

**Maulana Azad Memorial Lecture**

on

**The Future of Higher Education:  
Through the Lens of the History and Philosophy of Science**

by

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# **The Future of Higher Education: Through the Lens of the History and Philosophy of Science\***

Dhruv Raina#

RESPECTED Professor Varghese, colleagues and dear friends, it is indeed an honour to be invited to deliver the Maulana Azad Memorial Lecture. While it is easy to decipher the source of the honour, there is also a sense of humility prompted by a recollection of the many renowned scholars who have delivered the lecture before me and I am not sure that I could measure up to their standard. Several interdisciplinary fields have offered fruitful resources for examining higher education and its transformation. However, in examining this transformation in the world of higher education, the history and philosophy of science has had quite a marginal role to play.

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For more than half a century now, educationists have spoken of the importance of history and philosophy of science for science education, particularly at the secondary level, but more specifically for school science. The unfortunate part is that while papers have been written and programmes developed on this theme since the 1970s, research papers arguing for the salience of history and philosophy for science teaching seem to be coming in fifty years later. This clearly suggests that the progress along this axis of pedagogic improvisation and reform has been incremental and fraught with perhaps conceptual and other impediments.

But the history and philosophy of science is very rarely evoked in discussions of higher education except as an autonomous interdisciplinary field having little connection with didactics or even educational studies. This neglect has always bothered me although educationists and science teachers are well aware of the importance of what are referred to as “problems of teaching leading to scientific research” and that of developing instructional protocols for knowledge emerging at the frontiers of scientific research. Part of the problem arises from popular perceptions of the

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field as addressing the genesis of scientific ideas and their priority on the timeline of accomplishments, rather than addressing the dynamics of the growth of scientific ideas, the evolution of concepts, scientific institutions and disciplines, but more importantly excavating the relationship between the social and the scientific. The interdisciplinary field of history and philosophy of science is hyperlinked with the sociology of scientific knowledge and science studies or STS.

In other words, one of the most important works on the transformation of the world of knowledge production, namely, *The New Production of Knowledge*, edited by Helga Nowotny and several others, and its sequel was produced by scholars situated within this dense network of interdisciplinary fields related to science studies. Furthermore, the fields of educational studies and educational sciences are quite oblivious of the theoretical concepts and frames that have come into the educational sciences from the history and philosophy of science and its cognates, but little discussed or reflected upon. For example, most recently, an important book discusses the adoption of actor network theory in educational studies, namely Tara Fenwick and

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Richard Edwards' Actor Network Theory in Education. Without canvassing for the importance of my parent discipline, I would in the time left to me draw upon some insights from the philosophy of science and its resonances with our contemporary concerns with the future of higher education. While recognising that the locus of higher education in the contemporary world is quite distributed, and as *The New Production of Knowledge* argues, the university is no longer the centre of knowledge production, and yet it is incontestable that it is still the most important centre for the production and reproduction of knowledge.

The multivolume studies of Rashdall, Ridder-Symoens and others have scrupulously chronicled the history of the university as one of the three important institutions of the early modern world. Over the centuries it has undergone transformations and radically metamorphosed itself as society has changed, presenting itself to us in different forms over the last three centuries: e.g. Newman's Oxford-type Liberal Arts College, the Humboldtian Modern Research University, the multiversity of the 1960s, and finally the commercialised universities of the globalised world. But while

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these forms appear in a chronological sequence, they coexist today comprising the ecology of higher education with a rich institutional and cognitive diversity. Thus the university has travelled over the centuries, metamorphosed and diversified, reflecting both its adaptability and resilience. By the end of the nineteenth century, the university had moved to the centre of the world of the production and reproduction of knowledge. So much so that, as Thomas Soderqvist once pointed out, 80 per cent of all knowledge was produced within the last hundred and fifty years.

Like all evolutionary structures, the university has often been shaped by changes occurring in the societies within which it was situated and nourished. Sometimes the rates of socio-political change and economic realities have outpaced institutional and cognitive reform and change within the university. In the literature on the history of the university, the disruption in the relation between society and university, or the ecology of higher education, is reflected in themes such as the crisis of the university, or its impending demise, or the irrelevance of the university. But these disruptions have been witnessed several times

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in the 800 year old history of the university as a corporate body. The problem erases itself, for we can identify at least four moments of crisis or the possible dissolution of the university, but the university has been resilient enough to prove the prophets of doom wrong and has bounced back to redefine and revision itself, through far reaching structural transformations and in the process preparing and ushering in the new society.

But in this account of the evolution of the university we need to recognise some important features in this narrative of unending change and innovation. Eric Ashby, in his well-known classic *Universities, British, Indian, African*, pointed out while reflecting upon the travelling university, that there is an ontogeny of the university. On account of this ontogeny, universities at different stages in the timeline of the university can be linked to each other within the ecology of the university system whose extent today is global. The second feature relates to this ecology. The university has travelled and diversified, and yet there is a strong family resemblance between universities. By the last decades of the nineteenth century, in the universities distributed across Europe, Asia and Latin

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America, we witness that the structures of higher education coalesce into a connected global but not necessarily unitary system. This connectivity by the end of the twentieth century is reflected in the internationalisation of science and higher education, enhanced collaborative research and increased student and faculty mobility. As a result, the system of higher education and the university system form the nodes of an ecosystem.

Against this backdrop I would like to discuss the work of the late lamented Israeli historian and philosopher of science, Yehuda Elkana, and the evolution of his thinking on higher education and the university. While much of his thought evolved in the context of the university in the West, his later work is punctuated with references to universities in other parts of the world, particularly India and China. Inasmuch as I discuss higher education within the university, philosophically, I approach the university as a connected global ecosystem. While acknowledging the diversity between universities, the issues and concerns I shall discuss are shared by most universities within this global ecosystem. We can identify three phases in his career as an educationalist. In the first phase commencing in the 1880s,

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he was preoccupied with steering research agendas in the sciences and humanities. In the second phase, he was preoccupied with doctoral education and in the last he attempted to intervene in the reform of undergraduate education and Liberal Arts programmes. Elkana trained as a historian and philosopher of science but went on to spend the last four decades of his life first in helping conceptualise and establishing important institutions of research such as the Institute for Advanced Study in Berlin and the Max Planck Institute for the History of Science, Berlin, and then he finally retired as the founding CEO of the Central European University, Budapest. This list comprises just some of the institutions he was associated with. What I find fascinating about his writing from the 1980s onwards is the constant dialectic between his concerns in the philosophy of sciences and his writing on higher education and later on the university of the 21st century. Those familiar with the history of the social studies of science from the 1960s onwards will be aware of two central issues that boggled historians and philosophers of the sciences. The first had to do with the critique of the European enlightenment project that informed much of

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the research of the time although this movement had been preceded by a long canonised work by the critical theorists Adorno and Horkheimer, entitled *The Dialectic of Enlightenment*. But the second concern was a more major one and was anchored within developments of a movement referred to as constructivism within the sociology of scientific knowledge. These movements challenged the objectivity and universality claims of scientific knowledge. This critique was rearticulated from other theoretical perspectives, namely, feminist philosophy of science and postcolonial theory of science. In addition, the standard conception of science was disputed on several other counts that I shall not take up here since they are not immediately salient to the matter to be discussed. Elkana's philosophical orientation was deeply inspired by the thinking of the German neo-Kantian thinker Ernst Cassirer. Cassirer had embarked in the 1920s on a re-examination of the Enlightenment's imaginary of knowledge, just in and around the time that Edmund Husserl and Martin Heidegger had embarked on a similar project. Inspired equally by the work of the philosopher of science, Imre Lakatos, Elkana

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considered developing a Cassirerean research programme for a post-World War II context. Elkana's reading of Cassirer may by some be considered idiosyncratic and we are unfortunate that he was not able to complete his long planned work that would have clarified the idiosyncrasy. In this reading, the pursuit of knowledge does not entail the search for transcendent, universal truth, but with knowledge that was socially or historically situated. The theory of knowledge he is proposing aims at contextualising knowledge in its historical emergence. Put differently, in a language that weaves the philosophy of science with the history of science, historical epistemology has a genealogy that extends from Bachelard and Canguilhem to Hacking, Daston and Rheinberger. Elkana attempts to develop his own approach as a Cassirerean historical epistemology. The Cassirer we know is celebrated for his work on the enlightenment and who strayed towards a version of contextualism in the philosophy of symbolic forms. Elkana was one among many, as pointed out above, who worked towards developing the programme of a research institute, the Institute of Advanced Study on Berlin, and steered its research agenda.

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The goal was to prioritise the contextualisation of knowledge and the interaction between its several sub-constellations in the interests of a vigorous inter-disciplinarity. Elkana writes about this effort: “the road was bumpy and non-linear and certainly not fitting the way a rational reconstruction can be.” A couple of years later he went on to co-found the reputed journal *Science in Context*. His writings of the time were collected and published in a volume in German, the title of which translates as the *Anthropology of Knowledge: The Development of Knowledge as the Epic Theatre of a Cunning Reason*. The culmination of this phase of his thinking was a programmatic note he co-authored with the sociologist Wolf Lepennies entitled “Historical Epistemology of Knowledge” for what became the Max Planck Institute for the History of Science, Berlin. Gradually, his interests evolved from research to undergraduate and doctoral education. The writings on the latter themes were directly linked to his interests and research in the history and philosophy of science, while simultaneously cognisant of the institutional transformations in the world of science and the larger socio-political changes occurring at a global level. In 1981, Elkana

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published a paper entitled "A Programmatic Attempt at an Anthropology of Knowledge" and it is here that we encounter the first reckoning in his philosophical work with the issues that subsequently animated his intellectual effort. A careful reading suggests that he was in a way responding to the two foundational concerns tagged above and the consequences that followed from these premises or the critique of the same. The debates in the philosophy of science since the 1960s had compelled some philosophers of science to have another look at anthropology and psychology. Most of these endeavours shared certain presuppositions that Elkana identified as: "(i) a choice between realism and relativism is unavoidable, (ii) that human universals, once found, can be abstracted from cultural noise, (iii) that all reason is epistemic, (iv) that, once sociological influences on history of ideas are admitted, we must give up the hope for a rational explanation of great historical changes." Elkana rejects these presuppositions and poses a couple of countertheses. The rest of his paper then turns to anthropology, psychology and history to argue these claims. These countertheses are: " (i-a) that realism and relativism are simultaneously

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followed by most people on most issues (two-tier thinking); (ii-a) the quest for human universals outside a cultural context is meaningless; (iii-a) that there exists at least one other kind of reason, namely, metic (cunning) reason; (iv-a) that, once we realise that no sufficient and necessary conditions for historical change can be found, necessary conditions for change can be rationally analysed; for this it must be understood that all knowledge follows the rules of epic theatre and of dramatic theatre." These indicate that the tools required for historically understanding Western and other cultures, and "the different stages, of cognitive, moral and emotional development" are those of translation. I might not agree with Elkana's arguments on all the issues he raises, but my intent here is to highlight his reasoning and arguments that have salience to contemporary debates on education. The second, as we shall see later, is that he distanced himself from any commitment to the ontological claims of post-modernism and defended what he would have called a Cassirerean contextualism. Without rejecting Enlightenment thought he responded sensitively to its critiques and went on to initiate steps towards thinking about a

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`new enlightenment.' He argues for his preference to the voting of the agora rather than any idea of Platonic objectivity. The truth of an assertion was contingent upon the question that was formulated, contra Plato who wished to decouple the question of truth from democratic truth making, thereby developing an episteme that reaches its apotheosis in Cartesian enlightenment as "dogmatic rationality." How does knowledge figure, according to Elkana, in the Enlightenment? The Enlightenment remained the basic foundation for the knowledge making enterprise for three hundred years after which internal fissures that had been accumulating began to propagate. Instead of unthinking, how does one rethink the enlightenment. In order to do so, Elkana recommends that we re-visit the writings of Bacon (on text-books), Shakespeare, Francois Rabelais, Montaigne. This New Enlightenment is based on a laissez-faire scepticism rather than on Descartes' dogmatic scepticism. These ideas guided the pre-Cartesian world. The protocols of scientific investigation that emerged during the course of the scientific revolution were the outcome of a process of deliberation of thinkers weary of the religious

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wars of the sixteenth and seventeenth centuries. Elkana needs to specify and detail what is meant by this new enlightenment, and this is something he elaborates upon over a large number of papers. The new enlightenment commences in the recognition that all knowledge is contextual and that the process of the production of knowledge involves amidst scientific work taking decisions that are political. In other words, the making of knowledge rather than driven by a truth seeking engine is context dependent and requires “embracing contradictions” and not just eliminating them. Embracing contradictions does not imply that contradictions are to be accepted but entails the recognition that the knowledge enterprise is cluttered with them and the Enlightenment strategy was to isolate and eradicate that portion of the object being investigated harbouring the contradiction. This was as true of the classical natural and social sciences. In order to establish many of his arguments, Elkana draws upon the history of the sciences and offers a new twist to some of the exemplars often evoked by philosophers of science to make other arguments. Thus in the history of classical physics the problem of the perihelion

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of mercury was known for a very long time. It was Einstein, according to Elkana, who showed that the problem was not one that deserved to be edged out of the research concerns of the discipline but was so central that its resolution required a new physics. The question that the historian and philosopher of science is left to ask and find a response to is who decides what is central and peripheral to the discipline. Evidently, this choice or decision is made by a group of scholars who take it upon themselves to investigate something that is hitherto considered peripheral. This is Elkana's exemplar from the history of physics to demonstrate the importance and significance of what he calls embracing contradictions. This approach in a matter of speaking is influenced by Dijksterhuis' idea that the history of science is the epistemological laboratory of science, and Elkana was convinced or sought to convince his readers that this social epistemology has a deep bearing upon graduate education in the sciences. Let us run through the justification that Elkana offers for the need to incorporate a historical epistemology of the sciences into the science curriculum, keeping the core idea in

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the background that this would be the basis of the new enlightenment. Contrary to the consensual view of the science, it is pointed out that there is a great deal of controversy within the sciences. In order to appreciate the relevance of these controversies and why they are important for the evolution of the sciences, graduate students need an exposure to the basic epistemological concerns about what constitutes knowledge and knowing and the issues that continue to confront the sciences. This entails acquiring an appreciation of the organisation of knowledge, standards of validity, precision and rigour. Thus a proper appreciation of the sciences requires recognising the significance of the contradictions and inconsistencies within the sciences, and the function of the pedagogue is to highlight the regimes where favoured theories fail. This kind of approach as philosophy of science suggests catalyses thinking about alternate theories and ways of looking at problems, throwing open the possibility of questioning received theories that dominate the landscape of science at any one time. These arguments in part derive their philosophical premises in the works of Karl Popper and Paul Feyerabend and others.

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Elkana pushes this historical epistemology into the domain of science education. In other words the philosophical argument has precedents, but its reworking into the educational context is new. But this exposure is not to be limited to the boundaries of received disciplines such as physics or chemistry around which undergraduate education is organised. This contextualism is to be extended as part of the course work in doctoral research programmes which means introducing the salient philosophical, sociological and methodological determinants and perspectives. This exercise is to be constantly refreshed during the course of a cohort's doctoral programme. This would help develop the metatheoretical skills of students thereby enriching their ability to critically and reflectively step back in order to contemplate alternatives to and weaknesses of the discipline or an emerging interdisciplinary field. To tie the argument up then this development must feedback into teaching. As part of doctoral mentoring along these lines, the peers and research leaders in a discipline need to emphasise the critical and pedagogical functions of critical work that extends far beyond that of research. Doctoral students

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need to be alerted to aspects of their future, for most will spend more time interacting with varied publics that includes industry, policy and community settings, etc, rather than with their colleagues at the frontiers of science. Consequently, doctoral programmes need to equip students for such futures. In the light of the climate crisis and the pandemic, part of the doctoral students' socialisation would be to conceptualise scientific work for an intensely globalised world. For Elkanathe objective of these aspects of doctoral mentoring, within the framework of the new enlightenment, is to produce a generation of responsible stewards of the disciplines. The contextualisation of disciplines also helps overcome another issue that resides at the core of doctoral instruction in the academy and takes on the dimensions of a cultural and ideological divide. Doctoral programmes in the sciences and social sciences tend to asymmetrically undermine the latter with respect to the former and thereby create hierarchies. The sciences in this imaginary are characterised by more exact and robust problem definition and are so oriented that there is a greater commitment to consensus seeking, while the imaginary of the social sciences is indeed antithetical to this.

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The reality is that there is greater controversy in the sciences than the practitioners acknowledge or are aware of. Consequently, graduate students in the sciences are seduced by the imaginary into believing in “a dream world of putative consensus and shared premises,” the social sciences, on the other hand, are immobilised by their interpretive flexibility and multiplicity of perspectives. While not disagreeing that the humanities are messy in that they are marked by turmoil and deal with complexity, Elkana would thus add that the natural sciences are no different. For even in the natural sciences there are no theories of everything, primarily because “theoretical structures are far from complete,” their foundations are mired in presuppositions and contradictions and these presuppositions themselves constantly shift and are revised as the theories themselves evolve. In other words, in the humanities and social sciences “disagreements on basics is considered an intellectual desideratum,” analogous differences in the sciences are never verbalised in the socialisation of doctoral students. The consensus about consensus has resulted in the marginalisation of the space for dialectical thinking. Though dialectical

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thinking fundamentally engages with contradictions, there is a concomitant recognition that different framings of questions yield different answers. Elkana points out that in the curricular world dialectical thinking is often dismissed as Marxist and its promise lost to the contemporary academy. How does one explain this blanket acceptance of a culture of consensus? In *The Essential Tension*, Kuhn had argued that as a science becomes more mature or a theory gets increasingly formalised the polysemy surrounding the theory collapses and it becomes mono-paradigmatic ergo consensual. Once the idea of consensus is accepted it follows that the compulsions for conceptual change or scientific revolution are internally generated and hence there is no need to educate students otherwise. But scientists such as Weinberg disagree with Kuhn in so far as there is no science which in any stage of its development is mono-paradigmatic. Leaders of a scientific field are always articulating competing paradigms. The whole field of the history of concepts and even the history of ideas would suggest that in practice the social sciences accept and welcome this feature as intrinsic to the pursuit, the natural sciences see

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this transience as a passing phenomenon on the highway to objective truth. The remedy does not reside in making changes to the content of the doctoral programme in the sciences but in focussing attention in addition to aspects that are ignored by the protocols internalised by science students. A survey among doctoral science students as to what constitutes knowledge would disclose how inadequate that conception is. How do students learn to orient their research in a disciplinary or interdisciplinary format when confronted with competing paradigms and contradictions? Elkana believes that the processes of disciplinary specialisation has destroyed the skills of doctoral students to cope with this 'messiness.' Another exemplar that Elkana evokes is the different premises of the foundations of physics that separate the work of the theoretical condensed matter physicist Philip Anderson from that of the high energy physicist Steven Weinberg – both Nobel laureates. These foundational differences do not surface in the conflicting advice that is offered to review committees evaluating proposals to fund say the superconducting supercollider or in a several volume text book on physics

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that prepares a doctoral student irrespective of her/his specialisation. Weinberg and Anderson, and their students, would not disagree on the fundamentals of physics. But the two physicists and their associated networks would have different response, Elkana contends to the questions: (1) Are we approaching a final theory, (2) Do different levels of organisation of matter obey different sets of laws that are not necessarily reducible to one theory? Clearly, we see very different conceptions of theory that separate the two communities. Elkana sees this as an opportunity to bring in hermeneutics into the science disciplines. The point was driven home in the work of Patrick Heelan who pointed out that science too has its heremeneutic tasks. The ideology of science inculcated among scientists is founded on the ideal of scientific consensus formulated in terms of a neutral, value-free, context independent scholarly pursuit. But as discussed above, Elkana does not subscribe to this ideal of knowledge. At the same time, he is not an adherent of the strong programme of scientific knowledge, but to a weaker version of it. He argues that political context influenced the socially determined confines of the modern scientific movement

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without influencing the context of scientific theories. Researchers within the history of sciences have long been exposed to the methodological imperatives of contextualism – at least for three decades. Writing in the early days of the ascent of contextualism, Elkana alerted his reader to a set of contextualist questions: (1) where does knowledge come from; (2) what problems to scientific communities and collectives decide are important; (3) what is the social context within which this knowledge is embedded? We do know that the nineteenth century was dominated by the rational, dogmatic, universalistic character of the enlightenment that came to be interrogated by the pragmatists such as James, Peirce, Dewey and finally Toulmin and Rorty. The enlightenment frame did recognise the importance of complexity, the actual science pursued was as if it didn't exist. Research was guided by the ideal of rational, universal, context-independent science that was devoid of contradictions. In the sciences of complexity and the study of non-linear systems, there is a recognition of the cracks in the wall. The philosopher Justin Smith in his history of the dark side of reason points out that the history of rationality also

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comprises irrationality: "... exaltation of reason, and a desire to eradicate its opposite; the inevitable endurance of irrationality in human life, even, and perhaps especially – or at least especially troublingly – in the movements that set themselves up to eliminate irrationality; and, finally, the descent into irrational self-immolation of the very currents of thought and of social organisation that had set themselves up as bulwarks against irrationality." And so the task, according to Elkana, is to ensure that with this recognition rationality does not slide towards irrationality but is bolstered by the concept of reasonableness. In other words, our methods should embrace a contextualist reckoning with the historical, social and political settings for the emergence of concepts and themes. But it is not sufficient to recognise this at the frontiers of research. The point is to revise the curriculum of undergraduate education that is not based on the rationality of say game theory or rational choice theory. The task should be to enrich and tailor the curriculum by incorporating ways of dealing with complexity. This conception of the new enlightenment is just not to become the basis for reviving the curriculum of an

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undergraduate programme or that of any programme in the natural and social sciences and humanities but is to be extended to professional schools of medicine, engineering and law. Here too, Elkana picks up some exemplars from the contemporary world of professional education. The first of these is Andras Sajo's *Constitutional Sentiments* (2010). The work points out how liberal constitutionalism in France and the United States was shaped as much by emotionally driven processes that reflected public sentiments as much as moral sentiment. The discussion of these exemplars is not prescriptive but educational in that they seek to establish how we potter around in the creation of new knowledge and the sources of the errors we commit. Similarly, the effort of Randolphe Nesse to develop a new field of knowledge called evolutionary medicine at the intersection of evolutionary biology and the medical science has now been incorporated into the teaching and research programmes of several medical schools in the USA. In fact, this is of particular relevance to our own times as we live through this pandemic. Evolutionary medicine has much to offer our understanding of infectious diseases wherein the object of

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investigation is the co-evolution of parasites and humans. The third example, discussed as illustrative of the need to reform the professional practice of medicine, is that of narrative medicine proposed by Jerome Bruner, where the hope is to integrate the narrative of the patient into diagnostic protocols. In other words the larger methodological consequence of the exemplar is the importance of narrative in rethinking enlightenment. Towards the last years of his life Elkana began working on undergraduate education and developed an inventory of problems that were of salience to a new Liberal Arts curriculum that was to be integrated into three or four years of undergraduate studies, in addition to developing the basics of a discipline. At the end of four years the student should have acquired the ability to “understand the main problems of our age.” The list included: 1) Widespread poverty 2) The spreading of infectious diseases like AIDS/HIV, malaria, tuberculosis: including the social, cultural and historical dimensions, way beyond the bio-medical aspect; 3) The global spread of religious fundamentalist movements. 4) The knowledge required to follow the discussions on global warming,

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the widely diverging assessments of the risks involved, and how the citizen must be prepared to undertake facing those risks; 5) The intellectual resources required to understand the broad spectrum of different regimes in the world, as many tip towards forms of authoritarianism; 6) An engagement with the diverse types of corruption in the world, and their relative destructive power, and to see where they constitute an integral part of a newly-emerging democracy; 7) The different dimensions of the digital revolution and how it will change daily life of all people; 8) What are the diverse legal aspects of a globalised world? These concerns are global in scope and leave room for adaptation to local context. But any engagement with these problems would require an exposure to more than one discipline. The answer is not that of the NEP 2020, namely multi-disciplinarity. The preparation of an interdisciplinary undergraduate curriculum would require years of research, and a thorough exploration of the scope of interdisciplinary and trans-disciplinary knowledge. Developing a curriculum is not just an exercise in didactics, but thinking through the foundation of disciplines, and requires reimagining

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disciplines and the interactive boundaries between them. Elkana was prophetic in suggesting that inter-disciplinary knowledge combining bio-medical knowledge with that of socio-cultural and historical processes in the understanding of the spread of infectious diseases; or that contextually conceived cognitive psychology was the science of the future. The approaches to these inter-disciplinary fields were still what one could call works in progress and will take years to develop. Two tasks are imperative when undertaking such an enterprise - the development of the curriculum goes hand in hand with reimagining the structure and ideal of the university. In this talk I do not intend to address the structural and financial crisis of the university but these issues have been addressed in the work Elkana co-authored with Klopper and was published posthumously.

Conclusion At the end of this exegesis I am sure you, as listeners, would expect me to comment on the policies and reports that have been the subject of much heated discussion over the last two years. Firstly, in these reports there seems to be a strident chorus on critical thinking and research methodology as

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the magic bullets that would improve the quality of research in our universities. But it is very soon evident that research methodology is really a euphemism for research methods and techniques. The intrinsic relationship, as Elkana has pointed, between the development of a critical faculty of judgement and research methods has been undermined by mono-paradigmatic doctoral instruction. How do critical thinking and research methods co-constitute research methodology is never elaborated upon. The second aspect is the NEP 2020's uncritical espousal of multi-disciplinary education at the college level. This is rather surprising at the beginning of the 21st century. I have argued elsewhere that the disciplines, multi-, inter- and trans-disciplinarity are different moments in the evolution of knowledge and are responses to the problem of overload and integration that the world of knowledge cyclically encounters as its frontiers advance. The problem with multi-disciplinarity is that while it juxtaposes disciplines and fosters wider understanding, the disciplines retain their identity. Since multi-disciplinarity involves an assemblage of disciplinary courses integration and interaction are lacking. The template of

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multi-disciplinarity is that of industrial production involving mechanical separation of functions and at the end of the course or project there is a retreat back into the disciplinary domains. The moment of multi-disciplinarity passed several decades ago. Research communities the world over have been busy forging inter and trans-disciplinary fields deeply informed by the concerns of complexity, non-linearity and the boundary-crossing between disciplines. Restoring multi-disciplinarity is to ignore the nature of advance of the frontier of knowledge and is tantamount to pushing the envelope back. From Elkana's writings, we learn that we cannot mandate inter-disciplinarity. The development of inter-disciplinarity requires a firm grounding on solid disciplinary platforms, a team of scientists and social scientists at the frontiers of their disciplines, university and college teachers spending time and researching the form and content of an undergraduate and graduate programme. Finally, the general orientation of NEP 2020 is one of centralisation and homogenisation, rather than promoting diversity. This focus is a natural outcome of a mechanical overview of the system of higher education, rather than an ecological one

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characterised by diversity and diversity enhancing connections. The mechanical perspective is premised on the idea of an institutional separability that fails to recognise that higher education is characterised by functional differentiation and the connectivities of a changing society. Further, the introduction of the natural sciences to contextualist thought may provide the opportunity to bridge the gap between the sciences and social sciences, in addition to promoting many cultures of the sciences. But more than anything else, the NEP 2020 is silent about preparing generations of students for global citizenship – what cognitive and intellectual resources would be required for dealing with the impending calamities and the possibility of survival in the future. This is something we need to reflect on further.

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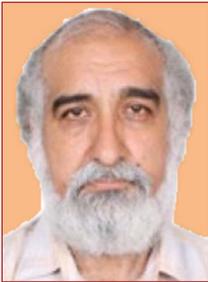
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