

Editorial

Foundation of Ethics

All religions, all countries and all societies teach ethical values, such as do not injure, do not kill, do not deceive, do not steal, be kind to others, speak truth and help others etc. In short they say “do unto others as you would have others done to you”. Why? Is it because all are one? Apparently, it is not true. Every person is different from the other in his looks, thoughts, emotions, temperament, likes, dislikes, name and fame etc. Some persons are honest some others are dishonest. Some are kind some others are cruel. Every person is different from the other. Then why do all religions, all countries and all societies teach the same ethical percepts to every person?

Swami Vivekanand raised the same question while delivering a lecture on “Vedanta as a Factor in Civilization” at Airdie Lodge, Ridgeway Gardens, England. He said “Though all religions have taught ethical percepts, such as do not kill, do not injure; love your neighbour as yourself etc., yet non of these have given the reason. Why should I not injure my neighbour? To this there was no satisfactory or conclusive answer forthcoming; until it was evolved by the metaphysical speculations of the Hindus who could not rest satisfied with mere dogmas”. They found that every one is the same at the core of their existence. Therefore by injuring his neighbour, one is injuring himself. In loving anyone, the individual loves himself. They said that this oneness of all is the basis of all ethics and morality. However, one may say that these statements may be true, but how to prove that everyone is the same at the core of existence? The answer is found in the knowledge of ultimate reality, the entity that remains unchanged under all conditions and at all times.

I came to know the ultimate reality in finding the answer to a simple question. Others know that you are by seeing your face but you can not see your own face, then how do you know that you are? You can see your face in a mirror. Do you go to a mirror and see your face to know that you are? Or, do you touch your body or hear your voice or, do you think whether you are or not to know that you are? The answer to all these questions is no. It means that you know that “you are” without bringing the body into picture and without using five senses, mind and intellect. It means that the knowledge of one’s existence is independent of body, five senses, mind and intellect. It means that the consciousness that gives rise to the knowledge of one’s existence is different from the consciousness that we experience in our body and that consciousness has an independent existence. In fact, the knowledge of one’s existence is the only knowledge that one has without the use of five senses, mind and intellect. No other knowledge can be had without the use our five sense, mind

and intellect. It means that the consciousness that gives rise to the knowledge of one's existence is a unique consciousness different from the consciousness that we normally experience in our body. In this consciousness there is no notion of individual because it is free from five senses, mind and intellect which give rise to the notion of individual.

It is the experience of one and all that there is no change in the knowledge of one's existence at any time (young or old) and under any condition (well or unwell, happy or unhappy etc.). It should be so because it is independent of five senses, mind and intellect which under go change with time and condition. There is nothing else in the experience of one and all that remains unchanged at all time and under all conditions. Therefore, the consciousness that gives rise to the changeless knowledge of one's existence is ultimate reality. We differ from each other because of difference in our bodies, five senses, mind and intellect. But the knowledge our existence is independent of body, five senses, mind, and intellect. **We all are one in the knowledge of our existence. This oneness of all in the Knowledge of our existence is the foundation of all ethics and morality.** The conscious that give rise to this knowledge is called undifferentiated consciousness.

The undifferentiated consciousness not only provides the foundation of ethics, it is the most likely source of the universe. The universe (energy and matter) originated 13.7 billions years ago in a phenomenon called Big Bang. "The known science can not explain from what and how the universe came". However, there is simple answer to these questions in terms of ultimate reality. The universe must have come out of some thing and that some thing was only undifferentiated consciousness ever present because of being ultimate reality. Therefore, it is quite logical to assume that the universe came out of undifferentiated consciousness. How it came out of it has been explained in a paper on "Ultimate Reality and Non-Material Origin of Universe" by me published in this issue. Though the paper is like any other scientific paper based on observation, interpretation, conclusion and verification, its first part is quite abstract and difficult to understand without deep and focused thinking and discussion. I would be glad to answer any question on it. The questions may be emailed to me on, premnath70@yahoo.com

— P.N. Tiwari

Padma Shri to SSV President Prof. K. L. Chopra



Professor K. L. Chopra

Professor Kasturi Lal Chopra, President SSV has been awarded Padma Shri. The award was announced on January 25, 2008, the eve of the 59th republic day of India. As is evident from his short bio-data Prof. Chopra has made unique contributions in research and management. He deserves higher awards.

Professor Kasturi Lal Chopra is recognised internationally for his pioneering contributions in developing Science and Technology of Thin-Films, now popularly known as Nanoscience and Nanotechnology. He is also well known for reviving troubled IIT Kharagpur to number one position among IITs with several unique innovations which have now been emulated by other IITs.

Born on July 31, 1933 at Chahal Kalan, Punjab (now Pakistan), Kasturi Lal Chopra witnessed the horrors of partition and reached Delhi, along with his family, in 1947. He pursued studies in Physics at Delhi University to obtain BSc (Hons) and MSc, and thereafter studied at University of British Columbia, Canada under World University Fellowship to get a PhD degree in 1957..He served in several senior R&D positions for about 14 years as Defence Research Fellow at Royal Military College, Canada, as Max Planck Fellow at Fritz Haber Institute, W Germany, as Staff Scientist at Philco-Ford Scientific Lab and Ledgemont Lab, Kenecott Corp, USA. Invited to the position of Senior Professor, Solid State Physics at IIT , Delhi in 1971, Prof Chopra also served as the Head, Physics Department , Thin Film & Solid State Technology Cell ,and Centre for Energy Studies,. He was the Dean, PG studies for two terms and Founder Dean of Industrial R&D.He has also been a Visiting Professor at Cornell and Northeastern Universities, USA n 1987, he was invited to the challenging position of Director , IIT , Kharagpur which, as a unique case, he served for two terms of ten years and turned the troubled institute around into a number one among IITs.His numerous institute-building innovations at IIT include a Management School named after its donor (Vinod Gupta), Microscience Laboratory, Bioengineering and Biotechnology Centre, GS Sanyal School of Telecommunications donated by an alumnus, 100 acre S&T Entrepreneur Park with faculty-held enterprises, Technology Foundation ,Multi -crore Corpus Fund, E- Library, Optical cable wired campus, IIT Extension Centres at Kolkata and Bhubneshwar. Many of these unique innovations have since been emulated by other IITs.

After retirement from Kharagpur , Prof Chopra occupied the newly created IREDA Chair at IIT, Delhi. Presently, he is Advisor and Honorary Professor of Thin Film Laboratory at IIT, Delhi, Advisor and Consultant to several academic , government, and industrial organisations, besides being the President, Society for Scientific Values and Associate Editor of the International Journal of Solar Energy Materials and Solar Cells.

Thin Film Laboratory at IIT Delhi and Microscience Laboratory at IIT Kharagpur founded by Prof Chopra and his colleagues are unique world class research centres, known worldwide for their pioneering R&D contributions in the field, now popularly known as Nanotechnology. Prof Chopra has supervised 60 PhD and over 100 MTech theses; published about 425 research papers in reputed international journals ; authored/edited 08 research/text books, including the famous Treatise“ Thin Film Phenomena” considered as the Bible of the field by the world community. He holds 5 US patents and has transferred 08 know-hows to the industry in India.Fifteen students of Prof Chopra are presently CEOs of S&T companies in India and abroad. Prof Chopra has lectured extensively in various international institutions and has also consulted various international and national industries such as IBM , Westinghouse, ARCO, VICO, BHEL, HMT, HHV, etc in the areas of Thin Films and Nanomaterials. Microelectronics, Vacuum Science & Technology, Solar Energy Conversion, Surface Engineering, and Superconductivity.

Significant contributions of Prof Chopra and his students in the field of Thin Films and Nanomaterials include : **D**emonstrated specular scattering of conduction electrons in epitaxial gold films ; * **R**eported Giant Thermopower in disordered metal alloy films ; * **D**iscovered effect of an electric field on nucleation and growth of thin-films ; * **D**eveloped a Chemical Solution Growth (used by the industry and now popularly called Chemical Bath Deposition) technique for semiconductor films; * **E**stablished transport mechanisms in transparent conductors and developed ZnO as the new generation transparent conducting film material ; * **D**eveloped Ion-Beam Sputtering technology for the first time ; * **C**ontributed extensively to the physics of amorphous semiconductors ; * **D**iscovered a Giant Photocontraction effect in amorphous chalcogenide films ; * **D**eveloped solution growth technique for conducting polymer films ; * **D**eveloped chemical and sputtering techniques for hard, tribological and optically selective coatings for solar energy conversion ; * **D**eveloped graded index multilayers, now known as Superlattices, for the first time ; * **C**ontributed extensively to the physics and technology of Thin Film Solar Cells of various materials; * **D**eveloped novel chemical techniques for synthesizing nanostructured complex multicomponent high temperature superconducting and spintronic materials .

Prof. Chopra is a Fellow of the Indian National Science Academy, Indian Academy of Sciences, National Academy of Sciences and the Indian Academy of Engineering,

American Physical Society and Honorary Fellow of Punjab Science Academy . He has served as member/chairman of numerous professional committees such as : National Science Committee, UNESCO; Trustee, Welch Foundation Scholarship, USA; Member IUPAP National Committee; Member, International Committee on Solid Films and Surfaces; UGC Reviewing Committee; Member, Executive Committee, National Physical Laboratory, ; Member, Advisory Committee, Centre for Advanced Studies in Physics, Delhi University; Member, Advisory Committee, Cement Research Institute of India; Vice President, Materials Research Society and Electron Microscope Society of India; President, Indian Vacuum Society; IUUSTA, Thin Film Division; Chairman, Physics Research Committee, CSIR; Member, Advisory Committees: UGC, DST, DOE, DNES & CART; INSA Council; Central Advisory Board on Education; Chairman, Dalmia Research Centre; and Chairman, RIT Review Committee. He is on the editorial boards of several leading Indian and International professional journals and is the Associate Editor of the international journal "Solar Energy Materials and Solar Cells"

Prof. Chopra has received many honours and awards which include: Fellowship of World University (1954-57), Fellowship of Max Planck Society (1954-57), Four Kennecott Copper Corporation Patent Awards (1966-70), S. S. Bhatnagar Prize in Physics, CSIR (1975), FICCI Science & Technology Award (1983), S. S. Bhatnagar Award in Solar Energy, UGC (1985), Bhabha Award, INSA (1989), Bhasin Award, Bhasin Foundation (1989), K. S. Krishnan Memorial Lecture Award, INSA (1992), Distinguished Vacuum Scientist Award (1994), Distinguished Material Scientist Award (1994), P. C. Mahalanobis Medal Award, INSA (1996), Biren Roy Memorial Lecture Award (1997), Photovoltaic Award, Solar Energy Society (2001), and Aryabhata Gold Medal , INSA(2004), D Sc (honoris causa) ,UPTU (2007). He has delivered 13 memorial lectures dedicated to prominent science personalities. Recognized as one of the seven "*most highly cited*" scientists of India over a period of more than two decades, International Scientific Institute (ISI) of USA has honoured him with a "Citation Laureate " award" in 2004.

— P. N. Tiwari

Ultimate Reality and Non-Material Origin of Universe

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Introduction

There are two types of realities; apparent reality and ultimate reality. Apparent reality is the one which appears real to our five senses; sight, sound, touch, smell and taste. Most of the things around us like table, chair, book, bed, body, house, etc. appear real to our senses and mind. These things come in the category of apparent reality. Ultimate reality is the one that remains invariant against time and condition. In other words, ultimate reality remains unchanged under all conditions and under all times. Is there anything in our knowledge that meets the requirements to be termed as ultimate reality? Let us examine.

We know that planets are changing, stars are changing, galaxies are changing, and the universe as a whole is changing very fast. Everything around us including our body is changing. What about senses, mind and intellect which are our knowledge acquiring agencies? A keen observer will find that his senses are changing with age and health; his mind, the seat of thought and emotion is changing very fast; his intellect, the faculty of logic, reason, discrimination, and conclusion is also changing with change in his knowledge. Thus we find that our knowledge acquiring agencies namely sense, mind and intellect are also changing. The knowledge acquired by the use of changing agencies can not meet the requirements of changeless ultimate reality. **Is there any entity which we know without the use of our senses, mind and intellect and does that entity remains unchanged under all conditions and at all time to be called ultimate reality?** Let us examine.

Knowledge of One's Existence

There is a single entity namely, the knowledge of one's existence known to all without the use of five senses, mind and intellect. But most of the people do not know that they have this knowledge without the use of their five senses, mind and intellect. They may know it by correctly answering the subsequent questions. The first question is, "are you or not". The answer which everybody will give immediately without any doubt whatsoever is, "I am". The next question is, **"others know that you are by seeing your face, you can not see your own face, then how do you know that you are"**. You can see the reflection of your face in the mirror. Do you

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go to a mirror and see your face and then say that “I am”? The answer is no. Do you see or touch your body or hear your voice or use other two senses smell and taste, and then say that “I Am”? The answer is no. Do you think whether you are or not before answering that “I am”? The answer is no. Does the thought of body come to your mind before answering that “I am”. The answer is no. It means that one knows that he is without bringing his body into picture and without using his five senses, mind and intellect which implies that **the knowledge of one’s existence is independent of one’s body, five senses, mind and intellect.** This knowledge is free from the knowledge of individual (name, fame, ego, etc.) because it is independent of body, five senses, mind and intellect that give rise to the knowledge of individual. In other words, there is only “am” and not “I” in this knowledge. This knowledge which is known to all (every one knows that he is) can not be correctly expressed in words because the words have been formed to describe the knowledge acquired by our five senses, mind and intellect but this knowledge is not acquired by five senses mind and intellect. However, it may be indicated by the word isness to mean conscious existence.

. The knowledge of one’s existence is the only knowledge that every one has without the use of five senses, mind and intellect. This is the only knowledge about which one can be completely sure because it is independent of five senses, mind and intellect where doubts arise. This unique and doubtless knowledge is called Prajnanam in Vedanta. Since the source of knowledge is consciousness and as the knowledge of one’s existence is independent of body, five senses, mind and intellect therefore, the consciousness that give rise to this knowledge must also be independent of body, five senses, mind and intellect. **It means that the consciousness that gives rise to the knowledge of one’s existence has independent existence.**

“Though its systematic study (in science) has only just begun, consciousness—in the opinion of some eminent scientists today—is an absolute fundamental part of this universe and cannot simply be computed away or dismissed as airy metaphysics. Their conviction is based firmly on the careful examination of quantum nature (nonlocality and entanglement) of primary reality” (Bhaumik, 2005).

Since the consciousness that gives rise to the knowledge of one’s existence has independent existence and is not caused by the body and mind it must be the same for one and all. And for the same reason it must be free from thoughts and emotions, pleasures and pains, inferiority and superiority, anger and greed etc. caused by the body and mind. Because of this it must be an experience of perfect peace and bliss (absence of grief and also absence of sense pleasure). This has been found to be true by the persons who have been able to experience it in the thoughtless state of their mind. This consciousness which has independent existence and is free from thoughts, emotions, pleasures, pains etc. is called **Undifferentiated Consciousness**. It is called Atman in Vedanta. Since this consciousness which gives rise to the

knowledge of one's existence is independent of mind and body, it is the same for one and all. **Therefore at the level of existence all is one. This oneness of all is the foundation of ethics.** The difference that we observe from person to person is due to the difference in their thoughts, emotions, pleasures, pains etc. caused by different brain processes. The consciousness caused by different brain processes is called **differentiated consciousness** that is being studied by neuroscientists, cognitive psychologists and artificial intelligence specialists. The consciousness that we normally experience is differentiated consciousness. The consciousness that one experiences in the thoughtless state of mind during meditation is undifferentiated consciousness. It is a rare experience. The persons who have known and realized the undifferentiated consciousness, called Atman in Vedanta are self-realized persons. Their thoughts, words and actions are almost always ethical in every aspect of life.

Ultimate Reality

Ultimate reality is that entity which remains unchanged under all conditions and at all times. The knowledge of one's existence meets all the requirements to be termed as ultimate reality because it remains unchanged under all conditions and at all times. No one has ever known under any condition and any time that he is not. The Knowledge of one's existence remains unchanged during the entire life time of a person. There is nothing else in the experience of one and all that remains unchanged under all conditions and at all times during entire life time. Since this knowledge (amness) remains unchanged, the undifferentiated consciousness the cause of it must remain unchanged under all conditions and at all times. It should be so because undifferentiated consciousness has independent existence and is not caused by the body and mind that under go change with condition and time. Therefore, **undifferentiated consciousness is the ultimate reality.**

It is very difficult to describe undifferentiated consciousness because it is neither matter nor energy. Because of this it is not confined to any particular place. The nearest description of undifferentiated consciousness is conscious space with one major difference. Before the emergence of universe (Big Bang) space was not there as matter and energy were not there to exist in it. There will be no space in the absence of the matter and energy. No such limitation is there for the existence of undifferentiated consciousness as it does not need space to exist because it is volume less like thought and emotion. It is timeless because of being changeless. It is called Brahman in Vedanta.

Non-Material Origin of Universe

The universe did not exist before 13.7 billion years as per the Big Bang model of universe. The known science can not explain from what and how the universe

(energy and matter) came 13.7 billions year ago because when the cosmologists extrapolate the Big Bang model of universe just 4 minutes and 4 seconds further back in time before the Big Bang, the universe's density and temperature becomes infinite, calculations become impossible and known physics breaks down completely. "The problem is such that careful theoretical work combined with a wealth of observations may never give us ultimate answers to how the universe came to be" (Aguirre, 2006). Science simply can not answer what was there before the Big Bang (Kruesi, 2007). "When we talk about before (Big Bang) we are taking in terms of time. Is it even reasonable to ask what happened in a time before time itself began, or are we stepping on God's toe's? Stay tuned for some interesting ideas" (Bhaumik, 2005).

The simple answer as to, what was there before the Big Bang and from where the universe (energy and matter) came 13.7 billion years ago is that undifferentiated consciousness was there because of being ultimate reality which remains unchanged under all conditions and at all times and, the universe (energy and matter) came out of it. The question is whether energy or matter came out first from undifferentiated consciousness or both came out together. The answer is provided by the fact that in the beginning the universe was almost entirely made up of energy (Aguirre, 2006). It means that energy came out first and got converted into matter because energy and matter are inter-convertible.

Since energy and matter are inter-convertible, and nature prefers symmetry, it is quite logical to assume that energy and undifferentiated consciousness are also inter-convertible with one major difference. Inter-conversion of matter and energy is quantitative given by well known Einstein's equation $E = mc^2$, but there can not be any quantitative relation in the inter-conversion of undifferentiated consciousness and energy. Because in the former, both the entities (matter and energy) are physical, while in the latter, one entity (energy) is physical and the other (undifferentiated consciousness) non-physical. There is no question of any increase or decrease in a non-physical entity. Undifferentiated consciousness will remain unchanged by any amount of energy going out of it or coming into it. **It implies that any number of universes may emerge out or merge into undifferentiated consciousness, called Brahman in Vedanta without causing any change in it.**

Thus, the hypothesis about the inter-conversion of undifferentiated consciousness and energy is able to explain the emergence of not only our universe but trillions other as predicted by superstring theory, the best candidate for the theory to unify nature forces. However, the inter-conversion of undifferentiated consciousness and energy is not without any restriction. Such a conversion can take place only when laws of physics are not operative as was the case at the time of the origin of the universe. Such a conversion can not take place at the earth where the law of conservation of energy (matter) is operative.

To test this hypothesis one has to create conditions similar to the one that existed at the origin of universe when the laws of physics were not operative. Such conditions can not be created and the hypothesis can not be tested experimentally. However, inability to test the hypothesis does not mean that the hypothesis is not correct because there is no logical flaw in it and it is able to explain the origin of the universe in a very simple way.

Acknowledgement

I owe a deep sense of gratitude to my Guru Swami Bhoomanand Tirtha of Narayanashrama Tapovanam, Thrissur, Kerala, India for teaching me Vedanta, giving me Diksha and answering my many questions that led me to know the ultimate reality and write this paper.

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Value based Scientific Research

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Basically science is the search for truth¹ and is a shared knowledge based on common understanding of some aspects of physical or social work. If these conventions are shaken, the quality of science suffers. The values emerge from science, both as a product and process and may be distributed broadly in a society. Science does not create these values but introduces novel situations which require us to apply old values in significantly new dimensions^{2,3}. For the pursuit of science, a real scientist has to promote integrity, objectivity and ethical values which in present scenario is deteriorating fast. In India, the value system is such that a scientist is not evaluated on the originality and capability but on 'scientific fluttering.' Big science atmosphere has gripped the Indian scientists who think doing science with less facilities is beyond their dignity. Indian scientific society unfortunately has become either highly individualistic or sycophancy oriented and therefore a real group activity wherein a leader is recognized through his work, an ability to plan, interpret and communicate does not develop easily³. It has become almost a fashionable to have a big '*empire*' that does most of the work, while one goes all over the world. The ethical and moral values of scientific research are on decline and the fraud and misconduct is spreading like a viral disease in many institutions and individuals. A major factor of this decline is the emergence of science lords/science managers/pseudo scientists and drum beaters.

The recent case of misconduct at National Center of Cell Science (NCCS), disparages the lack of surveillance and a shared sense of dignity and accountability. As pointed out earlier⁴ to do good science is itself a human value and so is the conviction that standard of scientific honesty, value and objectivity need to be maintained at all costs by those who really want to perform excellence in science by going deep into the ocean of research life. The social values or research ethics are not always followed in science but they remain very important⁵. As correctly pointed out by Chopra⁶, ethical values in the pursuit of S&T are coming to the centre stage in the emerging globalized knowledge era. Scientists must remember that public discussion of values and ethics requires justification just as much as in any scientific argument. Social ethical conclusions are based on general principles and not on person's "feelings," life style or ideological values. Further, in science and technology, excellence cannot be a parameter of quality and/ or quantity viewed independently of the entire global standards and this system is neither static or absolute. On the other hand it is regularly evolving and exerting in the process an impact on mankind

that brings about newer heights in values and better standard of living. Knowledge and learning conduce individual potentiality and competence, Social transformation is inevitably based on value consciousness and on an insight into its gamut while richness of ideas is recognized by what it produces and not by honours and occupying high positions. In conclusion, the values provide a nexus between moral and intellectual development and also between knowledge and character and they cannot and should not be separated from science.

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Loneliness of the Research Scholar

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The steady decline in the number of students opting for a science-based career has caused major concern in academic circles. Simultaneously, there have been suggestions, mostly from politicians, to increase the number of institutions like the IITs. Very little thought has been devoted to the reasons for the lack of motivation among postgraduate students who would normally have become research scholars and teachers. It is necessary to focus on the plight of these young persons, particularly their interaction with research guides. This is because the pre-requisite for good research is a harmonious relationship between the guide and the guided.

Some years ago, Dilip Salwi¹ sarcastically described the prevailing method of research guidance in these words: “Catch hold of a young man in his twenties who is hard working, sincere and willing to get himself cheated! Give him a research problem that you have been planning to work on for a long time—and then conveniently forget him”!

More recently, N. Gopal Raj² quoted Prof. P. Balaram saying that potential students were often viewed as technicians “whose exertions serve primarily to advance the careers of their supervisors”.

It is sad to note that like in many other issues, here also we have failed to learn from the experience of the western countries. Take for example, the Report³ of the Committee on the Future of the Graduate School at Harvard University. Way back in 1969, it stated that “They (graduate students) had hoped to be regarded by the faculty as members of a scholarly company to which the faculty members themselves belong. They find—or believe they find—that they are regarded as subordinates and outsiders to be processed, graded, labeled and sent forth”.

The problem of isolation of postgraduate students appears to be more severe in campus-based institutions. At one time, when the student population was small, there used to be a close social mixing with teachers and members of their families. This provided an opportunity for the teachers to act as local guardians. But these days, with large classes and tight schedules, students and their teachers do not seem to have much time for each other.

Gulhati⁴ has raised the question “why are alumni of IITs, who want their children to study at the IITs, not keen that their children take up a career of teaching at the IITs”? The answer offered is a relatively low compensation package for the faculty. However, there are a small number of determined individuals who overcome the lure of the lucre and enter the haloed portals of a University or an IIT as Ph.D. students. Once they are with us, are we offering them the right platform as colleagues?

It is during this period in their career that the research scholars need maximum support from their teachers. A Dean of Harvard's Graduate School of Arts and Sciences had remarked⁵ that "doing original scholarly work is often lonely, often erosive of self-confidence and often frustrating". On the other hand, most research guides are too busy to consider any independent line of action proposed by the student. They find it safer to follow the beaten track of a sponsored research. The hapless research scholar simply becomes an extra pair of hands for meeting various deadlines. This pressure-situation possibly leads to the adoption of unethical practices. Another alarming development is the increasing number of students suffering from psychological problems. In fact, several institutions have now introduced counseling for postgraduate students, a facility traditionally available to undergraduates.

So, what is the solution? The remedy lies in ensuring a continuous mixing between individuals and ideals. One Harvard professor had recommended⁶ that "the two are not be mixed so carelessly as to produce an explosion, rather they are to be marinated together so that each can extract the best flavor from the other over the longest possible time". He went on to advice that the President of the University "must keep the fire burning, but not stand in the light".

An interesting point has been made in a recent issue⁷ of the journal *Nature*. The author argues that it is not enough to simply hire research scientists for a team. It is important to nurture their non-scientific skills like communication, organization and leadership.

Let us hope that these prescriptions will be considered with the seriousness they deserve and research scholars in India will be able to pull our educational institutions out of the quagmire they have sunk into.

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Higher Education Is Sick

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In the last National Conference of Development of Higher Education organised by the University Grants Commission (U.G.C.), the minister for Human Resource Development (HRD) Arjun Singh remarked in his inaugural address that higher education is a 'sick child'. The Prime Minister Manmohan Singh also some months back, delivering the convocation address of Bombay University, remarked that higher education was in bad shape. Their responsibility should not end there. They must see to it that corrective measures are taken up by the HRD ministry, U.G.C. and state departments of education to rectify the situation at the earliest.

Government's initiative:

It is heartening that the present government has increased the funding of education to 6.0% of the G.D.P. for the first time since the Kothari Commission recommendation about 40 years back although it had been promised by all the Prime Ministers since then. The present Prime Minister deserves full credit for announcing this. Further, a cess of 2.0% has been levied for supporting primary education. The funding of education till recently has reached only 3.79% (0.7% for higher education) of the G.D.P.; but it is expected that it would reach 6.0% by the year 2012.

It has been announced to open 6000 government schools more, at least one in each block; 370 government colleges, 30 more central universities (based on "JNU as a role model"), 7 IIMs, 8 IITs, and 20 IIITs. with an investment of Rs. 1,30, 000 crores. (It gives me great satisfaction that I had some role in the formative years of JNU for about 12 years (1975-87) as a Dean, Rector (Pro Vice-Chancellor) and Vice-Chancellor). The size of the education sector is to grow from 7.0% in the Xth Plan to 19.8% in the XI Plan. .

Numbers alone would not do. We have to take care of quality as well:

The rise of Indian economy has been noticed and acknowledged by the whole world. It has now been accepted that India would be one of the top five economies of the world within a few years. In order to cope up with this and continue to compete, India will have to integrate with the world in its development of proper human resources, which at the moment is poor. The education system will have to be radically upgraded to cope with a world of intensifying competition. Higher education again of top-class standard, as Anthony Giddens, former Director, London School of Economics, says, has to be much more widely available. Availability of skilled and intellectually proper human resource in vital sectors of economy and technology would be extremely necessary. It is the time to develop and create a time bound trained young people to maintain the frontiers of growing industrial technology.

At present about 10% of students between 17 to 23 years of age are going for higher education and it is planned that this percentage be increased to 15 by the year 2015. While it is very much needed, one will have to look into their quality as well. Just the number would not do since unemployable graduates (like the ones that we are producing today) would some day, sooner than later, create social chaos. One has only to look into the survey report of a NGO, Pratham, released more than a year back that 50% of the children of government schools between the ages of 8 to 14 cannot read a simple paragraph while 65% of them cannot do a simple two-digit multiplication or division.

There are 23,000 schools with no teachers at all while there are 130,000 schools that have only one teacher. A recent study by the National University of Educational Planning and Administration, New Delhi has shown that almost half of the 47 lakh elementary schoolteachers in India have not studied beyond XII. Just about only one-third of those who teach classes I to VIII are graduates. And, of course, who can vouch for the quality of those graduates. And as it is, this is not enough. The NCTE has recently lowered the requirements for those who wish to get admission to the B. Ed. Course. According to the new norms, the eligibility marks for admission has been reduced from 50 to 45 and the number of teaching days has been reduced from 200 to 180 days. . Further, to become a lecturer in a state B. Ed. College, one need not clear the National Eligibility Test. Is education meant only for statistics or there would be some one to look into the quality as well? How distressing it is when one reads in UNESCO released Global Monitoring Report that places India in the bottom rung of 15 countries with a low 'Education for All' development index. India's fight against illiteracy has slipped from 100 last year to 105 now.

The HRD Ministry is planning to start about 6000 Central Schools, one in each block. Good news, but why is the performance of government schools that have good and qualified teachers so poor? The government school teachers are positively better qualified when they are selected and are paid three times or more than the private sector schools. Surveys show that teacher absenteeism in government schools ranges from 27 to 57 per cent in different states. It should not be surprising that people do not want their children to go to government schools? Why should government school teachers not be made accountable? Central schools and Jawahar Navodaya Vidyalayas are also government schools. Why is their performance so good? Should the government not look into the reasons that are responsible for this and take necessary action to rectify them?

It is sad that the state of over 8,000 teachers training institutes is bad. They have become as a cash cow and it is alleged that the National Council of Teacher Education (NCTE) has been turned into a breeding ground of corruption. In a small state university, there are 30 colleges but 67 B. Ed. Colleges. An enquiry committee, 'Admission Against Cash Scam' revealed that one person earned more than a crore in a year through B. Ed. Admissions. The students do not have to stay for study but

go to their homes and come only for the examinations. Cases of corruption in the Medical Council of India some years back that had to be looked into by of the Supreme Court and President had to be removed. It is being alleged that the All India Council of Technical Education may also be going the same way. How sad is it that really well meaning, straightforward academics are not willing to accept the Chairmanship of the AICTE.

One has only to look into how 'Deemed University' status is being given to new institutions without proper infrastructure and faculty. A fair percentage of them are being run for money and not for education. "De-Novo" deemed university status is given even to the institutions that have been running for about ten years without creating necessary facilities just on the promise that once they get the recognition, they would create all the facilities. How presumptuous, who is going to look into this that they have done it? The U.G.C. must give some respect to the unanimous recommendations of the AICTE team. The Human Resource Ministry may examine what harm would be done if the recommendation of the A.I.C.T.E. are made mandatory on the U.G.C. for granting Deemed University status to technical institutions. In a recent survey on technical education it has been said "Our technical institutes are churning out students by the lakhs every year, but are they all employable? Far too often, they're not." If the Human Resource Development Ministry itself gives recognition to such institutions, why should?

B. P. Agarwal, Secretary, Higher Education, lament after conducting a survey of 350 technical institutions that 'technical education a sick sector'. With the situation that is prevailing today, it should not be surprising that the Chairman of Nasscom, Kiran Karnik, says that only 20% of the technical graduates are employable? I do not know how the U.G.C. and the government give Deemed University status. As a clear example I may cite that the Army Institute of Technology at Pune has been given the status of a Deemed University while one of our best medical institutions in the country, Armed forces Medical College in Pune has been denied.

State of Higher Education

Our higher education system is not geared to produce accountability or attracting talent. The U.G.C. survey rates 68 per cent of institutions to be of medium to poor quality. The National Assessment and Accreditation Council's (NAAC) report should be considered as a wake-up call. To put it bluntly, close to two-third of our universities and 90 % of our colleges are functioning below even the most minimal level of academic acceptability. It is shocking to hear the Chairman of the U.G.C. saying, "Of the total of 14,000 colleges and 224 universities under University Grants Commission purview, only about 600 colleges and 167 universities are eligible to receive developmental grants. The rest don't even meet minimum academic quality requirement". Why should our leaders then lament that hundreds and thousands of graduates are unemployed? They are unemploye since they are just not employable.

It would also be worthwhile for the U.G.C. to look into how the self-financing programmes are running in the universities under the purview of the U.G.C. without creating proper facilities for years.

In my view a disturbing development is taking place even in central institutions. An exercise to fill up the important post of Chairman of the All India Council of Technical Education has taken place. The rules for the selection were changed. The post was advertised although nominations were also accepted. After short-listing, interview (in the name of consultation) was held. A good nomination of a former Director of an IIT was not considered since he did not (rightly) come for this so-called interview. According to new rules, appearance in the interview has become compulsory. This is clearly a regressive development. If such a step were continued, I am afraid, really good people would decline to accept responsible positions in academic institutions such as Vice-Chancellors since they would not like to attend interviews. For such positions, people have to be approached to accept positions.

Availability of proper faculty

Another factor that must concern us is the availability of proper faculty. We may have infrastructure, we may have library, we may have instruments but from where are we going to have instant number of faculty. It is a common knowledge that in all the IITs, IIMs and major universities, 15-20 per cent posts are vacant because of the non-availability of proper faculty. And once you appoint a sub-standard faculty, they are going to be there for at least 30 to 35 years. We will have to develop a balanced mechanism to attract talented people that are really willing to return home from abroad and contribute to our education and research. We may also consider employing people from abroad on contract who may be willing to work in India. A national register of interested persons can be created and made available upon request to any institution that may consider them for suitable appointment.

Feudalism in Higher Education and Research Institutions : Roots and Facets

Sisir K. Sen

Former Deen, IIT, Khargpur

Structure of knowledge institutions – Breeding Ground of Feudalism

The feudal social system is characterized by a feudal lord or boss with whom the vassals are linked through homage and dependence. The system prevailed in mediaeval Europe where the vassals held land from a superior in exchange for allegiance and service. The system has two attributes—a clearly etched hierarchy and a dependence for livelihood and goodies. This kind of hierarchy concentrates power at one end of the connection. The privilege and prerogative rests with the boss, only he can distribute the fishes and loaves

The hierarchic structure in the universities and higher education institutions were introduced by the British in India. Administrative convenience can be argued as one of the major reasons for doing so, but at that time possibly the negative sides of the system were not apparent. The system was certainly to result in concentration of power and privilege in a few hands. Now, this runs counter to the objectives of higher institutions of knowledge, where, especially these days, acquisition of knowledge grows through collaboration, cross-fertilization of ideas—all in an ambience of freedom. It may sound iconoclastic, but universities and higher knowledge institutions with vertical structures have become outdated—their organizational make-up is proving to be impediments to progress. The structures can not cope with parallel and converging pathways along which information and knowledge are progressing, and are unlikely to promote synergy. No wonder the European and American universities are changing their structures. For example, in German universities the Ordinarios professor (C4) was the king and the other teachers were Dozents no matter how competent they were. There was only one professor and he decided what kind of research should be undertaken. This started changing in the 1970s, and now we see many professors in these institutions following different research routes in diverse fields, and often effecting changes in the syllabi offered to students. The American university system was more democratic from the early days, the better universities(usually private, but now including many state universities) continuously adapt to new lines of enquiries, paradigm shifts etc. while pruning deadwood. When would the Indian institutions take up such dynamic stances? Will our feudal lords, who fear excellence and feel insecure at the onslaught of new knowledge allow this? Our government consists of politicians adept at Tammany Hall methods, barring some education ministers in the past none among them can be credited with foresight and

comprehension related to education and research. Add to this the gerontocratic system. So how will the change take place?

The social traditions of India make matters worse. We have been trained from our childhood to obey superiors and practice sycophancy if needed to please the boss. And questioning the superior is simply verboten. Let us remind ourselves here that a questioning attitude and independent thinking are the keystones of higher learning and research. So the feudalism which tends to grow in the institutions of higher learning and research finds a fertile soil in India and gets good nourishment. Many of our feudal lords mouth “democracy” glibly, but what kind of democracy? Democratic Centralism of CPM or Guided Democracy of late Ayub Khan?

Damage to the System

The damage caused by such concentration of power in the hands of individuals presiding over feudal networks is manifold. Independence is not tolerated, be it in the field of research ideas or introduction of vital changes in syllabus and laboratory practices. Departmental research grants such as fieldwork grants in geology or anthropology are denied though given to “vassals” who are usually sycophants or supporters of lower caliber and with no independence of mind. If a young teacher or researcher has to fall back on extra-mural support, chances are high that the boss can pull strings there. So fall in line! The prospect of advancement in academic or research careers are thwarted by the feudal bosses. They take it as their God-given or system-given right to be co-authors of the research papers based on the work of their juniors. About five decades ago the director of a CSIR laboratory had published more than 90 papers in a single year! A few years after I joined my teaching career I was stunned by a question or a left handed compliment from a professor of another university. He said “your head of the department must be an extraordinarily versatile person—he publishes on so many different fields of geology!” these publications were based on the Ph.D. work of junior colleagues and the head was their guide.

A question does arise here. Why does the boss reject or resent ideas or proposals he is not comfortable with? Hopefully, he had acquired a mindset in his academic life earlier but that seems to be unchangeable. There are several answers. Most of these people like status quo ante, they are in general afraid of excellence, and feel insecure at the onslaught of new challenges. But why should he not learn and reorient himself? Because, as some one has said, There is an inversion of the adage “knowledge is power”. For our feudal lords, “power is knowledge”.

As a result of these, syllabi remain backdated or get lopsided emphasis. Let me give an example from personal experience. We started teaching geology and geophysics at a time when the classical approach to these subjects was undergoing vigorous changes due to intensive application of physics and chemistry. So some of

us tried to emphasize the analytical methods and results which were enriching the subjects and reorient the syllabi. But our boss thought otherwise. He wanted courses like Drilling Methods, Remote Sensing (at a preliminary level those days) etc. which, in our opinion, could be learnt by picking up books on the subjects, and in the case of Drilling methods, can only be justified if facilities for practical exercises were made available.. Our boss argued that these courses would make them more acceptable to employing agencies. This is not correct, we could only offer sketchy details and that too in diluted versions. And these courses displaced the physics- and chemistry-oriented basic geology courses. Experience has borne out our conviction that only a good geologist will succeed in his career as an applied geologist.

The damage in the field of research is grave. Young researchers with potential feel frustrated, many of them opt out. No fresh research ideas are allowed and mediocrity flourishes. One sure method for ensuring this is practicing inbreeding. In good American universities even the brightest Ph.D.s are not absorbed in their Alma Mater. Contrast this with a department where I spent 10 years after retirement on CSIR and INSA assignment –only 3 out of 29 faculty members had doctorates from other universities! This ensures least encouragement of individual creativity and intellectual initiatives.

The Flip Side

Thus, we can blame the hierarchic structure of knowledge institutions, the indifference and incompetence of our education ministers and administrators, the sloth of the system etc. for persistence of feudalism, but there is the other side also, the side of the “vassals” and “consumers”. Here I mean the students, researchers and younger faculty members who help perpetuating the system. And if we want the walls to crack—and eventually to be demolished—it is the younger people who should rebel.

Our schools and colleges do very little to promote independent and critical thinking—instead of being honed the minds are dulled. The teachers act as conduits of information and “knowledge” and in tests (where have the open book examinations gone?) the student’s proficiency is measured by how closely he can reproduce the notes given by the teacher or the relevant parts of the textbooks. Discussions and dialogues in the classrooms develop the minds of the students but such exercises are rare. So unless one is exceptional, where is the scope of developing and strengthening one’s critical as well as creative faculties? No wonder when he starts his research career he can not, by himself, suggest a research problem and approaches to solving it. The lack of intellectual independence and maturity of the student complements the wishes of the leaders of the “school of research”, and chances are that these are problems parallel to those on which one of the boss’s students have worked, with a few parameters changed. It is a happy situation—the

student has a mentor and feels secure, while the boss does not have to exert himself much for guiding the research work. This happens in many foreign universities and its main beneficiary is our feudal lord whose CV gets fatter. Please allow me here to recall a personal experience. I took my Ph.D. from one of the best US universities and my guide was a big name in his field. While selecting my research problem he wanted me to suggest a couple or so and then give his opinion. I suggested three, and after discussing with him, zeroed in on one of them. And the problem had very little connection with the work he was carrying out then. Of course starting on a research is just the beginning, but future development of independence has very little chance in Indian institutions, it is wiser to cling on to the coat tails of the boss! No wonder very little innovative research comes out of the Indian universities or research laboratories.

Remedy

There can be little disagreement on the need for cure especially in this age of international competition in the field of acquisition and application of knowledge. But all the remedies that we can prescribe are long range, and needs social engineering on an extensive scale. Given the current perceptions and hangovers, it will have to be a long fight for the reformers from a back-to-the-wall position.

Broadly, four sets of changes are required. Overhaul the school and college system and make them friendly to development of independent and creative thinking. Second, cast the research institutions and universities in a non-pyramidal structure. Third, change the mindset of senior educationists and researchers.

But the fourth one is potentially the most powerful force that can usher in these difficult changes. Convince the young generation, the “consumers” of the knowledge industry of the urgency. After all they will suffer most if this antiquated feudal system is not dismantled.

Autonomy Is At Stake* **Indian Universities are Bound by Ties of Patronage**

Andre Beteille

Professor Emeritus of Sociology, University of Delhi

A recently retired education secretary in the central government said in a talk given at the University of Bombay earlier this year, "Those of us who were involved in the field of liberalisation know that the state was a predator. I believe that the state is somewhat predatory when it comes to education. It's a source of patronage; it is also a source of money..." Such observations are commonly made by senior civil servants in Delhi, though not often in print or in public.

Patronage is a system that cannot operate if there are only patrons. It requires both patrons and clients for its operation. The flow of patronage would come to a halt if there were only dispensers of patronage and no recipients willing and eager to accept it. Scientists and scholars who inveigh against the control of patronage by politicians and officials do not like being reminded of their own active part in keeping the system in operation. A colleague with a very sharp tongue used to tell me that a certain vice-chancellor never took a telephone call from the education secretary sitting down but always spoke standing up even when he was alone in his room.

There is no need for a scientist or a scholar to walk on tiptoe or talk in hushed tones in the presence of a secretary or a minister if he is asking for something for his institution or for something to which he is entitled. The problem arises because in public institutions the line of distinction between an entitlement and a favour is often left unclear, and by design rather than accident. Such a state of affairs cannot be sustained unless there is complicity between the dispensers and the recipients of patronage.

The system of patronage does not divide the population into two distinct and mutually exclusive groups, since the recipients of patronage also act as dispensers of it. A vice-chancellor may stand on his feet while answering a telephone call from the Ministry, but he, in turn will, have deans and professors outside his office waiting to serve him and to receive his blessings. 'Any service for me sir?' is a phrase that few consider it beneath them to use.

There is growing concern in our country over the erosion of autonomy in the institutions of science and scholarship. Many persons feel that there is now less autonomy in these institutions than there was in Nehru's India. The single most important impediment to the maintenance of autonomy is the luxuriant growth of patronage that has kept pace with the creation of new public institutions. The roots of patronage lie deep in Indian society and culture, but the compulsions of coalition

politics have added a new dimension to it. The system has acquired so many ramifications that every one, including the education secretary, complains about it, but nobody is able to do much about it.

Universities and many other centres of science and scholarship are, in principle, autonomous institutions. Those that were designed to be autonomous have had their autonomy progressively whittled down. I am not speaking now of their abject dependence for funds on the goodwill of the bureaucracy. Their freedom to make rules for their own internal governance has become restricted, and they have been made to fall in line with rules made by external agencies. When they find it hard to comply with rules in whose making they had no part, financial and other sanctions are applied against them.

Generally speaking, the government does not interfere directly with the constitution and functioning of autonomous institutions, but it does so indirectly through committees of distinguished academics over whose composition it keeps a close watch. It is here that the ramifying ties of patronage come into play. It is natural for academics and civil servants responsible for the oversight of academic institutions to maintain good relations with each other. But some academics are much more assiduous than others in doing the rounds of the various ministries and departments of the government. And it is they who are most likely to be picked up for placement in strategic academic committees. Sooner or later they, learn to trim their sails to the winds prevailing in the government.

The suggestion, of which there is a hint in the quotation with which this article began, that liberalisation might put an end to the play of patronage does not carry much conviction. A shift from the public to the private sector will bring new networks of patronage into operation without necessarily destroying the old ones: businessmen and company managers are no less skilled in the arts of patronage than politicians or civil servants.

There are now private universities in addition to those in the care of the Union and state governments, and there is a move to have more of them. That may be a good thing for a variety of reasons, but it cannot by itself reduce the role of patronage in academic institutions. For that to happen the outlook and orientation of the academic profession has to change. Its leading members must seriously consider what they are prepared to give up in order to securing and safeguarding the integrity of science and scholarship. Neither businessmen nor politicians have much interest in the autonomy of academic institutions.

*Reproduced from The Times of India, New Delhi, November 13, 2007

Investigation into Allegation of Misconduct in Publication

(Extracts from the 'Case Summary and Final Proceedings of SSV on the Kundu—JBC Case, April 28, 2007)

In August 2006, SSV received a signed complaint from Prof. Sohan P. Mondak, a retired professor from the Dept of Zoology, University of Pune, alleging that Dr. Gopal Kundu and his coworkers (Hema Rangaswami and Anuradha Bulbule) from the National Centre for Cell Science (NCCS), Pune, India, published some papers in the prestigious Journal of Biological Chemistry, by "fraudulent reuse of the Western Blot data". The locus standi of Prof. Modak is that he had a close association with the institute since its inception, as the Principal Co-Investigator/Founder of the NFATCC (subsequently renamed as NCCS), the first Research Director of NFATCC and a former member of the Governing Council of NCCS. His complaint also mentioned that even though an internal committee of the institute indicted the authors, the Director appointed another external committee, which exonerated the authors of all the charges. He suspected complicity by the second committee chaired by Prof. G. Padmanabhan. This committee had several prominent scientists from different parts of India as its members, such as Dr. Kanury Rao, Dr. Dinkar Salunke, Dr. Umesh Varshney, Dr. Anil Tyagi, Dr. Shekhar, Mande and Dr. Islam Khan.

The following two papers of Dr. Kundu and his coworkers were examined by the SSV

Paper I: Rangaswami H, Bulbule A, Kundu GC.

Nuclear factor-inducing kinase plays a crucial role in osteopontin-induced MAPK/ IkappaBalpha kinase-dependent nuclear factor kappaB-mediated promatrix Metalloproteinase-9 activation.

J Biol Chem. 2004 Sep 10;279 (37):38921-35. Epub 2004 Jul 7.

Paper II: Rangaswami H, Bubule A, Kundu GC.

JNK1 differentially regulates osteopontin-induced nuclear factor- κ B kinase/ MEKK1-dependent activating protein-1-mediated promatrix metalloproteinase-9 Activation.

J Biol Chem. 2005 May 13;280(19):19381-92. Epub 2005 Mar 9.

Many figures published in both papers contained photographic trips with identical appearance of not only the bands, but also background noise signals, which ought to have been random. There were several instances of the use of identical strips of Western blots both within and between the above two papers to depict different results, substantiating the allegation of falsification and fabrication of results.

SSV's letter to the Secretary DBT dt. 25 Sept. 2006 with a list of similarities and our queries regarding both the enquiry committees was never answered. The Director, NCCS only sent a copy of the report of the 2nd enquiry committee, without any further comments or answers. Dr,. Kundu has also been contacted and he denied these charges.

In the meantime, JBC announced the withdrawal of the paper (paper II above) on its website in mid-Feb, 2007. Earlier, Dr. Kundu confirmed to SSV that JBC contacted him with certain queries regarding his papers and that he submitted all the requisite information to them. Even after the JBC withdrawal, he continued to maintain that he stood by his papers, indicating that he was not a party to the withdrawal. The JB did not mention who withdrew the paper and on what basis, and did not respond to SSV queries in this regard. This forced SV to contact ASBMB, the society that publishes JBC, which then clarified that the journal took its own decision based on its own independent investigation. It states "The paper that you refer to, and related documents including digitally analyzed figures, were carefully reviewed by the Publications Office, the Journal Editor and the Publications Committee of ASBMB. A brief statement from the author's Institution indicating that they found no problem with the paper is also available to the Committee. However, it was the unanimous conclusion of the Editor and the Committee that there was data in a second paper that was reproduced (without citation and with different labeling) from a previously published paper. We, therefore, notified the author and withdrew the paper." It is important to emphasize here that two independent, parallel investigations by JBC and SSV have come to the same conclusions regarding misconduct by the authors of the two papers.

The JBC also simultaneously published an editorial (mid Feb., 2007) against image manipulations, though no manipulated paper was specifically cited. Among other things, the JBC editorial states, "Within the past year, we have, both during and after the review process, detected cases of fraud; re-use of figures from one paper to another for new purposes, re-use of control images within single paper without explicitly noting the repetition, removal of "contaminating" bands from gel patterns, etc. After investigation of such cases, papers have been rejected or withdrawn and institutional officers notified of misconduct".

Conclusions and Recommendations

In view of the above, SSV has come to the following conclusions and recommendations regarding the issue:

Kundu and his coworkers are guilty of misconduct for falsification/fabrication of data in their paper. As the corresponding author and the head of the group who receives the most of the laurels for the publications of his group (such as the

Bhatnagar Prize), Dr. Kundu must also take most of the blame for this misconduct. The concerned authorities should seriously reconsider their position in this case and take appropriate action on all the authors. Any disproportionate punishment of the students/ post-docs while shielding the senior scientists will open up new issues of injustice.

— P.N. Tiwari

Reactions and Responses on SSV Findings in Kundu's Case

The findings of the SSV in Kundu's case were widely reported and commented. Most of the comments were favorable but a few published as letter to Editor in the Current Science by the authors of the paper in question were bitter. Current Science published several letters and a long Editorial entitled "Probing Misconduct: Treading Dangerous Path" in its 10 June 2007 issue. The Editorial was unappreciative of the findings of the SSV. That Editorial and the response of the President SSV Dr K.L.Chopra on it, entitled "Probing Misconduct-Role of SSV" published in Current Science are reproduced below;

— P. N. Tiwari

Current Science Editorial

Probing Misconduct: Treading a Dangerous Path*

There is nothing more debilitating in a journal editor's life than to be involved in a discussion of a case of scientific misconduct. The issues involved are often contentious, unpleasant and difficult to understand, with the ever-present danger of being accused of bias and malice by all the parties involved. Discussions of the ethics of practicing science often transmute into debates on the ethics of journal editors, who make the decisions on publishing or refusing material pertaining to a specific case. Often, and this journal is no exception, the editor is also an active researcher raising the bogey of motivated judgment and conflicts of interest. It is, therefore, with a considerable degree of misgiving that I chose to write this column, introducing to readers the case of alleged misconduct at the National Centre for Cell Science (NCCS), Pune, which is considered at some length in this issue. The discerning reader will note that I have used the qualifier 'alleged', because both law and common

* Reproduced from Current Science, June10, 2007

sense dictate that anyone accused of an offence is innocent until proven guilty. In cases of data manipulation and fabrication, guilt is sometimes not easy to establish. Even more importantly, in the increasingly complex world of modern science, in multi-author papers the individual perceptions on responsibility for specific pieces of data can differ. The NCCS case, like most such problems, begins with an anonymous e-mail to the head of the institution. One of the charges is that a Figure published in a paper in 2005 (Rangaswami *et al.*, *J. Biol. Chem.*, **280**, 19381) is a reproduction of a Figure published in 2004 (Rangaswami *et al.*, *J. Biol. Chem.*, **279**, 38921), with only a change of labeling. Simply put, this is alleged to be an example of fabrication of non-existent data. The Figures represent 'Western blots', a favorite of cell biologists studying signal transduction, an area mired in biochemical complexity. With the mounting pressure on journals to look attractive, gel photographs (of all varieties) are cleaned and dressed up in many ways, using many different versions of 'image enhancement' software. To an outsider to the field, one blot looks very much like another, with only the legends to figures permitting ready identification. Mislabelling, both intentional and unintentional, can happen. Modern digital technology which permits such facile image storage and manipulation, even by beginning students also provides the tools to detect 'photo forgeries'. It is precisely such analyses which have been used to address the issue of whether the figures in the two papers from NCCS are identical or not. Matching signatures or fingerprints, in more primitive times, required experts who had learnt to recognize subtle clues in the data placed before them. In the case of the NCCS Western blots, it is a computerized analysis of images that constitutes the basis on which to conclude whether or not an inappropriate act has been committed. At first glance, the problem appears simple. Feed in the images, let the analysis software examine the results and pronounce judgment. Unfortunately, in the NCCS case there are two conflicting analyses, both of which are described in this issue. The first, conducted by an officially appointed committee chaired by G. Padmanaban, including several active researchers drawn from across the country, comes to the conclusion that the Figures are different and that there is no basis for the allegation of misconduct. The second, initiated by Sohan Modak, was conducted by an independent body, the Society for Scientific Values (SSV), based in Delhi. The SSV, which projects itself as a watchdog of scientific integrity, comes to an unambiguous conclusion that the Figures are deliberately manipulated. Both groups employ image analysis techniques; the former arguing that their conclusions are also based on access to original data, notebooks and interviews with all authors. The waters are further muddied by an independent investigation by the *Journal of Biological Chemistry*, which then proceeded to unilaterally withdraw the 2005 paper. In this case the details of data analysis are unavailable. Finally, there is the complicating factor of an 'internal review' which established a prime facie case, resulting in an attempt by the corresponding author to withdraw the paper under duress. In deciding to publish all the views on this affair, this journal has followed a

course that was taken some years ago (*Curr. Sci.*, 2001, **81**, 1389), in which all parties have been given an opportunity to be heard. The authors have been gracious enough to permit a degree of editorial moderation, although it has been difficult to temper the language in all cases. For accusers, there is a great tendency to adopt a strident and judgmental tone; clothed, as they are, in the impregnable armor of self-righteousness. Whistleblowers in India are usually anonymous; their anonymity, presumably, a defense against vindictive institutions and managements. In the NCCS case the charges were publicized, investigated and 'guilty' judgments pronounced by a private body, the SSV. With both libel and privacy laws being largely non-functional in India, the SSV has been able to take the questionable step of circulating by e-mail and advertising on its website the contents of their findings to large groups of scientists. On the other side, for the defenders there is the tempting option of tarnishing the image of the accusers. Malicious intent to destroy institutional and individual reputations is easy to allege, and is sometimes true. In the heat and dust of accusation and counter-accusation, the original problem recedes into the background and a new charge of institutional complicity in a cover-up emerges. In the NCCS case the focus has shifted; the accusers, represented in the published correspondence by Modak, challenging the competence and at times, by implication, the intentions of the Padmanaban committee. A feature of most discussions on misconduct in India is the pervasive view that there is a malignant 'Indian scientocracy', which seeks to influence all investigations of fraud. ('Scientocracy' is a curious word which could arise by a fusion of 'scientist' with 'aristocracy' or alternatively, with 'bureaucracy'. The former conjures up a vision of a decadent upper class with deteriorating moral values, while the latter invokes an image of a stonewall, defending wrongdoers). The SSV and its proponents therefore argue that an empowered, privately constituted group of 'vigilantes' would be the best way to raise the ethical standards of scientific practice in India. Here, I am reminded of Lewis Carroll's famous line: ' "I'll be judge, I'll be jury", said cunning old Fury'. There is also the oft-stated assumption that the treatment of alleged misconduct cases is carried out more efficiently in other parts of the world. Although the Office of Research Integrity (ORI) was set up over twenty years ago in the USA, the number of cases resolved is only the tip of the iceberg. Institutions struggle with their internal investigations and the fate of whistleblowers remains a matter of concern. A sad and disturbing case at the University of Wisconsin, which hinges curiously enough on manipulated Western blots, ended last year with the resignation of a professor, leaving questions about the veracity of data in three published papers in *Nature Structural and Molecular Biology*, *Developmental Biology* and *Molecular Cell* (Couzin, J., *Science*, 2006, **313**, 1222). Over nine months after this report, none of these papers has been withdrawn, with one journal reportedly waiting for the results of an ORI investigation. The reluctance of journals to publicly state a position on these papers is in sharp contrast to the treatment of the NCCS paper by the *Journal of*

Biological Chemistry. It is difficult to avoid the suspicion of bias; I raise this even at the risk of being described as a 'scientocrat' who 'resorts to calling it India bashing' with the intention of whitewashing 'the misdeeds exposed by *JBC* and *SSV*' (Modak, S., *Curr. Sci.*, 2007, **92**, 1469). In order to dispel any impression that it is only Western blots and cell biology that throw up cases worth investigating, I must cite the example of Purdue University and the 'bubble fusion' controversy. Here the University has struggled to resolve an issue, which surfaced following publication of a dramatic result over four years ago (Taleyarkhan, R. P., *Science*, 2002, **295**, 1868). A third investigation has now been launched, even though two earlier probes did not definitively establish fabrication of a result (*Nature*, 2007, **447**, 238). In such situations, resolution of a case can be a long drawn-out affair. Indian institutions must learn from many of these experiences in order to address the problem of setting up fair and credible investigations. The job of probing misconduct can be arduous, if approached with a completely open mind. In small institutions (and many of our high profile laboratories are miniscule in size), it will be very difficult to set up impartial internal reviews. Including members from other disciplines can bring a much needed freshness to an investigation. Bodies that arrogate to themselves the power to pass judgements, with little regard for individual rights, need to understand that their quarrels with the scientific establishment cannot be settled at the expense of ordinary researchers, who must have the right to defend themselves, when accused of wrongdoing. In the NCCS case the *SSV* does not seem to have taken the trouble to ensure that the first author of the *JBC* 2005 paper had a chance to review and respond to the charges, although it may be argued that they have no *locus standi* to ask for a response. It is finally, the student who collected and organized the data, who stands firmly accused of fabrication. Supervisors can be charged in the worst case with complicity, or in the best case, with poor supervisory practice. What then is the final resolution? If the verdict is 'not guilty' the authors can go back to work, undoubtedly scarred by the stresses and strains of a long drawn-out public controversy. Life may never be the same again. If the verdict is 'guilty', what is the punishment? This is a most difficult problem for institutions to address. Punishments must fit the crime. In the age of scientometrics the behaviour of scientists is conditioned by the tyranny of the journal impact factor. The pressures to publish in the most sought-after journals are impossibly high for those with overwhelming personal ambition. Stepping over boundaries between right and wrong is not uncommon. Indeed a recent study appears to provide a correlation between high retraction rates and high impact factors (Cokol, M. *et al.*, *EMBO Rep.*, 2007, **5**, 422); Butler, D. and Hogan, J., *Nature*, 2007, **447**, 236). Major errors of judgement are often committed under the intense pressures for quick success in brutally competitive, high profile institutions. Do these merit the harshest treatment of dismissal and denial of degrees, or is there room for reprimand, punishment and rehabilitation? In science the greatest punishment is the silent censure of peers and the uphill task of attempting

to piece together a shattered career. In India there is also the fear, and SSV articulates this concern well, that the 'guilty', if powerfully placed, will remain untouched and at times, be further strengthened by recognition and elevation. Investigations of alleged scientific misconduct must tread a dangerous path. Overzealousness can give the impression of a witch-hunt, while inadequate attention invites the charge of a cover-up.

— P. Balaram

Response of the President SSV

Probing misconduct – Role of SSV*

The Society for Scientific Values (SSV) is not surprised with angry letters^{1–3} from the scientists affected by our report on the case of misconduct by Kundu *et al.* at NCCS, Pune. But the judgemental editorial pronouncement such as 'bodies that arrogate to themselves the power to pass judgements with little regard for individual rights' is most unfortunate. The contempt for third party interventions, be it from Modak or SSV, is as stark as the propensity to be soft towards the concerned scientists. Clearly, the message to anyone worried about scientific misconduct in India is that they should avoid treading on the 'dangerous path', ask no questions, and make no comments lest the career of somebody is affected. And, does SSV have any authority or role in such matters? In the absence of any serious interest shown by our science Academies, SSV is the only though reluctant 'watchdog of scientific integrity' with a track record of many successful investigations for over two decades. Many of our members, including EC members, are Fellows of one or more national academies. In the current case, SSV did a transparent and thoroughly professional investigation over several months and I am proud to stand by its report as its President. The original source of the allegation was not Modak or SSV but an email apparently from a former student of Kundu. As a result of an investigation by an internal committee set up by the Director, NCCS, Kundu admitted the charges, wrote a letter to *JBC* to withdraw the published paper in question but later, citing duress, requested *JBC* to withdraw the letter of withdrawal. Thereafter, the Director, NCCS set up a second committee of six distinguished scientists, headed by Padmanaban (who is also the Chairman of the GB of NCCS). This committee exonerated Kundu *et al.* of the charges. As a concerned co-founder of NCCS, Modak requested SSV for an investigation of the case in view of the importance of the case and the opposite views of the two enquiry committees. SSV initiated enquiry by sending several queries of both technical and

*Reproduced from Current Science, August 25, 2007

non-technical nature to Kundu (corresponding author), who responded to all of them through email, telephone calls, and one personal visit with me. A copy of the second report was received but the report of the first committee was not made available. Also, Kundu was reluctant to provide the original blots/films since, 'he had only one copy of the original'. The analysis of the image by the SSV experts identified seven identical figures between the two *JBC* papers which were sent, along with other related queries, to Kundu as well as to the Director, NCCS, and Secretary, DBT and gave them ample time to respond. The *Current Science* Editorial advice 'including members from other disciplines can bring a much needed freshness to an investigation' is exactly what SSV did: The MATLAB analysis was done by an image analysis expert from a computer science faculty, with no involvement whatsoever with biology or NCCS or SSV. For all the fuss made in *Current Science* about the access to original blots, we are not at all clear how Padmanaban committee determined which original strip belonged to which published image (since all three published images were almost identical). This was one of the reasons for SSV's dependence on the published data, apart from Kundu's reluctance to part with the original blots. Even if those three original blots belonged to the three published images, 'processing' them so much that different images look identical is an act of misconduct in itself (misrepresentation of data). In fact, Padmanaban's acceptance in his letter¹ that 'when these strips are processed to highlight only the bands of interest using Photoshop, all the three look identical', proves the point. SSV did not take any public position on the case till it completed its investigation. In the meantime, *JBC* published the withdrawal of one of the two papers of Kundu and an editorial titled 'Photoshop: friend or fraud'. We enquired with *JBC* and *ASBMB* regarding the basis for their withdrawal and were informed that notwithstanding their knowledge of the exoneration by the Padmanaban committee, their internal investigation revealed 'deliberate misrepresentation' through 'image duplication and reuse of data'. They stood by their decision and declined Kundu's direct appeals and Padmanaban's indirect appeal recently through *Current Science*. SSV's own investigation revealed many more similarities than the two on the basis of which *JBC* withdrew the paper. SSV report includes critical comments on the authors, the journal (*JBC* and *ASBMB*) and the authorities (NCCS and DBT). Its contents were debated word by word in two EC meetings with a court-room spirit and modified repeatedly till it was adopted unanimously. Our final report was sent to Kundu, *JBC/ ASBMB* and the authorities. Having received no comments, the report and over 100 pages of supplementary materials were put on the SSV website (www.scientificvalues.org). This is in total contrast to the Padmanaban committee report, which gave its verdict in a short paragraph without any details whatsoever. Yet, SSV report did not make any accusation on Padmanaban or the members of his committee, except that it currently 'does not have any evidence to distinguish between willful complicity and an honest error of judgment'. It seems that our critics have not bothered to read our report. We

cannot convince the accused even though SSV findings have also been enorsed by independent experts from other reputed institutions in the country. Ethical values in the pursuit of S&T are coming to the centre stage in the emerging globalized knowledge era. To take a position that one should not report or examine unethical practice in a civic society would be an end of that civic society. Let us not forget: 'History of the world civilizations shows that the societies have risen to a higher level not through mechanical or technological efficiencies but by practicing sound moral and ethical values'. (quoted from *Gita and Management* by Swami Bodhinanada)

1. *Curr. Sci.*, 2007, **92**, 1467–1473.
2. *Curr. Sci.*, 2007, **93**, 6.
3. *Curr. Sci.*, 2007, **93**, 121–122

Plagiarism by senior professors in Indian Universities rocks the scientific community

Moral values dictate that no man should aspire to claim an achievement that is not earned by him. There cannot be any conflict of interest between individuals if scientific honesty and integrity is followed. Honesty means neither fame nor money, if obtained by fraud, has any value. Integrity implies that no one can fake one's own conscience. The cases of plagiarism, copying and publishing papers already published by other authors, reflect the unethical desire to gain such fame and importance by an individual which is not due to him. This is a deep malice which has to be uprooted from the minds of all researchers lest it brings disrepute to the Indian scientific community. Recent report on plagiarism by senior professors of some Indian universities of repute raise serious concern.

One such case is reported recently in the Times of India, about Prof.. Mahimaranjan Adhikary of Calcutta University. American Mathematical Society (AMS) which is arguably the most respected mathematical society globally, branded Prof. Adhikary a plagiarist and "cautioned university and institutes worldwide not to refer to at least three of Adhikary's research papers as he had copied them 'word to word' from works of foreign mathematicians" Prof. Adhikary is famed for his research on graphs and most of his work on this subject is allegedly plagiarized. The three papers referred above are "The connectivity of squares of box graphs". "The connectivity..." paper was allegedly copied verbatim by Prof. Adhikary from mathematicians like Simoes-Pereira, D. Bauer and R. Tindell. "On edge-connectivity..." paper was copied exactly from a paper published in 1970 by T. Zamfirescu. "Factor of" Paper is allegedly copied word to word from the original paper by G. Chartrand, A.D. Polimeni

and M.J. Stewart. Prof Adhikary holds two posts - president of the mathematical division of Indian Sciences Congress and secretary of Calcutta University. An investigation by the university has found the charges to be true, reported TOI.

Plagiarism by a senior professor of mathematics of Delhi Univeristy, Prof. S. C. Arora has been in the news (The Stateman) as Prof. Arora has been accused by American Mathematical Society which reviewed his research papers. Prof. Arora, who is also the acting dean of mathematical sciences department, has been accused of using the work of other reputed mathematicians such as Dr. Lawrence Fialkow, as his own without any acknowledgement. A professor in the University of Michigan who reviewed Prof. Arora's works has critically commented that "the papers used several theories and theorem from his work without any acknowledge". In a case of Right to Information Act (RTI), startling facts about the scenario of Ph.D. students in the mathematics department of DU has come to light. In last ten years, only five students out of ninety nine, registered for Ph.D. degree in the department of mathematics could submit their thesis. Out of sixteen students registered under Prof. S.C. Arora, currently head of department of mathematics, only one could manage to complete the Ph.D. degree.

The case which has been widely publicized in international scientific journals like Nature and Sciences, also been reported by The Hindu, is that of Prof. P. Chiranjeevi of Sri Venkateswara University (SVU) of Tirupati. Prof. P. Chiranjeevi has allegedly committed scientific fraud according to a report published in "chemical and Engineering News (C & EN)" a magazine of American Chemical Society. P. Chiranjeevi was found guilty of plagiarizing and falsifying more than 70 research papers published between 2004 and 2007 in various international journals, according to the university documents. The fraud came to light due to efforts of Purnendu K. Dasgupta, editor of the journal Analytical Chimia Acta, when the reviewer of the paper submitted by Chiranjeevi pointed out that Chiranjeevi's paper was a copy of an earlier published paper by different authors. SUV has reportedly taken disciplinary action against Prof. Chiranjeevi by banning him from examination work, research guidance, further promotions and administrative positions. The irony was that Prof. Chiranjeevi tried to proclaim innocence and blame his students instead.

— Santa Chawla

Membership of the Society for Scientific Values

Scientists who wish to join the efforts of the Society to promote ethics (support right and oppose wrong) in scientific research, development and management and, who meet the following requirements are welcome to become the member of the society.

1. He/she should have allowed his name to appear as an author in only those publications in which he/she was actively involved, in data collection, theoretical formulation, design and construction of apparatus, field trips, mathematical derivation and calculations, statistical analysis and interpretation of results, as distinct from administrative support and providing funds or facilities.
2. He/she should have never plagiarized or made false claims or indulged in or supported and encouraged any kind of unethical activity in science.
3. He/she should agree to withdraw from the Society if he/she ceases to adhere to the requirements 1 and 2 above.

A scientist who wishes to become member should send his brief biodata to the President or Secretary of the Society. A member of the Society may also send biodata of such scientist for the membership. Non-scientists who have promoted ethics in their profession can also become member of the Society.

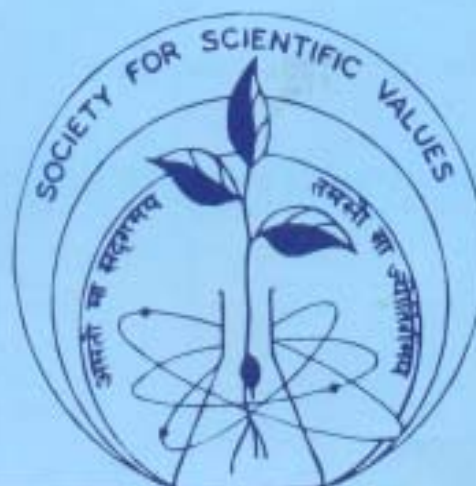
Society for Scientific Values

**Ethics in Scientific Research
Development and Management**
News And Views

Volume 6

March, 2008

No. 1



Lead us from unreal to real

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1. To promote objectivity, integrity and ethical values in pursuit of scientific research, education and management, and
2. To discourage the unethical acts in these areas

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