/religion/articles/2011/08/19/3297258.htm

14 This co-evolution also involved other institutes and processes that support science, like funding agencies, scientific journals, and university departments. All of these are largely organized along disciplinary lines. In fact, funding agencies and their policies, scientific journals with their peer review system and university departments with their requirements for tenure, reinforce each other so strongly that they effectively suffocate any ventures into interdisciplinary explorations.

15 See Stefan Collini (2012), *What are Universities for?* Penguin

factories where graduates are produced and where the value of intellectual property (to the university or the individual) is seen as more important than the value to society of education and knowledge[16].

Societies changed too. As the world population grew, the impact of technologies fed by science and economies driven by greed started to manifest itself in environmental disasters, loss of biodiversity, climate change, and startling differences between the rich and the poor[17]. Societies began to face problems that have become so wicked[18] that the institutions of government, be it local, national or international, have become hopelessly inadequate. That counts for the tools they have available to analyze and act as well. And science cannot come to rescue, because it never developed such tools, locked up, as it was, in its disciplinary silos.

On top and partly because of that, public confidence in science and public trust in politics are facing deepening crises, as neither of the two is able to deliver the solutions that are so urgently needed. Instead, separately and together, they increase the complexity of the problems; politics and governments by replacing democracy with technocracy and science by feeding the technocracy.

As indicated, this crumbling away of confidence and trust is the outcome of a silent transformation, and no one cause can be given. But the crumbling was not detected for a long time. The decisive role of science in the wars fought in the 20th century as well as the tremendous growth in wealth in the western world since WW-II have hidden the seeds of decay that started budding already a long time ago.

As we entered the 21st century, the disconnect between what universities teach and research and what society needs has become increasingly visible. At the same time the decay has become visible in the perversities in current science systems and the exhaustion of natural resources, while geopolitical shifts and tensions, and the stagnation of economic growth draws attention to the incapability of governments to understand the complexity of the world they are managing.

To sum it all up in a paradoxical manner: As western science began to play a bigger role in the life of the everyday human, it started to lose touch with humanity.

In the context of evolution (see paragraph 1.3) one could say that universities did not seek to cope with the changes in society. Now they must make drastic changes, or they will be doomed.

"If you do not change direction, you may end up where you are heading". Lao Tzu, 6th – 5th century BC

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16 Bluntly: Universities (most, not all) transformed from independent institutes that held the moral high ground into institutes that prostitute themselves to politics, industry and special interest groups.

17 There are of course many more factors that lead to changes in societies and many more areas in which these changes manifest themselves.

18 The term wicked problem originates from social planning. A wicked problem can be loosely defined as *"A problem where the problem definition and the solution cannot be kept apart"*. The distinction between complex problems and wicked problems is not very clear. One way of looking at it is to say that wicked problems are a set of special problems (related to the functioning and planning of society) within the more general set of complex problems. See also: Horst Rittel and Melvin M. Webber, *Dilemmas in a general theory of planning*. Policy Sciences 1973;4:155–69].

1.3 The disconnect from a perspective of evolution, exploration and exploitation

In determining the nature and direction of the drastic changes universities must make, it is worthwhile to take note of some insights from studies of the evolution of living systems, assuming at least that societies and universities can be treated as such.

Society as a whole will evolve in ways that are unpredictable. If universities are to sustain themselves in that society, they must evolve as well. That means that they must be able to **exploit** local conditions sufficiently to survive ***and*** be able to **explore** the boundaries of their existence to cope with changing conditions[19]. There is no way to know what the new conditions will be, so the greater the potential for exploration the better.

Living systems are exploitation-biased during times of relative stability, and exploration-biased during times of change.

Exploration versus exploitation
Throughout history explorers have ventured, discovered and opened up new fields of human endeavor and understanding, adding new riches, diversity, creativity and opportunities to society. Those explorers, from Xu Fu who explored Japan in the 3rd century BC, to Columbus and Vasco Da Gama, explored most of the world as we know it. Their spirit of exploration dominated the renaissance, setting a new stage for the development of arts and philosophy. It then spilled over into the enlightenment that brought us knowledge about the laws of nature and set the stage for the industrial revolution and everything that came with it.. The explorers' mind was focused on exploration. It was those that came after them that exploited what they found. When exploration was leading, there seemed to be no limits to our world. Now exploitation is leading, and the limits of our world have become painfully visible.

The period after WW-II seemed relatively stable (at least in the US and Europe) slowly turning societies to a mode of maximum exploitation of resources. With the US leading the way, universities were strongly stimulated to contribute to the "*improvement of the national health, the creation of new enterprises bringing new jobs, and the betterment of the national standard of living*" [20]. To exploit the influx of research funds, universities added a strong focus on the production of research results to their role as educators. The result was a flowering of the American academic research system but also a shift in the balance between education and research in the universities. On the surface this shift went largely unnoticed, until it became visible that the research did not fit the needs of society anymore. That became clear only when the conveniences of stability were challenged by the accumulating effects of the creeping changes that were triggered by phenomena such as the growth of the world population, the increasing and intensifying global connectivity, the unexpected consequences of collective human consumption and behavior and especially as a result of the synergy between these developments.

Evolution teaches that living systems that do not adapt to changing conditions, will go extinct. Universities will have to shift their focus from competing for research funds to exploring ways to cope with the changes in society.

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[19] With thanks to: J. Agosta and Daniel R. Brooks (2020), *The Major Metaphores of Evolution*, Darwinism Then and Now.

[20] This stimulus followed a challenge by president Roosevelt to use the positive effects of the "*team-work and cooperation in coordinating scientific research and in applying existing scientific knowledge to the solution of the technical problems paramount in war*", to "*the betterment of the national standard of living*". *See Appendix of https://doi.org/10.1002/pchj.199, for an analysis.*

2 Towards the future

2.1 Some thoughts

The future of universities and whether they will have one, will depend on the manner in which they succeed in delivering graduates that can meet the (continuously changing requirements) of society. This future will emerge from processes superimposed on and interacting with dynamics like the ones described in Chapter 1. While we know that we cannot control the outcome, we can strive for what we want it to be. To that purpose we can develop a set of actions aimed at moving processes in the direction we want. We may even be able to find metrics with which we can measure how close we are to the desired outcome. But contrary to landing a man on the moon (see textbox) we cannot reduce the complex process of emergence to a set of actions that will get us the future we want.

To land a man on the moon *and let him return to earth safely requires control of all aspects relevant to the journey. For technical aspects this can be attained using findings of physical sciences that are expressed in universal laws, empirical evidence, natural constants and testable hypotheses. However, these findings are real within the context of a laboratory only. There the real (non-linear) world is reduced to a simple (linear) one from which factors that may disturb experiments and observations are excluded. Within such a laboratory we can have control, because we reduce complex to complicated. When we send a man to the moon we create the conditions of such a laboratory as much as possible, even to the extent that the crew that we select must fit a set of criteria within which we can be sure that their behavior will not endanger the safety of the journey.*

Yet, we can decide what we want that future to be and change our views and actions as it emerges, and reality unfolds. While that requires a constant alertness and willingness to adjust, it will also give us a sense of control, without which life may seem meaningless.

2.2 The student: medium of transfer

For all practical purposes we look at universities to be institutes meant to transfer knowledge and students to be the medium of transfer. Over time, the purpose of the transfer varied[21], but the medium were always students, young men and women with most of their lives before them. They are at the beginning of their career, eager to suck up knowledge that is new to them, to exploit and experiment and to adopt new technologies. From the perspective that universities need to adapt to changing conditions, if they are to survive, they (may) have no better partners than its students.

History of universities
One can argue that universities are as old as the civilization of Sumaria, China, Greece, or Egypt but we start looking at their history from the moment the Paris ***scholae*** *started to unite students and teachers around a collective activity, the so called universitas. Scholae were schools for higher education, closely related to the Church. They functioned as such since Roman times. In the 11th century, their role changed in response to a growing need in European societies for educated people and a renewed interest in knowledge. In 1231 Pope Gregorius IX issued the bull Parens Scientiarum ("The Mother of Sciences"), assuring independence and self-governance to the universitas. As universitas, the scholae begot their own, formal position in society.*

The choices students make are dependent on a great variety of (interrelated) factors, such as background and upbringing, expectations from

[21] Examples of such purposes are: to support the church by learning to copy books (the bible), to build, support and strengthen the power structures of government, to create a pool of knowledge for industry, to win wars, to make informed decisions, to develop technology or to educate leaders.

parents or society, ambitions and dreams about a career, the spirit of the time, intellectual curiosity or the curricula and facilities that the university offers.

Not only are student the medium for the transfer of knowledge, they are also active at the continuously moving threshold between the past and the future[22]. In a metaphorical way, they become owners of the inheritance system[23] that connects the two. During the limited time they spend at the university they acquire knowledge that may shape their future as well as the future of mankind[24].

Knowledge (to be) acquired as related to the future (or the unknowns)
Part of the knowledge (to be) acquired by students deals with methods to create order in the chaotic mess of data from across the boundaries of what is known.

Thus, from the perspective of universities that evolved as institutions where knowledge is advanced for the betterment of society, universities should focus on *preparing young people to shape a better future for mankind.*

2.3 What goes into "shaping a better future" and its challenges to universities

The world is facing tremendous problems. To effectively cope with these problems, we should mobilize all human creative and constructive power and available knowledge[25]. Universities need to play a key role in this, but the research universities[26] that presently dominate the academic landscape are not in tune with that need[27]. To become relevant for society again, they must explore and address the real nature of the problems that society faces[28] and match the talents and ambitions of its students with the real needs of society. Universities should focus on exploration again.

The next chapter will point to three key issues that go into shaping a better world and that universities need to address if they are to survive.

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[22] This, of course, counts for every living being, but students are unique because as humans they can actively acquire knowledge about the past and have expectations about the future, and they are at a place (university) where knowledge is concentrated to be transferred through them.

[23] That is, if we consider knowledge as an "inheritance system". The term "inheritance systems" is used to describe different mechanisms, processes, and factors, by which hereditary information is stored and transmitted between generations.

[24] *An intriguing (and hopeful) thought:* Evolution takes place when species explore the boundaries of their existence and pass on ways to deal with changes in the conditions to next generations (adaptation). If we consider students to be a species and each next generation carrier of information how to survive in a changing world, there is a potential for rapid adaptations if attention is paid to an effective transfer of this information between successive generations

[25] No distinction is made here between scientific knowledge and other kinds of knowledge. For such a distinction see Karl Popper (1963) *Conjectures and refutations.*

[26] The first research-university was the Humboldt University, established in Berlin in 1810. Central to it were a *unity in teaching and research*, the pursuit of higher learning in the philosophy faculty, freedom of study for students and corporate autonomy for universities despite state funding (https://en.wikipedia.org/wiki/Humboldtian_model_of_higher_education.) The concept became the model for many European universities. A US version of research-universities developed in the wake of the Vannevar Bush report *Science the Endless Frontier* (1945). As a result of its recommendations US government funding for Research and Development increased by more than a factor ten from the 1940s to the 1960s. Most of that funding went to universities.

[27] See paragraph 1.2

[28] Jan W. Vasbinder (2017), *What if there were no universities,* https://doi.org/10.1002/pchj.199

3 Challenges to universities

3.1 Dealing with problems of the real, messy and complex world

The difference
Natural disaster, such as volcanic eruptions, earthquakes, floods, famines, pandemics or wars, have always been part of human history. The impact of these disasters was mostly felt locally or regionally, while temporal or cascading effects went largely unnoticed. That changed with the new problems that resulted from the growth of the world population, the increasing global connectivity, the unexpected consequences of collective human consumption and behavior and especially as a result of the synergy between these developments.

Many big "new" problems[29] that humanity faces, were (and to an increasing extent are) triggered by technological developments and unexpected consequences of interactions thereof, with our real, messy and complex world. And these problems are to a large extent a consequence of humanities' obliviousness to those interactions[30].
While the developments that led to these interactions were made possible by knowledge and insights coming out of disciplinary science, the problems alluded to have nothing to do with the way science has organized itself in disciplines. If only for that reason it is clear that these problems cannot be addressed in an effective way by the disciplinary science as we know it[31].

Moving the disciplinary boundaries
In its first 10 years, SFI focused on the relation between simplicity (such as manifested in the fundamental laws of physics) and complexity (as we see and experience it around us). This led to the emergence of the new science of complex adaptive systems. Later the intense and broad interdisciplinary collaboration within SFI led to new fields were general theories and models are developed such as evolution, scaling in biology, computation as a principle in nature, general theories of organization, networks, intelligent agents, sources of novelty, robustness and linguistics.

The Santa Fe Institute (SFI) in New Mexico was the first institute that took that realization as a starting point. It did so outside the structures of universities, because its founders were convinced that the traditional disciplinary infrastructure of universities, funding agencies and scientific journals would prohibit explorations beyond disciplinary boundaries[32].

To meet the big challenges that humanity faces, there is an urgent need for practical versions of the interdisciplinarity[33] that was pioneered at SFI to be added to the basic education of students. Consequently, universities face the urgent and existential challenge

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[29] Such as climate change, environmental degradation, loss of biodiversity, availability of energy, water and resources, rapid urbanization, impact of technology, vulnerability of infrastructures, stability of markets, or inequality

[30] As argued before, these interactions went largely unnoticed because we live(d) in a reduced reality and with an illusion of control.

[31] In his iconic article "More is Different," P. W. Anderson (1972) states: *The ability to reduce everything to simple fundamental laws does not imply the ability to start from those laws and reconstruct the universe. In fact, the more the elementary particle physicists tell us about the nature of fundamental laws, the less relevance they seem to have to the very real problems of the rest of science, much less to those of society*".

[32] See: M. Mitchell Waldrop (1992), *Complexity, the emerging science at the edge of order and chaos.*

[33] There is no consistent terminology yet to characterize the kind of science that may lead to insights in ways to address the messiness and complexity of the problems underlying these challenges. While it is tempting, and may be inevitable, to use the word complexity or any version of the word disciplinary such as: inter-, multi-, trans-, x- or non-disciplinary, looking for an appropriate terminology should not be confused with the purpose that is pursued, namely finding a way to deal with the messiness of the problems humanity is faced with.

to develop methods to educate student in the nature of the problems they will have to address once they graduate and step into the real world.
Students also need to be exposed to explorations into new and effective ways and methods to approach the interdisciplinarity of problems. These explorations should include philosophers, artists and people of practice. However, given the urgency to effectively address these problems and the inertia of universities in general, such interdisciplinarity may best be developed in small institutes (like SFI) that are independent of the traditional disciplinary infrastructure of science, like the one that characterizes present day universities, but may be the strongest reason for its resistance to change. Universities on their part should develop close collaborations with such institutes, to expose their students to the work being done there and to integrate their educational programs with them.

3.2 Educational demands and the need to educate leaders of the future

Higher education
One way or another, societies throughout history and geography, have counted on its universities to provide its students with an education that enables them to take on responsibilities. Such education included studying subjects that were seen as essential for the respective societies like the works of notable scholars in China (indispensable for intellectuals and civil servants) or subjects like rhetoric and philosophy in the ancient Greece.

Throughout history, the higher education of young people has been seen as a path to a better future, both for the young people[34] and for society. After the Paris scholae turned in universities, subjects like mathematics, philosophy and humanities[35], became a central part of the curricula. However difficult to trace its impact, there can be no doubt that teaching such subjects to young people has been and will be of incalculable value to society. In relatively recent times the Humboldt university focused on providing young people with the knowledge and tools that enable them to become autonomous individuals, capable of self-determination and taking responsibilities[36]. In the last 60 years or so, such higher education has become more and more focused on giving students the knowledge and tools with which they can chose a job that led to a successful career. Now, in view of the enormous problems the global community faces there is an urgent *need to educate leaders of the future*.

Educating leaders and explorers
Universities are in a unique position to identify the original and bright young people who may be future leaders of society. They are also uniquely positioned to stimulate the explorative minds of these youngsters. The latter was precisely the intent of Wilhelm von Humboldt, all for the benefit of society.

There is, of course, not one type of leader of the future, nor are the future and the problems it will pose to humanity in any way known or predictable. But there are a few characteristics that seem very pertinent to leaders whatever the future brings. Based on those characteristics, future leaders and young people, bent on shaping a better future for mankind, should be (in a somewhat random order):

- independent thinkers;

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[34] For articles about the history of higher education in Greece and China see respectively: https://www.nationalgeographic.com/history/magazine/2019/07-08/education-in-ancient-greece/ and https://link.springer.com/chapter/10.1007%2F978-94-6091-746-2_2

[35] The exact scope of what is included in humanities is irrelevant in this context. For the purpose of this discussion, it includes, amongst others, economic, political, social sciences.

[36] https://en.wikipedia.org/wiki/Humboldtian_model_of_higher_education

- resistant against the temptations of corruption and greed;
- able to understand what makes life worth living for "normal" people;
- able to navigate the differences between cultures;
- able to see and understand the complexity of the situations they will have to deal with;
- able to see and use the value of knowledge and insights from many sources;
- equipped to seek and find new powerful combinations of knowledge and be practical in applying those;
- focus on the use of technology, not on its development;
- active social networkers;
- able to handle uncertainty; and
- putting learning over education.

If these (and other) points are integrated with principles like problem based learning (see adjacent text-box) or variations thereof, there is reason to hope that the educational system in general and the university system in particular can regain a moral high ground for a society where leaders for the future are educated and where young people will be equipped with the knowledge and tools to shape a better future.

***"Problem based learning** (PBS) is a way of constructing and teaching courses using problems as the stimulus and focus for student activity. [..] It is a way of conceiving of the curriculum as being centered upon key problems in professional practice. Problem based courses start with problems rather than with exposition of disciplinary knowledge. They move students towards the acquisition of knowledge and skills through a staged sequence of problems presented in context, together with associated learning materials and support from teachers."*
Boud and Feletti (1997, p. 2)

To achieve this, the educational system must pose challenges to students that stimulate them to think independently and look for new combinations of knowledge to meet these challenges. It also requires mentors/coaches who know from experience what it is to look beyond boundaries and who can induce in the students the excitement of what can be discovered there. Such coaches and mentors exist, and should be held in high esteem.

3.3 The pursuit of knowledge

At the same time the pursuit of knowledge should not be abandoned. The basic arguments used by Vannevar Bush about the value of scientific knowledge to the well-being of society are as valid as ever. However, as universities evolved in the last half century, they are not the right places anymore to pursue such knowledge, other than as a way to challenge its students, reminiscent of the intent of the merger between education and research that was pioneered by the Humboldt University.

Manhattan projects
The increasing urgency to effectively address the problems that mankind is facing, makes that no time and money can be wasted any more by allowing individual scientists in innumerable small-scale projects in university laboratories all around the world to dally with these problems. Instead we need to mobilize and focus the bright minds of our world to work on them. An extreme example of what can be done if the creativity of bright minds is channelled by determination was demonstrated in the Manhattan project.

As suggested in paragraph 3.1 the pursuit of knowledge for the benefit of society might best take place in small dedicated institutes in which collaboration is fostered across disciplinary boundaries, and where critical masses can be

formed (like in Manhattan[37]-kind projects) that can address the big problems of humanity. Universities should develop close collaborations with such institutes, to expose their students to the work being done there and to integrate their educational programs with them.

At the same time, there is an ever-present need to explore and expand the boundaries of our knowledge. We need and always will need what Helga Nowotny calls "competent rebels.[38]" In fact, universities should provide space and impulses to develop the competence of rebels and allow competent people to be rebels. These rebels should be free to follow their intuition and pursue their ideas. For as far as science is funded by the public, only competent rebels should have that privilege, while others who have the competence but not the rebellious nature could work as scientific workers, whose main task it is to help answer the questions posed by these rebels[39].

Selecting such rebels will then become the key to expanding the boundaries of knowledge and is an essential function for the university of the future.

What should be leading in this selection is not what someone had done, but what he or she plans to do, how original and risky that is and what impact it can have on moving the boundaries of knowledge. Students typically do not have a track record of scientific accomplishments. They are curious and explorative and eager to experiment. They are the best population to select rebels from. It is largely up to universities to do so and to provide them with the coaches and mentors to develop their competence.

Scientists that are competent rebels should get full support to explore the almost infinite combinatorial space that the growing numbers of disciplines and super specializations have created. It is in that combinatorial space that most of the big breakthroughs in the past took place, all generated by such scientists. They should formulate challenging questions to be posed to talented young rebels or coach them into formulating their own.

This means that special interest groups, industry or government should give up the ambition to make money from the research at universities or continue keeping the illusion alive that society has control over its future. Instead what society gets out of it is the best possible present from which to move into the future.

The big promises for the future of humanity lie in the education of competent leaders and competent rebels and especially in the combination of the two. Universities that manage to fulfil that promise will have a future; the others will become extinct.

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[37] The urgency that was felt to win the second world war before Germany would build an atomic bomb, translated in a project in which the best scientists of the time collaborated to build the bomb first. See e.g.: James Gleick (1992), *Genius, the life and science of Richard Feynman,* Vintage Books .

[38] For Helga Nowotny, top researchers are competent rebels. In 2012, when she still was the president of the European Research Council (ERC), she gave the following remarks about researchers in an interview at the Katholic University of Leuven: "They must call into question the work of the previous generation, always based on skills and knowledge. There must also be room for a large variety of new ideas. The pressure on young researchers to publish is enormous, but this should never mean that they must think in the mainstream. Their curiosity carries them into unknown territory and that is why policy makers and fund providers must have patience and trust. Seemingly useless knowledge can later prove to be very useful."

[39] While uniquely positioned to identify competent rebels, universities should not be the place for scientific workers, unless such workers are students sharpening their skills (e.g. to create order in the chaos at the boundaries of knowledge) under supervision of a competent rebel.

Epilogue

This essay identifies some key challenges that universities face if they are to cope with changes in society and survive. The challenges must be met within the dynamics of the interplay between the universities, the societies in which they evolved, and the value attached to knowledge. It is tempting to think about ways to change these dynamics so that conditions can be created that might be conducive to meeting the challenges. To do so is mostly beyond our control. Yet, thinking about it brings to the fore some issues that may influence the perspective from which one can look at the challenges.

Crises and evolution
The possibility that crises develop is implicit in the adaptability of living systems to changing conditions, one of the keys to their evolution. But there is a limit to the adaptability of every living system. Evolution teaches that living systems that do not adapt to changing conditions, will go extinct. Universities are living systems. They too must adapt if they are to survive.

<u>The relevance of universities to society</u>

Traditionally universities are **the** institutes of higher education in society. As such they are as relevant to society as society finds higher education relevant. For most of history, places of higher education have taught humanities[40], and mathematics and have educated leaders and civil servants (China). Modern science has only been a serious part of the curriculum since the 1810, when Alexander Humboldt established the first research university. In the period between 1850 -1905, realizing the potential industrial use of the growing body of scientific knowledge at universities, a number of local industries in England established their own university[41] to ensure a supply of employees that were trained in the most current scientific knowledge and engineering. Then, in the first half of the 20th century many corporations established their own research labs, aimed at establishing and strengthening their superiority in the market[42]. These labs attracted the most talented PhDs in science and technology and became the birthplace of most of the technologies that shaped our modern world. But since the 1970s this corporate research fell in decline. Large corporations still value the golden eggs of science (as reflected in patents) but seem to be increasingly unwilling to invest in the golden goose itself (the internal scientific capabilities)[43]. Instead they promote a division

Some European history
*At least three developments predate the establishment of the first research university in 1810. **First**, European universities began as religious monasteries that were tasked with preserving knowledge, particularly written religious texts. Connected to this was the argument about whether or not written texts should be translated into vernacular languages, rather than just Latin. **Second**, associated with the Enlightenment, there was the transition of universities from religious centers to secular centers. Oxford, for example, had an original mandate to prepare children of the provincial aristocracy for life at the royal court in London.So, there was not only the secularization of universities during the enlightenment but also the emergence of different ideas emerged about their proper mission. Eventually, and **third**, this led to arguments about access by non-aristocracy to higher education. The initial opening of universities to people from modest backgrounds - admission based on merit not birth - coincided with the establishment of research universities.*

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[40] In Europe this included philosophy, history, literature, art history, classics, music, and religion. In China the emphasis was on "the Chinese classics".

[41] Like the universities of Manchester (1851), Newcastle (1852), Birmingham (1900) and Leeds (1905)

[42] A few of these stand out, like General Electric (1900), Royal Dutch Shell (2014), Philips (1914), AT&T (1924), Dupont (1928) and IBM (1945). These labs attracted the most talented PhDs in science and technology and became the birthplace of most of the technologies that shaped our modern world.

[43] https://doi.org/10.1002/smj.2693

of labor, in which universities focus on research and large corporations on development[44]. Because corporations do collaborate with universities and fund research that they think may benefit them, this division has raised the volume of science by universities. It also shifted the focus of universities towards the industrial sector of society as a major source of funding. This process threatens the independent position of universities in society and thus its relevance to society. To reverse that process may be one of the bigger challenges for universities.

Are the challenges facing universities the same in different civilizations?

Superficially the challenges may seem to be the same, because the western model for universities[45] has become a standard around the globe. In reality however, there is a difference between the university that evolved "naturally" in the west[46] and the university that was supplanted on other civilizations by the colonizers from the west. (See text box[47]) "*the World Revolution of Westernization*").

This difference may be most pronounced in China and in countries that historically have strong cultural ties with China (like Singapore), because China has the oldest system for higher education in the world[48]. Until the 16th century, China was also, technologically speaking, the most advanced civilization on the globe[49].

Following the imperialist invasions in the 19th century[50], China came in close contact with the western civilization, leading to a rapid flow of western ideas and concepts into its society in areas like religion, cultural nuances, ways of life, philosophy, education and science[51].

The World Revolution of Westernization *was triggered in the 19th century by colonizers from Western Europe and their descendants in North America. They "thrust the non-western world into a common harness, against their will. […] Western ascendancy was so complete that it left only one rational response: abject imitation as a condition of survival and self-affirmation. [...] Under the western impact traditional authorities and customs had no future; they crumbled away. Meanwhile the imported ways remained superficial or even incomprehensible; they did not fit the societies whose cultural sovereignty had been crushed."*)*

**) Theodore Von Laue, Page 3-5*

Modern science is rooted in the European tradition. The philosopher Alfred Whitehead commented: "*The safest general characterization of the European philosophical tradition is that it consists of a series of footnotes to Plato*" [52].

Following Plato, the European tradition has largely been concerned with abstracting from concrete cases to arrive at a principle or ideal form that is perfect, universal, eternal and unchanging. Traditional Chinese thinking, in contrast, emphasizes context dependency and constant change. It recognises that there are patterns and cycles in the world and that one can study the patterns of cycles and find the appropriate time to ride on that cycle.[53]

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44 http://www.nber.org/papers/w25893

45 The model is the Humboldt University that was established in Berlin in 1810 and that has since "conquered" the western world. Where the essay concludes that universities have lost touch with society, it refers to this type of research universities.

46 Initially western Europe, since the early part of the 20th century also the United States of America.

47 Theodore H. von Laue (1987), *The World Revolution of Westernization,* the twentieth century in global perspective, Oxford University Press.

48 Thomas H.C Lee (2000), *Education in traditional* China.

49 Joseph Needham, Colin A. Roman (1978), *The shorter Science and Civilization in China, Volume 1*

50 Starting with the first opium war (1839-1842).

51 Wahed, M. S. (2016). The Impact of Colonialism on 19th and Early 20th Century China. *Cambridge Journal of China Studies, 11* (2 , pages 24-33.

52 Alfred North Whitehead, (1979), *Process and Reality,* corrected edition, New York: Free Press, p. 39

53 This thinking features not only in Daoist thinking but also in Sun Tzu's *Art of the War*. It has also been a dominant factor in family and village life (Lin Yutang, *My Country and My people*).

Strongly simplified one might say that "the Western tradition is focused on universal truth, the Chinese tradition on practicality".

It is likely that supplanting western ideas about universities in China and countries with strong cultural ties with China led to universities that have fundamentally different connections with their societies than Western universities have. Then, the nature of a possible disconnect will be different too. Even if, in general terms, the challenges are the same, the operational way to address them will be different. Thus, it is thinkable that in countries like Singapore, the millennia old Chinese focus on practicality is an asset in reconnecting universities and society. This might translate in giving a low priority to competing with universities in the west (e.g. on ranking and publications) and putting a strong focus on finding the best available knowledge to address the crises the word is facing. Also, issues that contributed to the drifting away of western universities from their societies (like ignoring the real, messy and complex world) may be less relevant in the east and would give universities there a better starting position to face the future.

Anti-intellectualism

Different histories, cultures and backgrounds shape different contexts against which universities must face the challenges of the future. In a broad sense such contexts include the effects of crises that universities have to relate to in their interplay with science and society. Anti-intellectualism may be(come) one of those crises.

Crises have different origins and develop in different time frames. For example, climate change took a long time coming, while Covid-19 more or less sprung upon us. There can be little doubt that humans played a role in the way these crises evolved. But they are not exclusively related to human interactions or interference with nature. In contrast, anti-intellectualism seems to be an entirely human affair. It is a serious problem as it hampers the mobilization of the full power of human knowledge and creativity to deal with other crises. It is also a direct threat to the future of universities, because it makes it more difficult

Chinese science and civilization

The key question at the center of Joseph Needam's opus magnum: Science and Civilisation in China*, is: "Why did modern science not develop in China, and why was China technologically superior to the West prior to the 16th century?*)*

*The answer to this question is not clear-cut. Justin Yifuy Li**) writes: "The reason that China failed to have a scientific revolution is asserted to be the civil service examinations, which distracted the attention of intellectuals away from investing in human capital for modern scientific research. Therefore, the probability of making a transition from primitive science to modern science was reduced". Francois Jullien***), among many others, argues that China and the West have their own unique cultural frameworks for thinking, perceiving, valuing, and acting. TianCi Li ****) summarizes ancient Chinese science as "paying more attention to experience, integration and practicality than experiment, analysis and theory. [..] It was applied science with experience as method and practical application as purpose. It lacked understanding and rational knowledge of different phenomenon in the nature. Chinese ancient science was practicable, which always aimed at meeting human actual demand".*

**) Finlay, Robert. "China, the West, and World History in Joseph Needham's Science and Civilisation in China." Journal of World History, vol. 11 no. 2, 2000, pp. 265-303.*

***) Justin Yifu Lin, (March 1992), The Needham Puzzle: Why the industrial revolution did not originate in China.*

****) Francois Jullien (2004), A treatise on efficacy, between Western and Chinese thinking.*

*****)* TianCi Li, YuLin Wu (2016), Pragmatism in China, Chinese Pragmatism.

Anti-intellectualism

The (re-) emergence of anti-intellectualism may relate to similar processes that led to the disconnect between science, society and university. However, one should not assign too narrow a cause to it. Anti-intellectualism has been around as long as intellectuals have. It has been a dominant force in the hands of governments all through history and across the globe). As Isaac Asimov noted: "Anti-intellectualism has been a constant thread winding its way through our political and cultural life, nurtured by the false notion that democracy means that 'my ignorance is just as good as your knowledge".*

**) https://en.wikipedia.org/wiki/Anti-intellectualism#Ideological_anti-intellectualism*

for universities and society to (re)connect and focus on the prime functions of universities in society

But anti-intellectualism is not new to our time (see text block), nor is it caused by universities. While science helped win WWII and created the knowledge basis from which the tremendous economic growth after WWII could take off, anti-intellectualism was hiding in the shadow. Now it is out in the open again. Education may lessen its effects but will not eradicate it.

Information, knowledge and wisdom

There is an enormous body of knowledge and wisdom embedded in the works of ancient philosophers, whether from Mesopotamia, Greece, China, Arabia or elsewhere. In fact, there are books in each of those cultures that, often in similar ways, deal with day-to-day life and ways to relate to the real, messy and complex world[54]. These books constitute a general knowledge about life and systems that are important to people. They do not focus on information, but on the human capability to do something with information (knowledge) and on where and how to apply that knowledge (insight). They also contain lessons learned from reflection, imitation and experience, which, according to Confucius, are the three methods along which we may come to wisdom. Throughout the ages, whether through these books, organized education, storytelling, or in other ways, that knowledge, insight and ways to attain wisdom has been passed on from generation to generation. The real, messy and complex world provided the context.

Western science, looking for universal, eternal and unchanging truths, could only do so, if it abstracted from that context.

It has led to a world that is in the grips of data and algorithms, with an increasing number of people living under a growing information overload.

Wisdom has become an elusive concept[55]. The question must now be asked whether wisdom can be taught at universities (and whether we actually should). This question is similar to asking whether we can teach children to read. We can, but we cannot control what they read. The point is not whether we can teach students to be wise, but whether we give them the right material to study, and expose them to the needs of the real, messy and complex world. Should we? Yes!

Some quotes about knowledge and wisdom

Isaac Asimov: "The saddest aspect of life right now is that science gathers knowledge faster than society gathers wisdom".

Herman Hesse: "…Knowledge can be communicated, but not wisdom. One can find it, live it, do wonders through it, but one cannot communicate and teach it."

Jiddu Krishnamurti: "Real learning comes about when the competitive spirit has ceased."

Kahlil Gibran:"The teacher who is indeed wise does not bid you to enter the house of his wisdom but rather leads you to the threshold of your mind."

Jewish proverb:"Do not be wise in words, be wise in deeds".

Confucius: "By three methods we may learn wisdom: First, by reflection, which is noblest; Second, by imitation, which is easiest; and third by experience, which is the bitterest."

Rumi: "Yesterday I was clever, so I wanted to change the world. Today I am wise, so I am changing myself."

Lao Tzu: "To attain knowledge, add things everyday. To attain wisdom, remove things every day."

[54] Examples of such books are the *Gilgamesh epic*, the Old Testament's *Ecclesiastes*, Homer's *Iliad* and *Odyssey*, Lao Tzu's *Tao Te Ching*, Confucius's *Analects*, Epicurus's *The Art of Happiness*, Niccolo Macchiavelli's *The Prince*, Michel de Montaigne's *Essays,* Benedict Spinoza's *Ethics,* and many more.

[55] The process leading to this situation may very well have contributed to the disconnect between science, universities and society.