# THE POWER OF IDEAS AND THE MODERN UNIVERSITY

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*Ideas rule the world, drive our actions, inform our beliefs, and unleash mighty revolutions. Universities in the developed world are the powerhouses of ideas, the engines of progress, and repositories of accumulated wisdom. How can Pakistani universities follow suit, and how must Pakistan's higher education system be changed for it to succeed?*

It is a pleasure to be here at the kind invitation of this Convention's organizers. Although I am not an alumnus of your distinguished engineering college, I have fond memories of its old campus and students. As a 14-year old, my nights had been filled with dreams of electrical transformers and motors, and my days occupied with building various Meccano-based gadgets that used electromechanical devices. I cannot understand or explain my old obsession even to myself now, but at that time the very idea that an invisible current in a coil could move things around and around, and from here to there, fascinated me endlessly. One day someone told me that people at NED knew everything about electricity and magnetism. And so, every so often after school, I would cycle over to the NED Sevakunj Hostel, just opposite to the British Council at Arambagh. There I quickly adopted some students as my gurus. I kept bugging them to help me understand what was wrong with my transformers, and why my carefully constructed motors had the unfortunate propensity of catching fire moments after being turned on.

I don't think I was exceptional in having been "turned on" by an idea. Of course, there are lots of rather ordinary kinds of ideas. And then, there are great ideas. Great ideas are incredibly powerful. They rule the world, drive our actions, inform our beliefs and values, and unleash mighty revolutions. They have this enormous power because they move our minds and shape our understanding of the world. They are contagious, leaping from mind to mind until they become part of common wisdom, quickly toppling established beliefs. As Victor Hugo said, "A stand can be made against invasion by an army; no stand can be made against invasion by an idea."

The classic example of a great idea is Galileo's heliocentric universe. It is not the earth but the sun, he reasoned, that is the centre around which the planets revolve. Galileo's heretical idea was to forever change how humans see themselves in relation to the cosmos. Pope Urban VIII, for all the awesome power of torture and suppression at his disposal, could not stop an idea whose time had come. And, for all the flak that Charles Darwin continues to get even today, nothing could prevent his Natural Evolution from becoming the very foundation of modern biology.

The amazing thing about ideas is that we start thinking of them as if they are real when, in fact, they may be purely abstract and live only as mental constructs. In that sense, they are wholly disconnected with reality. Nevertheless, they are extremely important because they become part of, and indistinguishable from, our thinking processes. Let me give you examples.

## 1. SOME TERRIFIC IDEAS

*Numbers* make for a wonderful example. We humans have done better than birds and monkeys because we can do math, i.e. deal with numbers, and this is part of our mental machinery. But numbers are abstractions; they are "mere" ideas. They appear to have an existence but only because our minds can conceive of certain objects that, on our insistence, obey certain rules. The numbers 1,2,3,… do not exist in a physical sense. Yes, you can point to one apple, two apples, three apples, …. and they have a manifest physical existence. But the numbers 1,2,3… exist only in your brain. They obey the rule, abstracted from experience with apples, that $1+1=2$ and $2+1=1+2=3$, etc. Even if there were no apples in the universe – or even a single electron or quark – there would still be an infinite number of numbers provided there was a (hypothetically non-material) mind in which they could live.

But maybe you are not fully convinced, so let me give another example – that of the so-called "imaginary numbers". There is clearly no ordinary number which, when multiplied by itself, gives minus one. In other words we do not know how to take the square root of minus one. So 400 years ago someone *invented* a brand new kind of number and called it the "imaginary number" *i* or "iota". Without this apparently useless idea we would not be able to solve the simplest of equations, such as $x^2=-4$, much less the equations discovered by James Clerk Maxwell around 1860. But without being able to solve the Maxwell equations, electromagnetic waves could never have been discovered and so there would have been no radios, microwave ovens, or computers. The electronics industry would not exist, and there would be no Silicon Valley where we are gathered today. Isn't it amazing that our reality owes to numbers that do not exist! I wish I had time to talk here about still more bizarre numbers known as Quaternions and Grassmanians….. Without them, physicists would find it quite impossible to uncover the basic laws that govern elementary particles or to understand the early universe.

*Money:* Let's move from the domain of ideas in mathematics to ideas concerning society. Money is so fundamental. It is something that people are willing to work long hours for, and even willing to kill or die for. But money is really quite an unreal thing – it is just printed slips of paper. These slips are not even convertible to gold as they once were. But over time people have accepted the idea that they should be exchangeable for goods and services. In other words we have come to accept money as a medium of exchange that simplifies trade, and as a store of value that allows us to accumulate our labor so that we can stake our claim for goods and services in the future. Just try to imagine a world where we had not hit upon the idea of money!

*Wiki-ideas:* Now for some more contemporary ideas. Probably all of us have used Wikipedia. This free encyclopedia has over 75,000 active contributors working on some 5,300,000 articles in more than 100 languages. Currently there are about 2 million articles in English. The concept is to engage writers and editors in exploding Web-enabled communities and harness their collective capability and genius. But Wikipedia is just a taste of the things to come in the future. There is an interesting new term floating around these days – Wikinomics – a new art and science based on four powerful new ideas: openness, peering, sharing, and acting globally. U-Tube, and the Human Genome Project are among the successful examples and I am sure there are many more.

*Holography:* I could go on, but there's one last idea that I want to tell you about because, like many other physicists the world over, I too would like to understand how our normal 4-dimensional world arises from the actual 10 dimensional world that "exists out there". Juan Maldacena, a Harvard physicist, conjectured about 15 years ago that our world actually lies on the boundary of the larger 10-D space. He followed a bold proposal put forward in 1993 by the Dutch physicist, Gerard 't Hooft, who had won the Nobel Prize for some earlier work. The proposal was reminiscent of Plato's Allegory of the Cave in which people are chained in a cave so that they can only see the shadows which are cast on the walls of the cave by a fire. t'Hooft's proposal, which is known as the *Holographic Principle*, states that all of the information contained in some region of space can be represented as a "hologram" – a theory that "lives" on the boundary of that region. The subsequent Maldacena Conjecture is exciting many traditional particle physicists to do actual mathematical calculations for getting the properties of ordinary particles in 4-D, like protons and neutrons, from the complicated dances of little bits of string in the real 10-D world.

There's no end to great ideas. But where do ideas come from? Asadullah Ghalib thought he knew:

آتے ہیں غیب سے یہ مضامیں خیال میں
غالب! صریرِ خامہ نوائے سروش ہے

Well, it may be true that an idea or inspiration from "above" led Ghalib to his best poetry. But what could someone who has suddenly conceived of a clever mouse trap or a faster computer chip claim? As a matter of fact we don't know very much about where *any* idea comes from, much less a great idea. But we do know that every idea is a product of the mental process of thinking. Thinking involves the cerebral manipulation of information. When we learn new concepts, engage in problem solving, or decide between alternatives, we engage in thinking and set large numbers of neurons sparking away. Thinking is a higher cognitive function where new situations and new experiences are judged against recalled ones. In order to make these judgments, the intellect maintains present experience and sorts relevant past experience.

So, it is the intellect that generates ideas. And, to help nurture the intellect, a human institution has been created that we call the university. As a helpful tool let us create for ourselves a hypothetical "ideal university" that, free of practical constraints, allows us to imagine all that a university should be.

## 2. THE IDEAL UNIVERSITY

Please understand that an ideal university does not exist, in the same sense as a point particle or free particle do not exist in the physical universe. Nevertheless, the study of physics necessarily begins with the concept of particles that occupy no space, and which can move freely everywhere without feeling a force.

So then, what is an ideal university?

First, this university should be a bastion of critical inquiry covering every conceivable field of human endeavor. Its first-rate faculty does first-rate work on super-massive Black Holes and discovers new extra-solar planets, figures out quantum computation and the folding of proteins, documents the mating habits of macaws and tarantulas, and researches the extinct languages of Sumeria and Mesopotamia. The professors are widely cited and known for important discoveries. Their fame attracts other faculty as well as students from across the world.

Our university also spawns hi-tech companies that create more powerful computers and data compression techniques. It generates products and ideas upon which civilizations' progress and survival depend – new crop varieties, alternate energy sources, etc. It also does a splendid job at training engineers, doctors, economists, business managers, and other professionals.

Most importantly – this ideal university creates a modern citizenry capable of responsible and reasoned decision making. Its graduates can think independently and scientifically, have an understanding of history and culture, can create discourses on social and political issues, and are capable of coherent expression in speech and writing. They are in demand everywhere – both in academia and industry – nationally and internationally.

A tall order indeed! Harvard, Stanford, MIT, Cambridge, Oxford, Sorbonne, etc. are mere approximations to this high ideal. How does one create second order approximations in a developing country?

## 3. QUALITY - THE REAL CHALLENGE OF PAKISTANI HIGHER EDUCATION

Obviously money and resources are necessary. Well, there is plenty of that around in Pakistan these days. But we don't have anything that can even remotely be considered a world-class university. Why? Even for the wisest of planners this is a daunting task. The task is made yet harder by our misfortune that the current bosses of the Higher Education Commission prefer floating in space rather than risk having their feet on the ground. Hence their mad-cap projects.

An example: take Pakistan's ambitious $4.3 billion project to create 9 Pak-European world-class engineering universities staffed with European faculty and administrators. The project sounds wonderful even if expensive – Pakistan plans to pay the full development costs, recurrent expenses, and euro-level salaries (plus 40% markup) for all the foreign professors and administrators. Still, presumably the large presence of European professors teaching in these Pakistan universities would ensure high standards of teaching. The official starting date of the first university (French) is currently listed as October 2007.

But, on the ground, the situation is dismal. Because of the dangerous security situation – a fact that planners could have easily anticipated – the French seem absent from the French university. As of the beginning of March 2007, not a single faculty member from France, including the all-important head of the university, had joined. But even if the Europeans come, there is not enough Pakistani faculty for all these universities. Nor are there well-prepared students.

The HEC, operating securely under the protection of a dictatorial regime, has other projects too that also make one gasp in astonishment. But I do not want to waste time here shooting them down. There are more serious issues to be addressed.

It is a sad fact that enrollment in Pakistani universities stands at around 3% of the eligible age group, a figure far below that in neighboring countries of South Asia. The common belief is that making more universities and spending more money on higher education will fix the problem. But this is just not working. Although the number of universities stands at 101 today in comparison to just 24 in 1997, and although the higher education budget has jumped from Rs 3.8 billion in 2002 to Rs 33.7 billion in 2007, we are not even close to the beginnings of a meaningful change.

Real change can only come from squarely addressing the core issue: what should students ideally get from pursuing higher education and what, in the typical Pakistani situation, do they actually gain? Just increasing enrollment simply isn't good enough.

Imagine a department of English where the department's head cannot speak or write a grammatically correct non-trivial sentence of English; a physics department where the head is confused about the operation of an incandescent light bulb; a mathematics department where graduate students have problems with elementary surds and roots; or a biology department where evolution is thought to be new-fangled and quite unnecessary to teach as part of modern biology. Regrettably, none of these examples is hypothetical, or even uncommon. And clearly, if that's what we are offering to students, then there is no point in having more of a bad thing.

We need to think and reflect, not just keep expanding blindly.

## 4. HOW CAN PAKISTANI HIGHER EDUCATION BE TURNED AROUND?

Brevity carries the risk of incomplete argumentation. So, although I am unable to present my case for proposed changes in adequate detail, here in a nutshell are the changes that I think are needed:

A) Concentrate upon improving colleges rather than universities. Most government funding for higher education goes to universities. During 2001-2004, the funds annually allocated to over 600 colleges averaged Rs. 0.48 billion only, and the spending per college student was only one sixth that for a university student. In subsequent years, this has become worse. In 2005/06, spending on university grants for about 45 universities totaled Rs. 9.2 billion. Currently (2007), HEC's total funding is a huge Rs. 33.7 billion, mostly for universities. But spending more money on universities can result only in tiny, incremental gains because of the existence of various non-resource related constraints. On the other hand, colleges desperately need improvements in infrastructure, administration and governance, curriculum improvements, computer facilities, and scholarships.

B) The lack of adequate numbers of good university and college teachers is by far the most important roadblock in improving higher education. "Adequacy" is not to be

judged solely by the number of teachers with formal qualifications, but also in terms of their actual subject knowledge. Some possible ways to improve this situation are:

i) Create large-scale higher education teacher-training academies in every province with the aid of international agencies, bringing the best and most highly-paid master trainers from across the world. This should be a major project worth roughly $1 billion dollars over 5 years. The academies should have a clear instructional philosophy aimed at equipping teachers to teach concepts rather than use rote learning; use modern textbooks rather than their old notes; and emphasize basic principles of pedagogy, grading, and fairness.

ii) Build on various current HEC initiatives such as foreign faculty hiring and scholarship schemes for university teachers. The fact that these have been badly mismanaged by the HEC should not prejudice one against their potential usefulness if proper procedures and rules are adhered to. There are simply not enough qualified persons within the Pakistan to adequately staff university departments.

C) Emphasize improvement in university teaching quality and infrastructure rather than so-called "research", which is generally of poor quality. This "research" is largely done to increase publication numbers of individual teachers and adds little to the stock of existing knowledge. In 2005/2006, research funding totaled Rs. 0.342 billion – an enormous sum considering how poorly funded colleges are. The policy of monetary rewards for publishing research papers, given by the PCST and HEC, must be discontinued because this has led to an outbreak of plagiarism without improving the quality of the research. Research projects need to be evaluated much more carefully than at the present time and the funding reduced to sensible proportions.

D) Improve student input into higher education institutions through standardized entrance tests. Although its quality is not satisfactory, the National Testing Service could be used as a way of starting this. Meanwhile, work for meaningful national entrance tests for higher education institutions.

E) Use education technology more seriously. Distance education, as well internet materials, can be used far more effectively in Pakistani colleges if their teachers are trained to correctly use them. This requires creating a proper methodology and investment in infrastructure.

F) Take academic ethics seriously – declare a national policy of zero-tolerance for plagiarism, cheating in examinations, fake degrees, and fake universities. These academic crimes have done immense damage to the fabric of national education.

G) The campus ambience must be improved: intellectual activities – seminars, colloquia, debates – should be actively encouraged by college and university administrations. Students must be permitted, even encouraged, to self-organize. It is crucial to bring back on to the campuses meaningful discussions on social, cultural and political issues. To create the culture of civilized debate, student unions must be restored, with elections for student representatives. They will be the next generation of political leaders. Such a step will not be free from problems – religious extremists rule many Pakistani campuses although all unions are banned. They would surely try to take advantage of the new opportunities offered once the ban is lifted. Political parties have also been less than responsible [for what?]. But the reinstatement of unions – subject to their elected leaders making a pledge to abjure violence and the disruption of academic activity – is the only way forward for creating a university culture on campus. Ultimately, reasonable voices, too, will be heard. As an interim step, the government should allow and encourage limited activities such as community work, science popularization by students, etc.

H) Implement better, more transparent, and accountable ways to recruit vice-chancellors and senior administrators. Pakistan has a patronage system because of which unqualified and unsuitable military men as well as bureaucrats, are appointed as vice-chancellors or senior administrators.

## 5. CONCLUSION
No one doubts that we need to allocate more material resources for education, have help from other countries and from Pakistani expatriates, etc. And of course one

must prepare detailed education policy papers and documents aimed at reform.

These are necessary, but the deeper reasons for Pakistan being unable to develop good universities as yet lies in the realm of attitudes and cultural mores. At the base lies the unresolved tension between traditional and modern modes of thought and social behavior. We must not allow religious vigilantes to enforce their version of Islam on to the university community by forcing girls into the veil, destroying musical instruments, forbidding men and women from being together, and putting a damper on cultural expression. We must not allow the universities to enhance ethnic divisions. And, we must stop the disgraceful practice of intelligence agencies roaming around campuses monitoring staff and students for "anti-state activities".

The bottom line: universities are all about thinking. Thinking needs mental space – in other words, freedom.

Without personal and intellectual freedom there can be no thinking and hence no ideas, no innovation, no discoveries, no progress. Our real challenge is not better equipment or faster internet connectivity but the need to break with mental enslavement, to change attitudes, and to win our precious freedom.

So let us pray, with Rabindranath Tagore, for a Pakistan:

*Where the mind is without fear and the head is held high;*
*Where knowledge is free;*
*Where the world has not been broken up into fragments by narrow domestic walls;*
*Where words come out from the depth of truth;*
*Where tireless striving stretches its arms towards perfection;*
*Where the clear stream of reason has not lost its way into the dreary desert sand of dead habit;*
*Where the mind is led forward by thee into ever-widening thought and action--*
*Into that heaven of freedom, my Father, let my country awake.*

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