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Symposium on the Interaction of Science, Technology and Law in India
Law School, B. H. U., Varanasi 1979.

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INTERACTION OF SCIENCE, TECHNOLOGY AND LAW IN INDIA

Mr. JUSTICE H. R. KHANNA*

Science and technology have made great strides in recent years. They have acquired immense potentialities, both for good and evil. Unless they are subjected to the control of law, there are great chances of evil having sway. The advance in science has created visions of colossal power being placed at the disposal of man. Even a little power has more often than not a corrupting, and one may add degenerating, effect. The dimensions of corruption and degeneration caused by power would expand manifold with the increase in its size, and we can take it that the greater the power the greater would be the likelihood of corruption and degeneration caused by it. Unless, therefore, advance of scientific knowledge is subjugated to discipline and control of law, it might, like the Frankestein monster, destroy its very creator-the man. What is needed for the true progress of society is a healthy relationship between law on one side and science and technology on the other. This can be best achieved by a healthy collaboration of the men of law and men of science and technology, a proper fusion and harmony of their activities. Science and technology must be tamed by law so that their potentialities for causing harm may be curbed and also with a view to ensure that science and technology, instead of growing into dreadful monsters threatening the annihilation of humanity, might become its faithful ally and servant. Not many people may be aware of the fact that industry for destroying man is one of the largest human enterprises. It looks as if mankind is gripped by a death-wish. Atom bombs, hydrogen bombs, nitrogen bombs and laser rays are symbols of new power of destruction. The next war involving major powers, we can take it, would be fought in space. It would cover optical and infra-red satellites and hydrogen bombs. To expect that those in charge of warfare would be able, in the event of a major conflict, to resist the use of weapons of destruction which science and technology have placed in their hands, would be a sheer exercise in misconceived optimism. There would perhaps be no human eyes to gaze at the aftermath of destruction caused by such war though the skeptics might say that the sun and the stars would continue to shine. Whether this could provide sufficient con-

* Chairman, Law Commission of India and formerly Judge, the Supreme Court of India-Inaugural Address, the Symposium on the Interaction of Science, Technology and Law in India, 1979.

solation for the exterminated humanity, I do not know, but I do feel that all this makes it imperative that we should not lose sight of human values. Human values have a close nexus with law. They need the rule of law for their preservation and efflorescence, and it is for that reason a greater and more purposeful role of law acquires importance. To tame and subdue the scientific knowledge and technological advance for human good and to prevent their degeneration into instruments of mass destruction would have to be one of the major functions of law in the times to come. If human species has to survive and not meet extinction at the hands of science and technology, it would be essential to put them under a code of discipline and subject them to rule of law. We are today confronted with the situation where, in the words of Martin Luther, the means by which we live have out-distanced the ends for which we live. Our scientific power has out-run our spiritual power. We have guided missiles and misguided men.

The magnitude of the latest innovations of science and technology would stun many of us. Scientific penetration of the mysteries of human heredity has brought into being new applied techniques. Amniocentesis for gaining information about the genetic make-up of a foetus still in its mother's womb is one instance. Research is taking place regarding other techniques like cloning and in vitro fertilisation. These developments would raise serious ethical and social policy questions for genetic technology for they portend taking human heredity out of the realm of blind fate or chance into the realm of free will and choice. In the past we were prone to apportion blame and credit to the nature for the genetic inheritance we pass on to our descendents. Henceforth the responsibility would be increasingly ours. In the face of the new responsibility we need to ask ourselves the question as to whether the new technology of genetics promises better quality of human beings or whether it holds out threat of new source of enslavement for mankind. Will these developments be used to breed wiser and better people, or will they lead to a tyrannical 1984 ? Acquisition of more knowledge is not always an index of greater wisdom nor does it furnishes guarantee of its use for only human welfare. One of the great fallacies of the present age is to equate wisdom with acquisition of knowledge. Acquisition of knowledge may lead to attainment of wisdom but is no substitute for that. Wisdom is born of intense thinking and prolonged brooding. It needs calm contemplation and penetrating discernment. A computer can be the repository and store-house of great knowledge but no one can ascribe to it the attributes of wisdom. Real wisdom is the preserve of the human species and among them also of the select few.

Laws have been enacted in some countries forbidding marriage amongst the feeble-minded. The States of Washington and North Dakota prohibit marriage between men of any age and women under forty-five if they have a history of insanity, are feeble-minded, imbeciles-habitual criminals, or common drunkards. Denmark has a eugenic sterilization law concerned with feeble-mindedness which leads to the sterilization of about half of the women whose IQ is less than 75. Question which confronts the law-markers is whether the union between two persons which gives life to a third one should be kept free of government intervention. What should be the answer of law-givers to the proposal, if and when it is mooted, that the government should budget the number of children per family or put a contraceptive drug into the water-supply or to force mothers to abort surplus children ? what should be the attitude of the society to a proposal that in order to reduce criminality, chromosome tests on all pregnant women should be required and abortions demanded of all mothers who carry XYY "criminal" foetuses ? What would be the impact of such laws on basic human rights ?

Not long ago, the media celebrated the events involving the birth of a test tube baby. Recently, the Royal College of Obstetricians and Gynaecologists, Australian Council informed the Australian law Reform Commission that major medical developments are expected, possibly within the next two or three years, in the realm of fertilisation of the human egg cells outside the human body. This may be due to a physical condition of the woman concerned making it undesirable or impossible for her own egg cells to be fertilised normally. Subsequent transplant would then take place of the fertilised egg or embryo into the body of the woman concerned, or if that be not possible, into the body of another woman. These processes are called in vitro fertilisation and embryo transplants. Some of the questions which might arise in this context are : (i) Does life begin with a successful in vitro fertilisation before implantment in the uterus, and can such per-implantment fertilisation be deemed in law to be a conception ? (2) Would a decision to abondon the fertilised ovum and not implant it lead to what is abortion in eye of law ? (3) Who would be deemed to be the parents of the child born as a result of in vitro fertilisation and embryo transplants ? Both men of law and science would have to join their heads to find answers to these questions.

The use of genetic techniques for improving genetic quality raises other issues in the matter. Attempts to breed, what according to those supporting such attempts, are better progeny have been made in the past. We all know of measures adopted by Nazis. Some of these measures created a wave of abhorence because they brought in the concept of master

race and inferior race. German laws in this respect were directed not only against the Jews, but also caught within their sweep many others. The regime imposed compulsory sterilization of maniac-depressives, severe alcoholics, feeble-minded, epileptics and those suffering from hereditary blindness end deafness. There were also cases of castration of dangerous and habitual criminals. To preserve the hereditary soundness of the German race, marriage was forbidden when one of the parties had a dangerous contagious or hereditary disease or suffered from mental derangement. The question which needs consideration is as to what extent some of these measures can be reconciled with our concept of the rule of law and sanctity of human rights.

In the field of criminal law, psychiatry has brought about fresh awareness of the acts done as a result of irresistible impulse or emotional disorder. Modern psychology has explored the complex web of instinct and the area of unconscious and their impact on human behaviour. This has led to re-examination of the causes of criminal behaviour and the various degrees of mental abnormality. More recently, biological research, particularly modern genetics, has revealed the impact of genetic structure on man's character and behaviour. Some of these developments naturally affect the traditional basis of moral and legal responsibility.

One matter which has been the subject matter of considerable controversy is how far the legal system, while dealing with acts of murder or rape, should penalise the act as such without regard to the subjective factors in the individual offender. One extreme approach is to ignore the subjective factors in the individual offender altogether. The other extreme approach pleads for complete individualisation of the ofiender, i. e., taking each individual as a composite of moral and intellectual faculties, genetic factors and social environment. The one sphere where the conflict of these approaches has brought the controversy into a sharp focus relates to offenders who are insane or mentally deficient. Persons thus afflicted, there can be no doubt, are a burden to society. Suggestion has, on one side, been made that the insane murderer should be punished equally with the sane or that, although he ought not be executed as a punishment, he should be painlessly exterminated as a measure of social hygiene. As against the above, stress is being laid, increasingly in modern times, that criminal law should take into account the weaknesses of the individual as a defence against criminal prosecution or at least in mitigation of the punishment. Whatever one may say with regard to the different view-points, we should not forget that criminal law cannot forsake its character of being a major and vital instrument of protection of society.

Many countries are still following M, Naghten rules enunciated by the House of Lords in 1843 while dealing with the plea of insanity. The developments in modern psychiatry, it has been observed by friedmann, which, between the fully normal and the fully abnormal person, recognizes an infinite varieties of shades of disturbances lessening, to a varying degree, the emotional powers and capacities of self-control rather than intellectual discernment, call for a corresponding elasticity in the legal approach to the problem of responsibility. At the same time, it is conceded that any attempt to elaborate a series of new additional criteria, superimposed on the M'Naghten test, in correspondence with the many types and grades of mental disturbance, would lead to casuistry and a multitude of interpretations by different judges and juries.

One of the questions which has acquired importance in recent years relates to the right of privacy. Privacy has been defined as the claim of individuals, groups or institutions to determine for themselves when, how and to what extent information about them is communicated to others. Science and technology have produced sophisticated devices which can enable organised agencies to pry into the private lives of individuals. Electronic surveillance has led to unprecedented accumulation of data which often gets computerised. There is eavesdropping by mechanical process. Watch is kept by an invisible eye. Both men and women are thus in a way laid bare and all their activities are viewed by and get exposed to inquisitive eyes. What protection should be afforded by law against such intrusions into privacy and what control should be exercised on the manufacture, sale and functioning of devices mentioned above are matters which call for consideration at the hands of both men of law and men of science and technology.

Another question which needs attention is about the point of time at which death occurs. It may now be necessary to evolve precise legal rule about the exact time of death. For centuries the time of stopping of the heart-beat was accepted as the moment of death but modern skills of resusciation after cardiac arrest have made this test out of date. The concept may now have to be evolved in the light of the revelations made by medical science that a person is truly dead when the brain ceases to function and not when the heart or other organs stop working.

Man may be a little lower than the angels, he has always carried within himself the streaks of the brute. In primitive stages, the brute in the man manifested itself in the struggle and strife started for securing food and shelter and satisfying bodily urges. With the march of time, mankind acquired a thin veneer of refinement and sophistication but it

did not and could not get ride of the brute within. And the brute within is apt to break lose on occasions. To curb and control the brute, we need the rule of law. Laws are nothing more than a code of conduct which the people, speaking through their representatives, prescribe for themselves on pain of punishment for all deviations and infractions. Laws also prescribe the criteria to determine as to who is in the wrong when dispute arises between man and man. Laws further prescribe the mode of settlement of such disputes. With the change of times, laws have been vested with a much greater role and their functions have increased manifold. The concept of justice which is the ultimate aim of law has also undergone transformation as a result of new developments. One such development has been the Industrial Revolution. Another important development has been the political awakening which followed the French Revolution and paved the way for democratic regimes. The said Revolution also created an awareness of new rights. The third development has been the demand for economic democracy and the stress on narrowing of the economic disparities. This process has been accelerated by the Russian Revolution even in countries opposed to communism. Law, if it has to satisfy the needs of society, must keep abreast of all the developments and provide an adequate response to the challenge posed by the changing society. It cannot afford to remain a captive of the past; to be true to itself, it must meet the new demands and satisfy the felt necessities of the time.

Law, therefore, cannot remain unaffected by the tremendous advance made by science and technology. The strides made by science and technology have made it necessary to have a fresh look on laws with a view to make necessary changes and make them adept to the new situations, so that the laws may subserve the needs of society in a world transformed by science and technology.Any isolation between law on one side and science and technology on the other can spell disaster. If law fails to take into account the changes brought in society by science and technology, there would arise a hiatus between the needs of society and the responses of law. We must guard against such a hiatus if we want to prevent strains in the actual working of law and not detract from its utility as necessary instrument for producing order in society. Laws, it has to be borne in mind, are made for the existing societies. Laws made only in the context of conditions which have ceased to exist shall prove inedaquate, ill-equipped and perhaps useless.

Science and technology can also help a great deal in brushing up laws, in preserving legal knowledge in a more scientific manner, in making it more easily and speedily available and in also expediting the judicial

process. The time that we spend in transcribing the oral evidence, in preparing judgments and in preparing and supplying copies thereof can be reduced to a fraction thereof if we properly apply the means placed at our disposal by science and technology as is being, to some extent, done in the advanced countries. Computers are slowly and gradually becoming a store-house of legal knowledge. Evidence is tape-recorded, so as to ensure accuracy and also with a view to give a correct idea of occasional hesitancy, intonation, deliberation and evasiveness during the course of oral testimony These are some of the facets of the problem faced by men of law and men of science and technology which could be minimised through a healthy collaboration of men of science and technology and men of law.

THE INTERACTION OF SCIENCE, TECHNOLOGY AND LAW IN INDIA[1]

Prof. R. P. DHOKALIA*

Man is *homo feber*, and so, common to all anthropological definitions of man, the essential feature of his nature is that he advances technology and is dependent upon it for his survival. The level of technological development determines the basis of his way of life as well as his inner destiny. His future development is dependent on further technical innovations. In the human society today the richness of contemporary technology has vastly enlarged man's capacity. On the one hand, it has given him tools with which he can command Nature ever more effectively as to enable him to impose an human order on the environment by the application of human science and increase his comfort and physical security and well being within Nature. On the other hand, tools devised by technology have also greatly enlarged his individual and collective capacity to destroy himself and his kind as a result of which the thought, that technology which is the end-product of science is now the enemy of humankind, has become quite common. Technical innovation has had disruptive consequences and is a sources of uncertainty. Under the impact of technology human population has increased as the economics of technology cluster populations together in large aggregations and create individual conditions of anonymity which tend to corrupt order. Whilst the contribution of religion in the past was to personalise the abstract rules of human order and their meaning so that they became self-induced more than socially-enforced, in the legal way and the scientific way a high degree of abstract order serves the mass of the human society involved, with the result, that more impersonal the rules are, the less compelling they seem to the individual, and the more anonymous one feels, the more one is tempted to break rules because of reduced risk of discovery and its consequences. Thus, science and technical innovations have a contributory influence on the dissolution of a juristic order. Mass industrialization, mass production, mass communication, mass education and identification of masses with state, which are the consequence of technical innovation, along with uneveness of human participation in technology itself--all these are the factors which pose both a great challenge and a

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1. A Key-note Paper for the Symposium on the Interaction of Science, Technology and Law in India, 1979.

major threat to the human society. On the one hand, technical and scientific inventions have been and continue to be decisive means for fulfilling human needs and, therefore, create optimism, great hopes, and expectations linked with development of technology and, on the other, unlimited proliferation in the human needs, the changes in the basic life style of man and social stratification, explosion in human population and the conflicts between social interests and disruptive social consequence of technical innovations, demand new behaviour patterns to become normative and legitimized. Some social consequences of technical innovations have not only created a crisis for law but even seem to threaten the very essence of man. Yet, the jurists, lawyers as well as laymen seem to assume that the law will some how find out some answers to the current problems faced by the human society.

In highly technologically advanced countries an awareness is growing that civilized societies appear to be disintegrating; violence, aggressiveness and self-aggrandizement of the individual and groups are increasing and terrorism is being developed as a cult for realization of their own ends; organized and recurrent strikes by workmen, students, teachers, and government servants threaten to paralyse the life and bring the country to a standstill; moral and spiritual values have declined to a lowest ebb; all traditional concepts are being challenged and faith and the confidence in the law are steadlly declining; and the legal systems by and large appear to be losing the base of popular support. Genetic engineering, the possibility of 'creating' human life in the test-tube and of manipulating embryos in artificial conditions with its ethical and legal dimansions; establishment of sperm-banks for preserving semen of man indefinitely in order to use it for artificial insemination and fertilization by the test-tube method; and researches in mass cloning of human being with possibilities of fabrication of standardised human being from genetic blue-prints, are all some of the frightening developments having sinister potential to the detriment of mankind. These developments demostrate that the impact of advanced science and technology is the most incisive of the decisive forces which are reshaping contemporary society on a scale and at a rate unprecedented in human experience. It has a three-fold bearing on law: (a) it has a profound influence on the fundamentals of legal thought; (b) it poses a wide range of specific problems for law; and (c) it raises a general question of the relationship of law, science and technology in the life of the human society.

The progress of advanced science and technology poses immediate practical problems of legal regulation and legal liability and have raised several questions : Can all the frightening problems be foreseen before

they become insoluble or whether law must always lag behind life ? Must the progress of the law to cope with new problems arising from the current scientific and technological development always wait upon disaster ? Can the pattern of life of entire community has no control ? Is law responding adequately to the scientifie and technological developments and, if so, how far it can control and has handled the scientists and technologists in the best and ultimate interests of the community ? To what extent can the society exert itself to enable the law and the government to be more effective in meeting squarely the challenges posed by developments and solving problems created by scientific and technological developments ?

India too is rapidly moving towards modernization and development through science and technology aiming towards more exploration and exploitation of its natural resources, more industrialization, more production, raising the standards of living of the masses, and fighting prevasive poverty, disease and destitution by planned and organized efforts. It is already regarded as one of the most industrialised of the developing nations. Modernization and technological developments necessarily produce great structural changes and create crucial problems in such areas as upheaval in social and cultural life, growth of cities, paucity of energy and raw materials, environmental pollution, disorganized transport and traffic, automation and consequent unemployment, erratic food production and distribution, chaotic condition created by dismal inability to respond to the needs in health, education and training, employment, and capital resources. Further industrial development appears to be threatened by haphazard industrialization as much by uncertainties over policy as in respect of infrastructural inadequacies like lack of power. Criminal indifference or unfortunate inability to respond to a crisis situation, dessication of idealism and the sense of purpose, the disruption of the old social order along with its traditional network of authorities maintaining social discipline, the gradual decay of the system of education and lowering of the standards of public life, and so on seem to be slowing our further progress. All these require well-thought out, concerted and all-out, efforts, and strict rules of planning, organization and control which will need coordination of the creative activities of a large number of scientists, social scientists, jurists, engineers and other technologists, full utilization of the limited personnel and financial resources, and collaboration between large number of disciplines in order to deal with the complexity of scientific and technological developments of our society as well as to find out solutions of consequential problems.

The need of the day is an interdisciplinary dialogue between the scientists, technologists, social scientists and academic and professional

lawyers with a view to focussing their attention on the consequences of development and rapid transformation of the tradition-bound Indian society by science and technology and its bearing on agencies of social controls in particular law which is the primary control system of the society. It may also give them an opportunity to examine the bearing of law on the rate, process and direction of scientific and technological change. Considering that the points of contact as well as confrontation between the systems of law, science, and technology are manifold and multi-faceted, the researchers may delimit their programme by formulating a *list of arenas* denoting the following situations :

(a) Wherein law and science must take each other into account and seek cooperation, at national and international levels for an harmonious working relationship rather than a confrantation which is suggestive of bellicose relationship. Recently, a need of new legal relationships and a scheme of international cooperation are being witnessed in the areas of exploration and exploitation of Antarctica, the sea bed and the outer space, and control of population transgressing national frontiers.

(b) Wherein the contact between law and science is at once the most *direct* and most *venerable*. These cover the areas in which the law in discharging its traditional adjudicatory functions must draw on scientific knowledge in order to reach its decision, or where scientific developments, like the emergence of eleetronic devices that are compelling the legal systems to re-examine the adequacy of established legal doctrines;

(c) Wherein the crises, arising out of the new dangers besetting us, or shaking the very foundations of our civilized living, or challenging the traditional age-old beliefs and concepts, have led the state to intervene through the legal mechanism of appropriation, executive order, taxation policy and other methods of control with a view not only to regulating scientific objective, activities and programmes, but also seeking to maximise the contributions of scientific and technological researches and inventions for the welfare of the humau society.

With the rise of science, both basic and applied, and pervasiveness of its effects on our society, lawyers as well as scientists and technologists today must join hands not only with each other but also with their fellows in other countries in the design of, or adaptation to new legal instrumentalities and relationships in order to advance and secure

the common interests of the human society. It is a fact that the rise in the prestige of the science and technology tends to bring about a corresponding diminution in the importance of the function of law as well as the place of the lawyer in the modern society, and so, one is likely to conclude that the important functions of the lawyer and the special *fortis* he is required to possess for making his best contribution to operation of the complex human society, are in danger of falling into *desuetude*. This development however, raises the question : how, if at all, our legal education has responded and adapted itself to technologically-induced social changes and new social needs, national as well as international ? Appearently, our Law Schools do not seem to have been aware of serious challenge thrown to them by the needs and demands of a modern industrialized society into which India is rapidly transforming itself. If our law schools take a less professional and practice-oriented view and take initiative in providing highly specialized teachers for training the future lawyer for his effective and fruitful role as a citizen, a social engineer, and a potential leader of the society, then they must recognize the urgency of specialization and study of the interactions of law, social sciences and science as having a corresponding place in the highly specialized training of tomorrow's lawyers.

In our times, a university ought to be closely linked with its political, social, economic and scientific environment and must react directly and flexibly to changes in the society. Unless the inter-disciplinary teams of specialists are created, in which scholars, scientists engineers, lawyers and social scientists specialized in their own specific branches work together and the universities offer ideal and flexible conditions for inter-disciplinary studies and activities covering a broad spectrum of knowledge required by the demands of technological society, they cannot remain in the forefront of fruitful, researches to bring about the replacement of quantitative by qualitative growth in which living conditions can be improved without any additional burden on the environment. Technology, requiring as it does, strict control by man, must provide the impetus for similar progress in the political and social sciences. It is, therefore, necessary more than ever before to narrow down the gap existing between the arts, the natural sciences, and the social sciences if we are to meet future challenges and cope with the impending dangers of industrial and technological revolution taking place in India.

Scientific *eclat* and technological change have important implications for legal education. A law trained man traditionally viewed as

facing the past and preoccupied with the Acts, Statutes, Precedents, technicalities, quibbling of words, and money making cannot be considered today a man for the season of scientific successes, or for a society going through a transformation by scientific and technological change. He is today specially called to make law vital by constantly relating it and his legal work to the new needs and demands caused by rapid changes in the conditions of life. In addition of his traditional *fortes* as an advocate and conciliator of disputes, in a society of technological change, new *fortes* are required to be developed by him as a participant in legal planning and legal designing for tailoring the law to new conditions of denser population; faster transportation and communication; higher mobility; slum clearance; incessant labour strikes; baffling inflation; accelerated smuggling; erratic and chaotic di tribution of essential commodities; pervasive corruption; threatening chemical and radio-active contamination; environmental pollution and adulteration; tax-evasion and commercial malpractices; violation of human rights; violence; perversion and misuse of governmental power with impunity; development of nuclear weaponory; control of activities and experiments in outer space; international crimes, and varieties of new local and global problems transcending in their ramifications national boundaries. Planning solutions to the problems arising from technological and social changes calls for complete reorganisation of legal education, a highly specialized training with an insight and understanding of sociological background of these problems falling within specified areas, and opportunities of communication, interaction and collaboration of lawyers with the specialists of other disciplines. These new demands of a society of technological changes have rendered obsolete the traditional legal education which has remained confined almost entirely to keeping lawyers *an courant* in narrow areas of practice, to the knowledge of statutory and administrative materials and case studies, and professional thoroughness and technical mastery over formal aspects of a legal system.

New demands on legal education created by scientific *eclat* and technological change call for a serious rethinking and exploration of ways and means of providing opportunities for initiating pioneering curricular experimentation and extending their reach to a highly selective students who may be trained in the scientific as well as standard social science research techniques for their use in traditional professional task with a view to meeting the exigencies created by new forces operating in and upon our society.

Looking from the point of view of some social scientists at the social and political consequences of the rise of science and technology, it has been asserted that, unwittingly and indirectly, the scientist undermines the

juristic order because technology, the end-product of science, accelerates the pace of social change whilst law and the lawyer unavoidably and automatically stand in the way as they operate traditionally and have antipathy to any rapid change. In our times, whilst on the one hand sciences and technology have accelerated the pace of social change and enthusiasm for progress thereby posing a threat indirectly to the dissolution of juristic order, there appears to be an uncomprehending assumption that law by its very nature is a crystallization of the *status quo* and is a drag upon progress. However, law, both as a process for resolving conflicts between competing interests without resort to unilateral force and as a social engineering skill for accommodating and balancing the asserted interest, and *the lawyers*, in predicting, counselling, negotiating, litigating, arbitrating, mediating, public speaking, and taking broad account of all interests affecting life along side common interests with dispassionate and creative neutrality contribute enormously to the alleviation of human difficulties and the expansion of the potential of human life. As technological advances add new interrelationships to a complex network, exclusive spheres of private interests in isolation tend to become smaller and less tenable and the acceptability and vitality of the legal way as a pattern of life tend to become centrally important. But, complexity and proliferation in the number of future conflicts will demand, not only sharpening of the traditional *fortes* of the future lawyer as a counseller and as a mediator and conciliator trained in the adversarial process and in an essential dispute-resolving mechanism but also, developing new *fortes* for which legal education requires to be reorganized and revitalized. There exists also the need of evolution of new legal concepts in order to stabilize new policy decisions, of overhauling of legal machinery and antiquated court structures and outmoded procedures, of strengthening the emerging common law of mankind, and of planning solutions of varieties of municipal and transanational problems arising from technological and social changes. This calls for display of new *fortes* of future lawyers. It calls for communication, interaction, and collaboration among highly specialized lawyers and specialists of other disciplines so that they can be involved in extending society's forward line of vision to foresee, anticipate, and begin providing for latent and potential conflicts and finding their solutions.

Considering that a formal and traditional law office training is now wholly outdated because of insulation of the law school and the legal profession from other disciplines and from educated layman, it is only by curricular advances through new ventures, which can provide students with a full perspective on their own law by suggesting relationships between law, sociology, economics, social reality, political developments, social changes, political attitudes, and constitutional evolution in a context

in which those relationship can be fully grasped, that law students can become more accustomed to, more naturally familiar with, and more proficient at working on the social "macrocontroversies". It is doubtful whether or not customary basic and elemental courses in Contracts, Torts, substantive and procedural Criminal and Civil Laws, Taxation, Labour Law, Company Law, Constitutional and Administrative laws, and skill courses, like legal method and writing, and drafting of statutes can survive new demands in legal education, because they can serve as canopies under which new principles may be easily explored. But, the courses like Public International Law, currently in vogue in the Indian law schools, cannot be regarded as sufficient to meet the new demands of the "One World" when time and space have been conquered. The range of practical problems to be solved by International Law is becoming wider and wider to include the international control of nuclear energy; activities in outer space; contamination of and from space; environmental pollution in all its forms; new development in the exploitation of the ocean depths and in the polar region; the regulation of supersonic flights; weather and climate modification programmes; and earthprobing operations. All these are the problems arising out of the impact of science and technology on man and none of them can be dealt with in isolation as they call for creative imagination and a comprehensive programme of education, research and action. Curricular advances require inclusion of international commercial law, international labour law, international maritime law, international cartel law, international economic and tariff law, international law of business associations and of regional and international organizations, law of the United Nations, law of international institutions, international law of human rights, international aerial law inclusive of outer space, international law of the seas, international criminal law, international treaty law, and international law of armed conflicts etc., etc. Along with these, the courses on the history of international law and its codification, comparative law, legal philosophy, historical and current international affairs, international politics, foreign policies, economic development, political attitudes, and structural changes in the world society can alone provide to students proper perspective in a context in which international relations and factors of international conflicts can be adequately grasped more quickly than in the context of hodgepodge of traditional set of courses based on *Oppenheim* pattern. Similarly in the area of criminal law, criminology must be linked with the related empirical sciences like psychiatry; psychopathology; forensic science, sociology; anthropology and other criminal sciences as well as legal aspects of mental illness; juvenile delinquency; and other experimental courses stressing on the lawyer's role and responsibility in law complexes

and in the legal ramifications of community problems and situations. There can indeed be an impressive array of course offerings in other fields as well in order to emphasize the relevance of legal ideas to problems not cast in traditional legal form. However, ingenious programmes and new ventures not only require pragmatic reorganization and restructuring of the law schools and their courses in the country but also adequate financial support to obtain library and research material, teaching caliber, physical facilities and curricular breadth and innovation.

By and large, lawyers know little about science and scientists regard law as a survival from a pre-scientific age. The lawyers in the brave new world of technology and science should become scientists and scientists must imbibe a new respect for the discipline of law to create an understanding of human values and justice. *Above all, it is unquestionable that the ability to train and attract brilliant men for teaching is the most determinative single ingredient of the future character of legal education in the training of future lawyers.* But it seems that the law schools in India have conspicuously failed to take discernable steps which have made any impact on the quality of teaching law. Reasonable answers for the plethora of problems arising from the current scientific and technological developments call for an altogether new breadth and synthesis of scientific enquiry and technological ingenuity with spirit and power of legal philosophy, technique, and research so that positive response may be fruitful in the world of action and our learning can be converted into leadership in the formulation of policy in the form of recognized principles, in the translation of the principles so recognized into a firm law, and in the continuous intensification of collaborative measures in administrative, financial, logistic, servicing and technical matters necessary for planting seeds of growth with justice for a full partnership with a view to developing the resources of science and technology for the service of man. This goal can be achieved only by concerted efforts of education, research and action in order to keep the law abreast of scientific and technological developments and ensure its continued vitality as an essential element in the effective social control of the new relationship between man and his evironment resulting from these developments.

Being convinced that the law is potentially capable of structuring the present and the future, it is considered essential that jurists and social scientists should work side by side along with scientists and technologists rather than in collaboration for solving the outstanding problems of social change. The interdisciplinary approach must concentrate on the growing concern for social consequences in India of technological progress, its bearing on law as our society's primary control system, the influence of law on the rate and directtion of scientific and technological change, and the implication of scientific *eclat* and technological change on legal education.

MEDICAL SCIENCE, PATIENT AND THE LAW

SHAUKAT ALI*

There is nothing sweeter than life whatever its cares and anxieties may be. There is nothing more frightening than death. This frightening nature of death has compelled the mankind from the very beginning to find out means and methods to postpone the happening of death as far as possible. In modern times many a scientist believe that death is a state of hibernation from which some may find a way to revive the sleepers. To-day science has enhanced man's power over death and thousands of patients are kept alive by blood transfusion, intravenous feeding, artificial respiration, transplantation of organs and other measures. Now, a patient consults a doctor or goes to the hospital in the hope that he may have a fresh lease of life. Even a man suffering from what is believed to be an incurable disease wants to live as long as possible and he places himself in the hands of his doctor in the hope that he will receive the best treatment and will survive for some more time. And the doctor, under his professional oath, tries to do his utmost to save him, to keep the spark of life burning, howsoever feeble that spark may be.

However, not all the doctors may get success. Something may go wrong with the patient either as a result of negligent act of the doctor in administering the treatment or as a result of various untoward happenings. While administering anaesthesia, adequate precaution is not taken; as a result of wrong diagnosis of the ailment the whole treatment may go wrong. A new pattern of treatment which may include a novel method of surgical operation, the patient may develop other side effects of the operation, a newly manufactured medicine may be administered to a patient for experiment which may have reactions and in some cases disasterous consequence. Inadequate sanitary conditions, carelessness in not attending the patient under treatment when the circumstances demand prompt attention may also add to the misery of the patient. In any case the patient is going to suffer doubly or trebly. He was already suffering from an ailment and that ailment was not cured, instead he developed another one, which would require spending of money for the treatment. Who is going to bear the loss ? Is there any law to govern the above problem; if so, is it adequate ?

The modern breakthrough in the field of medical science is the advances in the genetic engineering. It has enabled a physician to find out

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whether a child in the womb is suffering from a genetic disorder. If the prospective parent consult a physician who negligently advises the parent against the termination of pregnancy and the child is born genetically defective in such a case it may create more serious problems. Can such a child file a suit against the physician who was responsible for the wrongful birth ? Can the parent file a suit against the physician for the money they will be required to spend for the treatment of the child ? Is there any law to govern these problemes ?

An attempt has been made in this paper to identify and discuss these problems and also how for law meets these challenges and where the law is lagging behind these developments in medical science and technology.

I. Liability of the practioner generally

When a person submits himself for treatment and something goes wrong resulting in injury or death of the patient, is the practitioner answerable for that injury or death ? That injury or death may be a consequence of the physician's negligence in providing the treatment; or that injury may be of natural result, In the former case the patient or the representative has a remedy by filing a suit for damages in negligence but there is no remedy in the later one. The questions of medical practitioner's duty arises from the fact that he does something to a human being which is likely to cause physical damage unless it is done with proper care and skill. The question usually arises as to how much care should a medical practitioner must take. Is it expected of him to take every possible care and use the highest skill or his duty is limited to show a fair, reasonable and competent degree of skill ? This aspect of practitioner's duty to take care and standard of care has been defined in *R. V. Bateman*[1] as follows :

"If a person holds himself as possessing special skill and knowledge and he is consulted, as possessing such skill and knowledge, by or on behalf of a patient, he owes a duty to the patient to use the caution in uudertaking the treatment. If he accepts the responsibility and undertakes the treatment and the patient submits to his discretion and treatment accordingly, he owes a duty to the patient to use diligence, care, knowledge, skill and caution in administering the treatment. No contractual relation is necessary, nor is it necessary that service be rendered for reward. The law requires a fair and reasonable standard of care and competence. This standard must be reached in all the matters mentioned above. If the patient's death has been caused by the defendant's indolence or carelessness, it will not avail to show that he had sufficient knowledge, nor will

1. (1925) 94 L. J. K. B. 791.

it avail to prove that he was diligent in attendance, if the patient has been killed by his gross ignorance and unskillfulness. As regards cases where incompetence is alleged, it is only necessary to say that the unqualified practitioner cannot claim to be measured by any lower standard than that which is applied to a qualified man. As regards cases of alleged recklessness, judges are likely to distinguish between the qualified and unqualified man. There may be recklessness in undertaking the treatment and recklessness in the conduct of it. It is no doubt, conceivable that a qualified man may be held liable, for recklessly undertaking a case which he knew or should have known, to be beyond his power, or for making his patient the subject of reckless experiment."

A charge of professional negligence against a medical man is a serious one. It stands on a different footing to a charge of negligence against the driver of a motor car. The consequences in the first case are far more serious. It affects his professional status and reputation. The burden of proof is correspondingly greater when even with the best skill in the world things sometimes go amiss in surgical operations or medical treatment. A doctor is not to be held negligent simply because something goes wrong. He is not liable for mischance or mis-adventure, or for an error of judgment. He is not to be liable for taking one chance out of two or for favouring one school rather than another. He is only liable when he falls below the standard to be adopted by a reasonably competent practitionerin his field.[2]

The Supreme Court of India, while deciding a case[3] on doctor's

2. Lord Denning MR in *Hucks* v. *Cole* 1968, 118 N. C. J. 469.
3. *Dr. Laxaman* v. *Dr. Trimback* A. I. R. 1969 S. C. 128.

The S. C. cited with approval the following observation in Halsbiury's *Laws of England* 3rd Ed. v. 26 at p. 17 : "A person who holds himself out as ready to give medical advice or treatment impliedly undertakes that he is possessed of skill and knowledge for the purpose. Such a person, whether he is a registered medical practitioner or not, who is consulted by a patient, owes him certain duties, namely, a duty of care in deciding whether to undertake the care; a duty of care in deciding what treatment to give; and a duty of care in his administration of that treatment. A breach of any of these duties will support an action for negligence. The practitioner must bring to his task a reasonable degree of skill and knowledge, and must exercise a reasonable degree of care. Neither the very highest, nor a very low degree of care and competence judged in the light of the particular circumstances of each case, is what the law requires; a person is not liable in negligence because someone else of greater skill and knowledge would have prescribed different treatment or operated in a different way; nor is he guilty of negligence if he has acted in accordance with practice accepted as proper by a reasonable body of medical men skilled in that particular art, although a body of adverse opinion also existed among medical men."

negligence approved and followed the law laid down in England on the point and held that a medical practitioner was under a duty to take care of the patient and was liable for the consequences that follow due to his negligence in undertaking the patient for treatment, in deciding what treatment to be given and how to be given. The practioner must bring to his task a reasonable degree of skill and knowledge, and must exercise a reasonable degree of care. Thus actions for negligence in India are to be determined according to the principles of English common law.[4] The judicial approach in this regard is that in an action for negligence against a medical practitioner, as in any other action for negligence, the plaintiff has to prove : (1) that the defendant is under a duty to take a reasonable care towards the plaintiff to avoid the damage complained of or not to cause damage to the plaintiff by failure to use reasonable care; (2) that there is a breach of duty on the part of the defendant; and (3) that the breach of the duty is the legal cause of the damage complained of and such damage is reasonable foreseable.[5]

A comperative study of the judicial approaches in U. K., U. S. A., and India with respect to the modern methods of treatment, either in medicine or surgery may be undertaken.

In *Roe* v. *Ministry of Health*[6], in October 1947 a spinal anaesthetic called nupercane was in the use at the hospital. It was a liquid supplied by the makers in closed glass ampuoles. There were test tubes sealed with glass. When the time came to use it, a nurse filed off the glass top, the anaesthetist inserted his needle and drew off the nupercane, which he then injected into the spine of the patients. It so happened that in this process there was some risk of the needle being infected. The reason was because the outside of the ampoule might become contaminated with a germ of some kind, and the needle might touch it as the anaesthetist was filling it. This risk, which was a real, was proved. In order to avoid this risk, the senior anaesthetist at the hospital, decided to keep the ampoules in a jar of disinfectant called phenol, which was a form of

4. See : *R.* v. *Bateman*, 1925; 94 L. J. K. B. 791; *Hucks* v. *Cole* 1968, 118 N. L. J. 469; *Malron* v. *Osborue*, 1939, 2 K. B. 14; *Hunter* v. *Hanley* 1955, S. C. T. 213; *Vancouver General Hospital* v. *Mc. Danial* 1934, W. N. 171, *Roe* v. *Ministry of Health* 1954, 2 K. B. 66 C. A. The American position on the subject is more or less the same. For example-*Bronett* v. *Chelsea Kensington Hospital*, 1968, IAER 1068. (H. L.)
5. This conclusion has been drawn in *Phillips India* v. *Kunju Punnu*, AIR 1975 Bom. 306 at 315.
6. 1954, 2 K. B. 66. (CA.); See also, *Lim* v. *Camdeu Kiugston Area Health Authority* (1979)2 All. E. R. 910 (H. L.) in which a doctor went under a gynochological operation, this operation affected her brain and was awarded as damages £ 2,49,513.

carbolic acid. This disinfectant was made in two strengths. The stronger was tinted light blue and the weaker was tinted pale red. This was so as to distinguish it from water. This new disinfectant system was defective unknown to the specialists. The ampoules in the jar might become cracked, the cracks might be so fine or so placid that they could not be detected by ordinary inspection, and the carbolic disinfectant would then sweep through the cracks into the nupercane, and no one would realize that it had taken place. Thus the anesthetist, who thought he was inserting pure nupercane into the spine of the patient, was in fact inserting nupercane mixed with carbolic acid. Thus in the instant case even though carbolic acid was inserted into the spine of the patient and corroded all the nerves which controlled the lower half of the body, yet the court held that the anaesthetist was not liable because looking into the peculiar circumstances of the case the said anaesthetist was not negligent.

Fiorentino v. *Wenger*[7] is an illustration of novel methods of surgical

7. (1967) 19 N. Y. 2d. 407 (Court of Appeal of N. Y.)

The law regarding the liability of a medical practitioner for negligence towards the patient is similar to that in England and is expressed by several judicial decisions : It was observed in *Hansen* v. *Pock* 57 Mont. 51 Mont. 187 P. 282 (Supreme Court of Montana) :

"It is the rule, recognised by the courts generally, that when one holds himself out as a physician or surgeon, whether licenced or not, and accepts employment as such to treat a patient, he assumes towards the patient the obligation to exercise such reasonable care and skill in that behalf as is usually exercised by physicians or surgeons of good standing of the same system or school of practice in the community in which he resides, having due regard to the condition of medical or surgical science at that time."

The same rule is expressed in somewhat different terms by the Supreme Court of New York in *Machenzie* v. *Carman* 92 N. Y. S. 1063, as follows :

"The law thus requires a surgeon to possess the skill and learning which is possessed by the average member of the medical profession in good standing, and to apply that skill and learning with ordinary reasonable care. He is not liable for a mere error of judgement, provided he does what he thinks is best after a careful examination. He does not guarantee a good result, but he promises by implication to use the skill and learning of the average physician, to exercise reasonable care, and to exert his best judgment in the effort to bring about a good result."

"The object of the law on the one hand is to guard the patient against the wrongful practice of ignorant or negligent who hold themselves out as physicians or surgeons, and on the other to protect the faithful practitioner of ordinary learning, skill, and ability from loss in reputation or purse on account of matters for which it would be unreasonable to hold him responsible."

(*London* v. *Scott* 58 Mont. 645 : 194 P. 488).

operations and the consequences thereof. In the present case the diseased was a generally healthy, athletic school boy of 14 years. He developed a moderate (38%) scoliosis or curvature of the spine. Dr. Wenger, an orthopaedic specialist, recommended a drastic or radical procedure, known as a spinal-jack operation, rather than the customary protracted treatment involving spinal fusion (also a major operation) and the use of a body cast. The surgeon did not inform (it was proved in the case) the parents of the patient of the relative novelty of the spinal-jack operation, the broader details of its execution, or that it was not a procedure generally accepted in the medical community. The surgeon himself had devised the spinal jack operation and had performed it thirtyfive times. He was the one in the country using this technique which was not commonly used elsewhere in the world.

In the instant case the operation lasted for five and half hours. Two inches excised from each of seven ribs, and a similar number of bonny processes were removed from the spine. The principal artery, the aorta were detached from the spine so that it hang freely, and evidently t e same was done to the vena cava-the principal vein. Other organs were temporarily pushed aside. Holes were then drilled into vertebrae to receive two screws. Firstly by mannual pressure and thereby wrench applied to the turnbuckle then spine was straightened. Throughout the operation X-ray were taken to verify placement and alignment of the devices. But the result was that the patient developed untoward symptoms and after 17 days of the operation died of a massive hemorrhaege with external effusion of blood.

Plaintiff adminisratix sued for wrongful death and conscious pain and suffering. She was awarded a verdict of $ 45000-30,000 for cause of death and $ 15,000 for pain and suffering against the doctor and the hospital, On appeal, doctor's negligence was unanimously upheld but the hospital's liability was upheld by a majority-one judge dissenting.

In *Laxman* v. *Trimbuck*[8] the patient, with a leg fracture, was treated by the appellants. The patient was given morphia injections alone and while putting the leg in plaster the defendant used mannual

"The usual standard is that of an ordinary training and skill possessed by physicians and surgeons of good standing practicing in the same or similar community. Sometimes this is stated as the "average" skill of the professiou; but "we are not permitted to aggregate into a common class the quacks, the young men who have had no practice, the old ones who have dropped out of practlce, the good, and the very best, and then strike an average between them. This method would evidently place the standard too low" (*Sim* v. *Weeks* 1935, 7 Cal. App. 2d 28=45 P2d 350).

8. AIR 1969 S. C. 128.

traction and used excessive force for this purpose. Normally, such traction is never done under morphia alone, but done under proper general anaesthesia. This resulted in the death of the patient. The cause of the death in the certificate showed as cerebral emblism. In this case the Supreme Court had no difficulty in holding that the doctor was liable because he was negligent.

In the English case the doctor was not liable because he took reasonable care in protecting the new type of anaesthesia. In the American case the surgeon was liable because he was negligent in not informing the parent of the patient all the consequences and even detailed effects of his novel method of operation. And in the Indian case the surgeon was held liable because he acted in a gross negligent way and did not take those precautionary measures which a reasonable medical practitioner could have taken in those circumstances.

II. Diagnosis

The first stage in the process of treatment is to diagnose the illness and it is very probable that the diagnosis may go wrong and it may result in the wrong treatment and the consequence may be disasterous, The symptoms of different ailments are so often similar or close to resemblance that a practitioner who has just entered into the field or of little standing or not equipped with modern and up-to-date paraphranelia is bound to reach a different conclusion. The seriousness of the problem may not be so great in a modern hospital or a nursing home having all the facilities which the modern medical, surgical technology has provided. But then we are not talking only about these big hospitals but an average hospital or a medical practitioner.

So the question arises as to what is the position in law about the liability of a physician who diagnosed a wrong ailment. Will it be treated as a malpractice or will he be given the benefit of the less qualified in the field ? In this respect the following observation of Lord Nathan highlights the law relating to liabilities of a practitioner in case of a wrong diagnosis :

"The diagnosis of ailments is normally the first matter with which the medical man is concerned; and there can be no doubt that he may find himself held liable in action for negligence if he makes a wrong diagnosis aud thereby causes injury or damage to his patient (as for example, where the false diagnosis leads the medical man to apply a wrong treatment or to refrain from applying some treatment which, if it had been applied at once, would have averted or cured the condition complained of). It follows, however, from the standard of care required from the

medical man, that a mistaken diagnosis, is not necessarily a negligent diagnosis. It was said forty years ago, and the principle still holds good, though allowance must of course be made in any particular case for subsequent advances in techniques that no human being is infalliable; and in the present state of science even the most eminent specialist may be at fault in detecting the true nature of a disease. A practitioner can only be held liable in this respect if his diagnosis is so palpably wrong as to prove negligence, that is to say, if his mistake is of such a nature as to imply an absence of reasonable skill and care on his part, regard being had to the ordinary level of skill in the profession."[9]

An illstration of wrong diagnosis and liability may be seen in *Phillips India V. Kunju Punru.*[11] The plaintiff's son (deeeased) was an employee of the appellant's company defendant No. 1 and the company had employed defendant No. 2, a medical practitioner, as medical officer and advisor. D_2 had to treat the patients of D_1 free of charge. The patient (plaintiff's son) was sent for treatment and D_2 treated him as a V. D. patient though he was allegedlly suffering from small pox. The patient developed high fever and D_2 continued to treat him as V. D. patient with a high dose of treatment which made the condition more serious. D_2 sent him to the nursing home of one Dr. Grant, a skin disease specialist. However, it was too late and Dr. Grant finding, that it was a case of small pox, sent the patient to the infectious diseases hospital where he died. It was alleged that D_2 was negligent throughout in diagnosis, in treatment, in not attending and continued treatment on the basis of V. D. though he was told persistently by the relatives of the diseased that he was not suffering from V. D.

The court held that D_2 was not liable because the plaintiff could not prove negligence on the part of D_2. It was pointed out that the standard of care and skill to satisfy the duty in tort was that of an ordinary competent medical practitioner exercising the ordinary degree of professional skill. The court was of the opinion that a defendant charged with negligence could clear himself if he showed that he acted in accordance with general and approved practice. As to the wrong diagnosis, the court, following the observations of Lord Nathan, held that it was only a mistaken and not negligent diagnosis.

Though a physician or surgeon is not required to make a perfect diagnosis, yet he is liable for a failure due to want of the requisite skill or care, to diagnose correctly the nature of the ailment, with resulting injury or detrimental to the patient. But he is not liable for mistake in

9. Lord Nathans *Medical Negligence* p. 43.
10. A. I. R. 1975 Bom. 306.

diagnosis if he uses the proper degree of skill and care. The law imposes on a physician or surgeon the same degree of responsibility in making a diagnosis as in prescribing and administering treatment.[11] If a physician or surgeon negligently makes incorrect diagnosis but render treatment which is proper and skillful for the patient the physician is not liable for malplactice.[12]

A patient is entitled to an ordinary careful and thorough examination. The physician or surgeon is required to use reasonable skill and care in determining the condition of the patient, the nature of his ailment. But he is laible for his failure, due to want of the requisite skill or care, to diagnose correctly the nature of the ailment[13]. The standard of care in diagnosing the ailment in a modern hospital is greater than the care taken by a general practitioner in a village area or even in a city area. The cases requiring the ordinary care to be taken by a physician in diagnosing an ailment are of old time when sophisticated methods of diagnosis were not evolved and the hospitals and physicians were not equipped with modern machines. The screening machine at present can point out within seconds the ailing portions of the body. The blood, urine, stool, saliva and other tests may reveal to a greater certainty the real cause of the trouble. In these circumstances even an ordinary practitioner should not be given the benefit of not capable of using these devices. A surgeon, who do not take X-ray photos to locate a bone fracture may be held responsible[14] Can we extend this rule to the area where a local man who has not studied this branch of medical science, cures so many bone dislocations or even fractures, if he does not take X-rays or does not use proper anaesthesia or other precautionary measures ?

III. Burden of Proof :

Two serious problems erupt almost in every case where a medical practitioner is charged with malpractice. First is with respect to the proof of negligence because the plantiff normally cannot understand the magic box of the doctor or the paraphranelia with which the doctor's operation room is equipped with. The second is the consent of the patient,

11. *Lawless* v. *Calaway* 147 P2d 604 = 24 Cal. App. 2d 81.
12. *Mc Bride* v. *Roy* 58 P2d 886=177 Okl. 233.
13. *Mc Hugh* v. *Audet* 72 F. Supp. 394; *Reynolds* v. *Struble* 18 P2d 690=128 Cal. App. 716. *Agnew* v, *City of Los Angeles* 218 P2d 66 (California); *Bickford* v. *Lawson* 81 P2d 216=27 Cal. Appeal 2d 416 (California); *Floyds* v. *Walls* 168 S. W. 2d 672=26 Tenn. App. 151.

There are so many Persons performing this practice in the states of U. P. and Bihar.

14. *Young* V. *Fisbback* 1958, 262 F. 2d 469.

which under the law of torts does not impose liability on the defendant. Everytime, when the operation is to be done, the patient is required to sign a form which implies that the consequences of the operation will be brone by the patient. And usually, this signed form is produced before the court in proof of the fact that the patient consented for the alleged surgical operation and thereby agreed to suffer the consequences. It will not be out of the context to discuss here as to how far the law has governed these delicate aspects of the problem.

In an action for negligence the burden of proof falls upon the plaintiff alleging it. Hence it is for the plaintiff to give evidence of the facts on which he bases his claim. His evidence may consist of facts proved or admitted and after it is concluded two questions arise : (1) whether on that evidence negligence may reasonably be inferred, and (2) whether, assuming it may be reasonably inferred, is it in fact inferred ?

There is evidence of negligence if the facts proved and the inference to be drawn from them are more consistent with negligence on the part of the defendant than with other causes. The plaintiffs evidence must show that on the balance of probabilities the most likely cause of the damage was the defendants's negligence and not the negligence of any other person.

There are certain circumstances when the doctrine of *res ipsa loquitur* may be applied to prove the alleged negligence. When an operation leaves a sponge in the patients interior,[14] or removes or injures an inappropriate part of his anatomy,[15] or when a tooth is dropped down the patient's windpipe,[16] or the patients suffers a serious burn from a hot water bottle,[17] or when the instruments are not sterilised[18], these incidents speak for themselves without the aid of any experts advice.[19]

In *Ybarra* v. *Spangard*,[20] the plainfiff's physician identified the ailment and arranged for an appendectomy. The plaintiff was given a hypodermic injection and later was awakened and wheeled into the operation room. The plaintiff's testimony was that before the operation he had never experienced any pain in his right arm or shoulder, but that when he awoke he felt a sharp pain between the neck and the joint of the right shoulder. Thereafter the doctor gave him diathermic treatment and the

15. Vergeldt v. *Hartzell*, 1924, 1F. 2d 633
    Dee v. *Beck* 1962, 141 So 2d 920.
16. *Nelson* v. *Parker* 1930, 104 Cal. Appeals 770.
17. *Timbrell* v. *Suburban Hospital* 1935, 4 Cal. 2d 68.
    Mc Donald v. *Foster Memorial Hospital* 1959, Cal. Appeal 2d 85.
18. *Barham* v. *Widing* 1930, 210;Cal. 206.
19. Prosser, *Law of Torts*, 3rd Ed. p. 231.
20. 1944, 162 A. L. R. 1258 (Supreme Court of Califoruia)

pain spread down the lower part of his arm and continued to grow worse after he left the hospital. The expert witness testified that from X-ray pictures there was a wasting away of the muscle above the shoulder due to injury by pressure or strain applied between the plaintiff's right shoulder and neck during the operation. It was also testified that the plaintiff's injury was paralysis of traumatic origin.

It was held that the doctrine of *res ipsa loquitur* was applicable. Gibson C. J., applying the doctrine, observed :[21]

"The present case is of a type which comes within the reason and spirit of the doctrine more fully perhaps than any other. The passenger. sitting awake in a railroad car at the time of a collision, the pedestrian walking along the street and struck by a falling object or the debris of an explosion, are surely not more entitled to an explanation than the unconscious patient on the operation table. Viewed from this aspect, it is difficult to see how the doctrine can, with any justification, be so restricted in its statement as to become inapplicable to a patient who submits himself to the care and custody of doctors and nurses, is rendered unconscious and receives some injury from instrumentalities used in his treatment. Without the aid of the doctrine a patient who received permanent injuries of a serious character, obviously the result of some one's negligence, would be entirely unable to recover unless the doctors and nurses in attendance voluntarily chose to disclose the identity of the negligent person and the facts establishing liability. If this were the state of law of negligence, the courts to avoid gross injustice, would be forced to invoke the principles of absolute liability, irrespective of negligence, in actions by persons suffering injuries during the course of treatment under anaesthesia. But we think that this juncture has not yet been reached, and that the doctrine of *res ipsa loquitur* is properly applicable to the case before us"

The doctrine of *res ipsa loquitur* was also applied in *Mayor* v. *Dowsett*,[22] where a 34 year old woman in good health, was paralysed after anaesthetic at child birth. It was observed that it was unnecessary to determine whether it was common knowledge among layman that paralysis of a healthy woman following child birth with use of spinal anaesthesia would not happen without negligence in administering, since there was expert testimony that such injury is not expected if due care is exercised. In *Washington Hospital Centre* v. *Butler*,[23] diabetic sustained injuries in a fall from an x-ray table wheu vertical irridation was attempted. Judg-

21. *Ibid*, at p. 1263.
22. 1965, 400 P. 2d 234.
23. 1967, 384 F. 2d 331.

ment was entered against the hospital and radiologist, although neither side adduced evidence of medical practice in the community.

In *Voss* v. *Bridwell*,[24] a patient, hospitalised for mastoid operation, was in custody of a surgeon, an anaesthetist and a resident physician who was head of hospital's anaesthesiology. The operation was never performed because the patient was disabled from administration of anaesthesia and use of an indotracheal tube because the tube so used supplied oxygen to the stomack instead of the lungs. It was held that under the circumstances the doctrine of *res ipsa loquitur* applied because the injury was one which did not ordinarily occur in the process of a mastoid operation or in the absence of negligence in the process of administering anaesthesia and in the use and employment of an indotracheal tube.

Whenvever a question of application of doctrine of *res ipsa loquitur* arises defendants feel that a gross injustice is done to them. After all, this doctrine means nothing except the shifting of burden of proof. When the plaintiff initially proves that he was injured in an accident by an agency or instrumentality within the control of the defendant and without plaintiff's fault but he could not prove defendants negligence, then the defendant is required to disprove negligence. In the field of patient and doctor relationship, ordinary patient simply cannot comprehend the intricate techniques of a modern treatment. The modern hospital conducts a highly integrated system of activities with many persons contributing their efforts—the physicians, the anaesthetist, the doctor immediate in-charge, the nurses, the occassional advisor sometime employed by the hospital are some of many equipped with the modern techniques of treatment. In these circumstances it is too much to ask the plaintiff to establish a fact of malpractice. This rule of burden of proof of bygone days must not be dragged to this extent where a case of malpractice has been complained and the plaintiff has suffered damage.

Imposing a burden on the plaintiff to prove negligence and its failure is not a good reason for denying him all reasonable opportunity to recover for negligent harm. It is rather a good reason for re-examination of the statement of legal theories which supposedly compel such a shocking result.[25]

24. 1961, 188 Kan. 643.
25. Generally, the authorities have applied tbe doctrine of *res ipsa loqnitur* in malpractice cases under the following circumstances : (1) Failure to remove foreign object from the body of the patient : (2) Injuries to unaffected areas and organs during medical care, outside the field of operation or region of treatment; or (3) where, in the experience or knowledge of alaymen (or upon proof by medical testimony) there is an unusual injury to healthy or unaffected portions of patient's body, within the field of operation or region of treatment : 162 A. L. R. 1291.

IV. Consent

In a case of malpractice by a physician, consent given by the patient for the alleged operation or other treatment is usually set up as a defence by the defendant. In a particular case whether the patient gave his consent or not usually becomes a point seriously discussed in the courts. There may be cases where the patient is not able to give the consent either there is emergency and he is unconscious or because of his status as a minor, a married woman or a person of unsound mind who are not in a position to give consent. Every human being of adult age and sound mind has a right to determine what shall be done with his own body, and a surgeon who performs an operation without the patient's consent commits an assault, for which he is liable in damages. This is true, except in cases of emergency where the patient is unconscious and where emergency requires an operation before consent can be obtained.

Mohr v. *Villiams*[26] has long been regarded as the leading case on consent problem. Plainitiff, troubled with bad hearing, went to defendent, an ear specialist, and on his advise consented to an operation on her right ear. When she was under the anaesthetic the surgeon found a more serious condition of her left ear, and operated on that instead of the right one. It was held that the plaintiff had given no consent to an operation on the left ear. Moreover, there was no emergency sufficient to justify defendant in proceeding on the assumption that plaintiff's consent would be given if she were conscious. Further her family physician, who was present at the operation, was not authourised to give the consent for her.

However, the law does not insist that a surgeon shall perform every operation according to plans and specifications approved in advance by the patient, and carefully checked away in his office safe for court room purposes. A descretion has been given to the doctors, whether physicians or surgeons, to exercise their professional skill in the best interests of the patient. But this is generally limited to the cases in emergency when there is no time for these formalities of obtaining the consent of the patient—the predominant objective is to save his life. But when there is no emergency, the surgeon is not allowed to rely on the consequential consent.

This concept of consequential consent has been well illustrated in *Tabore* v. *Scobee*.[27] In this case the patient, a minor of twenty years of age, submitted to an operation for appendicitis to the defendant surgeon. During the operation the surgeon discovered that the patient's fallopian tubes were full of pus, swollen and scaled at both ends. Unable to obtain a consent of the patient to remove them because of her anaesthesia and

26. (1905) 95 Mim 261 N. W. 12.
27. (1952) 245 S. W. 2d 474 (Court of Appeals of Kentuky)

not obtaining the consent of her stepmother, who apparently was in the hospital at that time, the surgeon proceeded to remove the tubes on the theory that it would have had to come out within six months. He feared that fallopian tubes would break and cause peritonitis. From a medical stand point his decision was approved by the testimony of his professional colleagues who believed the patient could permanently sterile before the operation if the tubes were sealed at both the ends.

Faced with their removal without her consent and the destruction of any hope she might have of bearing children, the patient sued the surgeon for the unauthorised act. The court said that the evidence did not justfy the conclusion as a matter of law that there existed an emergency of such immediate urgency as to justify the removal of the tubes without the consent of the patient or her step-mother. The evidence indicated that removal of the tubes probably would be necessary soon and that their remaining in the body in swollen and infected condition was dangerous, but it did not establish that their removal was an emergency in the sense that death would likely ensure immediately if the tubes were not removed. Although delay in their removal might have proved harmful, even fatal, yet still there was time to give the patient the opportunity to give consent. Had she been operated upon originally for the removal of her fallopian tubes and the surgeon also removed appendix without her consent during the operation, the surgeon would not have been held liable because the consent to remove the appendix would be implied, on the ground that the appendix is generally considered by the medical scientists to be of no utility and potential danger.

In both the cases the court has gone to far regarding the consent of the patient. The ear ln the earlier case and the fallopian tubes in the latter one have been considered to be dangerous, even fatal, by the court itself but the defendants have been held liable for damages inspite of the fact that there was no malpractice in these cases. The patients have been benefited in the sense that their ailment, a dangerous, or even a fatal one, has been cured and the court has awarded damages on the whimsical ground of consent. After all, what a surgeon is required to do is to perform that operation according to the plan pre-arranged and nothing doing further. If this judicial approach is adhered to then the patient is going to suffer in the long run. The surgeons must be given some discretion in performing operation of other parts of the body for which there was no consent and good surgery demands that if the surgeon was not negligent in that operation he should not be held liable. In this connection the following observation seems to be more conducive :

"Where an internal operation is indicated, a surgeon may lawfully

perform, and it is his duty to perform, such operation as good surgery demands, even when it means an extension of the operation further than what was originally contemplated, and for so doing he is not to be held liable in damages for an unauthorised operation[28].

As regards minor patients the rule is that in case of an emergency a surgeon may operate on a child without waiting for authority from the parents or person standing in *loco parenti* where it appears impractible to secure it. In the absence of an emergency an operation performed on a child without the consent of the parents or person standing in *loco parenti* is a legal wrong[29]. Removal of an ovary and one fallopian tube during removal of appendix in a 10 year child was held to be without consent[30]. After discovering erroneous diagnosis a surgeon proceeded to remove cyst without advising patient of possible serious consequences, in such a case he was held liable[31]. Anaesthetist gave spinal injection against patient's wishes and was held liable[32]. During fistula operation surgeon removed mole from patients legs and was held liable because there was no consent[33].

Today when more recent and sophisticated method of treatment is applied it results in more intricate and far reaching consequences. This raises a question : is the physician or surgeon owe a duty to disclose each and every aspect of the probable dangers of the treatment and then obtain a consent and proceed with the treatment ? The question is answered in *Fiorentino* v. *Wenger*[34] where the court evolved a new concept of informed consent and observed :

"Dr. Wenger stands responsible for proven acts of malpractice on the record, but not because spinal-jack operation is *per se* an act of malpractice. The surgeon's responsibility stemmed from his failure to obtain an informed consent from the boy's parents, and perhaps for some of the incidents of the operation. The physician must place the welfare of his patient above all and this very fact places him in a position in which he sometimes must choose between two alternative courses of action. One is to explain to the patient every risk attendant upon any surgical

28. *Kennedy* v. *Parrot* (1956) 243 No. C. 355 (Supreme Court of North Carolina)
29. *Corpus Juris Secundum* : 70, Physician & surgeons, para 48 (2).
The Restatement of the Law of Torts, Sec. 54 requires consent in normal cases to be a must and Sec. 62 requires a consent as not necessary in cases of accidents and other emergencies.
30. *Suffer* v. *Biggs* 139, N. W. 2d 684 (Mich. 1966).
31. *Wall* v. *Brim* 145 F. 2d 492.
32. *Woodson* v. *Huey* 261 P. 2d 199.
33. *Lioyd* v. *Kull* 329 F. 2d. 168.
34. (1967) 19 N. Y, 2d. 407.

procedure or operation, no matter how remote it may be. This may well result in alarm in the patient who is already unduly apprehensive and who may as a result refuse to undertake surgery in which there is infact minimal risk Further, it may also result in actually increasing the risk by reason of the physiological results of the apprehension itself. The other is to recognise that each patient presents a separate problem, that the patient's mental and emotional condition is important and in certain cases may be critical, and that in discussing the element of risk a certain amount of discretion must be employed consistent with the full disclosure of facts necessary to an informed consent."

The question of consent under-goes a change in emergency as the name of emergency is itself sufficent to justify for extra-ordinary actions. Section 62 of the American Restatment of Law of Torts provides that consent in emergency is not a must. A surgeon operated a patient for hernia in right groin instead of left and anaesthetic created emergency, it was held that the surgeon was impliedly authorised to give consent for the patient.[35] Suppose a person authorised to give consent will not give it, can the court authorise treatment ? A father may not give consent for his son's operation, a husband or wife may not give consent for the treatment of the other spouse proposed by the doctor and court thinks it must for the survival of the patient. The court ordered the husband to give consent for blood transfusion to wife who refused to give consent.[36] A court order for medical treatment necessary to save a woman's life, over her objection, was upheld in *Application of President and Directors of Georgetown College.*[37] Because of eight day infant's blood had to be changed-parents objected on religious ground but the Court ordered the transfusion over these objections.[38] Twelve year old child with cleft palate and harelip, both father and child opposed surgery in favour of natural forces-Court ordered and the child submitted to surgery.[39] In these cases the concept of personal liberty is changed and the court has rightly acquired the power to decide the survival of the patient through medical help. Will the Indian courts pay heed to these changes where the life of a person depends upon the orthodox whim of a religious man ? The Indian conditions may not be suitable to these court actions. A Brahmin or a Rajput or any other high caste Hindu may furiously oppose the blood transfusion if he is not educated and knows

35. *Bennam* v. *Parsonnet* 56 A. L. R. 2d 695.
36. *Powell* v. *Columbta Medical Centre* 267 N. Y. S. 2d 450.
37. 1964, 331 F. 2d 1000; rehearing denied—331 F, 2d. 1010 and Certiorari denied—*Jones* v. *President and Directors of Georgetown Colleg* 377 U. S. 978.
38. *Wallace* v. *Labrenz*, 104, N. E. 2d 769 (1952).
39. In *re Seiferth*, 137 N. Y. S. 2d 35.

that the blood comes from a rikshaw puller or worst of all, from a lowest caste or non-Hindu. He may well challenge the court order that it inter-fears and affects his religious feelings. But if there is such an approach for the Court's order to authorise blood transfusion then the court should not hesitate to exercising its discretion because the medical science has proved that blood has nothing to do with the thinking process of an individual or its caste, creed or race.

Another p oblem of consent arises in the beauty operation. The modern medical science has been extended not only to cure the ailments but to add to the beauty of the human being. And how can the already beautiful specie of human being-the woman, escape the temptation of the modern medical science the beauty operation. This possibility of temptation increases where the individual concerned belonged to the cine world or the modelling business. Cosmetic surgery has taken such strides in the United States that all you have to do is to get a literal face lift or to specify which of the external appendages need to be preferred. A nose job done. Roman, Greek, tip tilted, Cliopatra, oriental-you name it, you get it. Cheecks bones to rise petal softness, cheeck-bones raised or lowered, ears converted into poetic shells concave chests and hips made to behave, hair up or down or artistically permed or tousled, eyebrows hyperbolised. Anything goes with the surgeon. Only one has to sell out a lifetime's savings if he decides for a beauty operation. Here are some illustrations :

Poor job of remodelling a designers body through cosmetic surgery-$ 115,000 damages awarded[40]. Twenty two surgical operations over a period of two years to reconstruct plaintiff's face, macabre and tragic resulted in $ 60,000 damages[41]. Operation to remove dark circles beneath eyes, unable to close eyelids-damages awarded $ 30,000[42]. Permanent wave given by student at beauty school, customers' head burned-$ 40,000 damages awarded[43]. A woman from a backwoods town called Poughkeepsise underwent an operation to tighten up her stomach and then found that the surgeon had put her naval some six centimetres off the centre. It was pushed back a year later by another surgeon. She had been awarded damages of $ 854,000 by the New York Court. The first surgeon had gone in appeal and the decision has not yet arrived[44].

In all these cases one can suggest that it is too harsh a rule to impose such a liability on the s urgeon even though the person concerned had given

40. *Gluckstein* v. *Lipsett.*, 209 P 2d 98 (Californian Appeal 1949)
41. *Denike* v. *Mowery*, 422 P 2d. 388 (Washington Appeals 1966).
42. *Walters* v. *Crites* 166 S. W. 2d. 496.
43. *Wall* v. *Gill* 14 A. L. R. 2d. 857.
44. *Times of India* Ltd.-11.5.1979 Editorial.

consent for such an operation. True, but the injured person did not give consent for the injury. His consent for the operation cannot be attributed to the consent for consequential injuries. And it must be considered that beauty operations are not within the reach of an ordinary man or woman they have to give handsome fee for the said operation. At this stage it may be pointed out that what will be the position if it happens in India specifically in connection with hospitals maintained by educational institutions or government hospitals where the consultation or operation is free. Can we exempt the hospitals from liability on the grounds that the hospital is a charitable or the patient gave the consent or the damages paid by the hospital will be paid out of public fund ? None of the considerations will be helpful. A person who presents himself before a hospital for treatment, the hospital by itself or through its staff, owes a duty to take as much care as a reasonable doctor or hospital would take and it makes no difference whether the hospital is a charitable or for profit[45]. As for the consent, a person who submits himself for cosmetic surgery in a hospital maintained by an educational institution or a government hospital is certainly not authorising the surgeon for disfigurement or other ill-consequences. It is the boon of modern technology in medical science that he wants to take an advantage of the advaces. And if he cannot afford to go to a private practitioner, it does not mean that he should be deprived of what he already had or to remain disfigured. If the surgeon or the hospital is not held liable, merely because it was a charitable hospital, it will not be a correct statement of law. As for the source of payment of compensation, it may be left to the capacity of the hospital concerned.

V. Attending the patient

Even if the diagnosis and the treatment provided were proper, the patient may at some critical time require the personal attendance of the doctor who may not be available either by deliberate voilition or he may not be informed by the other staff about the serious condition of the patient and consequently the patient may suffer seriously in developing side effects of the treatment. This usually happens in cases of surgical operations where the patient may develop any kind of side illness which may not be within the anticipation of a layman or the nursing staff. In this respect also law of negligence has taken cognisance of the problem and liability for negligence in attending the patient has been fixed by various judicial pronouncements.

In *Mundt* v. *Alta Bates Hospitals*,[46] injury resulted when fluid

45. See the observations of Lord Denning MR in *Cassidy* v. *Ministry of Health*, 1952, 1 All Or 1068.

46. 1968, 223 Cal. Appl. 2d. 413.

being infused into plaintiff's vein was permitted to infiltrate the surrounding tissue. In making the cut down to insert the needle into the vein wall was inadvertently punctured, but a medical decision, held to be justified under the circumstances, was made to continue the infiltration, since the fluid appeared to be going into the vein properly. Things went properly for the first twelve hours but thereafter complications began to surround and the doctor incharge did not visit the patient inspite of repeated calls from the nurses even after the plaintiff's leg was swollen twice the original size and ultimatly neorosis resulted. The court held that the doctor was negligent in failing either to order the intravenous infusion discontinued or to come to the hospital and see for himself the condition of the patient.

The above case was an illustration of the doctor's negligence but there may be situations where the entire staff may be negligent or the hospital's administration is not proper. *Valenti* v. *La Societe Francaise de Biene faisanee*,[47] provides an illustration of the above kind. After the deceased had been operated for hernia his condition was normal for eight days, but thereafter he developed a fever and chest pains; on the following days his fever continued to increase and felt chest soreness and inability to chew developed, and at this time, on request of the bed side nurse defendant's resident physician examined him and found him suffering from a tight feeling in his throat and reported to the supervisor of nurses. At about 12 noon it looked as if it might be a case of tetanous, a call was send to the attending physician. But the operating surgeons were not available and nothing was done until the patient's mother arrived at 7.00 P. M., when she demanded that a physician be called at once, but it was more than three hours before the night superviser prevailed upon a doctor. Tetanus was immediately diagnosed and treatment started, but meanwhile death resulted. The court said that in view of the evidence it was inescapable that defendant was negligent in failing to exercise ordinary care.

VI. Liability of the hospital for its own negligence

There may be a situation where a physician may not be employed by a hospital and due to his negligence an injury is done to the patient. That physician may be a consultant visting the hospital once or twice a week or the hospital may provide its facilities to a private practitioner (this is a common practice in U. S.) and while performing operation in the hospital the patient suffers injuries. In all these cases the hospital may always take the plea that it is not vicariously liable because the real wrongdoer was not its servant. Or there may be another interesting case. Just consider this problem : A doctor who was qualified

47. 1946, 76 Cal. App. 2d 1.

for a post of lecturer in a medical college, is appointed on a temporary basis for six months as a lecturer in the department of surgery. He performs a surgical operation on a patient on the last day of his term of employment. On the next day the patient develops serious conditions and the surgeon concerned does not turn up saying that he is no longer a college employee. Other doctors may not came because that patient was not under their charge and to avoid further complications they may not attend the patient. The senior doctor may not also be available and by the time an alternate arrangement is made the patient dies. Is there any liability on the surgeon who performed the operation ? Or is the institution which maintained the hospital liable vicariously for the negligence of the surgeon ? Or can there be any other liability apart from the above two ?

As for the personal liability of the surgeon concerned he can always say that he is not liable because there was no negligence on 'his part when he performed the operation. So far as the non-attendance of the patient is concerned he can say that it was the hospital who admitted the patient and he was deputed to provide treatment to the patient as a servant of the institution and not as a private practitioner. Since his duties were linked with the service in the institution and when his service ends his duty also ends. The institution could have made arrangement for attending patients after the expiry of his services.

On the same theory the institution which maintained the hospital may say that it is not vicariously liable because : firstly, when the act was done by the servant it was done carefully; and secondly, when alleged negligence was done by the surgeon in not attending the patient, he was no more a servant of the institution.

But the problem remains the same—the patient has died without his fault. Is not the hospital liable for its own negligence if not under vicarious liability theory ? There are some authorities in the English common law which suggest that the hospital authorities have a duty to provide proper treatment at all stages, a duty which they do not throw off by entrusting it to competent staff. If the obligation to treat a patient is undertaken by a corporation, or a body of trustees or governors, they cannot escape liability for its breach by saying that the obligation is assumed gratituously by a person, body or corporation which does not act for profit.[48] Lord Denning M. R. has observed in *Cassidy* v. *Ministry*

48. See the observations of Lord Greene Mr. R. in *Gold* v. *Essex County Council*, (1942) 2 K. B. 293 at p. 301. At p. 300, Lord Greene quotes the following observations of Kennedy L. J. in *Hillyer* v. *Governers of St. Bartholomews Hospital* (1909), 2 K. B. 820 at p. 829. According to him these observations

of Health:[49]

"In my opinion, authorities who run a hospital, be they local authorities, government boards, or any other corporation, are in law under the self same rule as the humblest doctor. Whenever they accept a patient for treatment, they must use reasonable care and skill to cure him of his ailment .... What possible difference in terms of law, I ask, can there be between hospital authorities who accept a patient for treatment and railway or shipping authorities who accept a passenger for carriage ? None whatever. Once they undertake the task, they come under a duty to use care in the doing of it, and that is so whether they do it, for reward or not."

The position in England at present is that a hospital is under a duty to provide the services of a specialist in treatment of an ailment of a patient accepted by the hospital.[50] The judicial extension of this duty is that this duty is not limited to the provisions of specialists but extends to the provision of treatment by those specialists.[51] And in 1968 it was held that a hospital authority which ran a casualty department had a duty to provide proper medical and nursing attention for those who presented themselves there, complaining of illness or injury.[52]

of Kennedy L. J. are the origin of the hospital authority for its negligence. Kennedy L. J. observed :

"In my view, the duty which the law implies in the relation of hospital authority to a patient and the corresponding liability are limited. The governers of a public hospital, by their admission of the patient to enjoy in the hospital the gratitutious benefit of its care, do, I think, undertake that the patient whilst there shall be treated only by experts, whether surgeons, physicians or nurses, of whose professional competcnce the governers have taken reasonable care to assure themselves, and further, that those experts shall have at their disposal for the care and treatment of the patient, fit and proper apparatus and appliances..... It may well be, and for my part I should, as at present advised, be prepared to hold, that the hospital authority is legally responsible to the patients for the due performance of their servants within the hospital of their purely ministerial or administrative duties, such as, for example, attendance of nurses in the wards, the summoning of the medical aid in cases of emergency, the supply of proper food, and the iike. The management of a hospital ought to make and does make its own regulations in respect of such matters of routine, and it is, in my judgment, legally responsible to the patients for their sufficiency, their propriety and observance of them by their servants.

49. 1951, 2 All E. R. 574 at p. 585.
50. See 3 (1) (c) of National Healths Act 1946.
51. *Razzel* v. *Snowball* 1954 1 W. L. R. 1382.
52. *Barnett* v. *Chelsea Kensington Hospital Management Committee*, 1968, 1 All E. R. 1068.

The law in United States has been developed to the extent that even if there is no master and servant relationship between the hospital and the doctor, the hospital may be held liable for negligence in administering the affairs of the hospital. In view of the U. S. Supreme Court decision in *Darling* v. *Charleston Memorial Hospital*[53] the hospital was liable for negligence on the theory of independent negligence in failing to review, supervise, or consult about the treatment given by the physician directly incharge, if the situation indicated that the hospital had the opportunity for such review but failed to exercise it, or that its servants (usually nurses or residents) were negligent in failing to call the attention of the proper hospital authorities to the impropriety or inadequacy of the treatment being given.

In the situation given earlier, the hospital authority must be held liable for its own negligence. This has been the trend of judicial decisions in England and U. S. There is no harm in accepting the law laid down in these countries. To hold otherwise would be to hold the hospital not liable in so many other cases like, supplying defective enquipment used in diagnosis, defective bed and other furnitures, defective prosthetic devices, other defective equipments used in treatment and a host of other paraphranelia used in the hospital in diagnosis, treatment or other purposes. And that will be an unfortunate situation.

In modern hospitals every method is employed for diagnosis—the blood, urine, stool, saliva and other tests, which the hospital do it by itself. The blood infusion, the blood is borrowed from the bank geneally maintained by the hospitals. There is every danger that the results of these tests may interchange, or the wrong blood may be infused, or the most dreaded danger—the change of patient's chart while going for operation. The result of these changes is self evidenced of carelessness on the part of some of the persons concerned with the hospital staff. Who is answerable for such type of carelessness ? A nice illustration is provided in ***Higgins*** v. *Graves*[54] a case of "operation confusion." Higgins had been a double victim of wrong surgery. He was 55 and had long suffered from hemorrhoids which he enventually agreed to have them removed. He was admitted on 3rd September, 1958. So was Bill Slater, scheduled to go under operation by Dr. Charlse Jackson Ray for correction of hernia and removal of a diseased left testicle. In morning each patient got preliminary anaesthesia, and were trundled off to the operation room. One room was reserved for Dr. Ray and one for Dr. Graves. But plaintiff Higgins

53. 1965, 14 A. L. R. 3d 860 : 383 U. S. 946.
54. 1964, 337 F. 2d 486.

was sent with patient Slater's chart to Dr. Grave's operating room, while Slator got Higgin's chart and went to Ray's room.

Both surgeons were a bit late to identify the draped figure on the operation table. What especially outraged Higgins was that although he insisted that he had no hernia. Still surgeon Graves cut his abdomen to correct one. Even though he had no testicular disease still his left testicle was removed. For the resultant pain and suffering plus lost wages the plaintiff was awarded a compensation of $ 100,000 against the surgeon and hospital.

The liability of the hospital may also arise if a patient contact another disease in the hospital. In every big hospital with a capacity of several hundred beds the sanitation problem is a big problem. The recent reports of bad sanitary managements in all the four big hospitals in Delhi, i. e., the All Indian Institute of Medical Sciences, the Hindu Rao Hospital, the Safdarjang Hospital and the J. P. Hospital, shows the seriousness of the problem in the big hospital[55]. The problem in this direction is that a patient, while undergoing the treatment, may contact another diseases by infection in the ward itself or through lack of sanitation facilities or through any other reason connected with the

55. See for example a series of reports in "SANMARG" 23.5.79 to 26.5.79 a Hindi daily published from Varanasi regarding bad sanitary arrangements in the hospitals maintained by Varanasi Municipal Corporation. The reports goes to say, amongst other things, that even pigs visit more-than once a day in these hospitals and there is none to check them. See also the survey of Delhi hospitals in *The Hindustan Times*, 10th May, 1979 :

"Through the broken dusty corridors of Safadarjung hospital, the orderly wheels the food trolley enroute to wards, a cow, strayed in from God knows where nuzzles at the huge canisters of food appreciatively and walks away."

"A streacher trolley used for carrying patients stands in a pantry off ward in Hindu Rao hospital, its paints peeling off and covered with hundrads of flies. A ward boy ccmes. dumps the "patilas" of vegitables and chapptis on the trollery and he is all set to dole out the days dinner Another few minutes and probably the same trolley would be brought back for transporting patients."

"At the prestigeous All India Institute of Medical Sciences, the kitchen is bigger and cleaner, but it is the same sight of barefooted men in their undergraments without anything to cover their heads kneading dough with hands which nobody can say they have washed or not."

"By the time I arrived at the J. P. hospital at 4 p. m., the dinner had been long readied and the kitchen cleaned up and closed for the day Like the other hospital kitchens, there is not adequate facility to clean the utensiles hygienically and the utensils need nickelplating. The P. A. C. (Parliamentary Affairs Committee), in its report, year 1974-75 also noted that staff working in the kitchen had not been medically examined for several years."

hospital staff, and thereby he suffers a new injury for which he had not been admitted.

In *Lindsey County Council* v. *Marshall*,[56] the hospital admitted the respondent as a patient to their maternity home for the purpose of her confinement, without informing her that there had been a recent case of puerperal fever in the home. While in the home she contacted puerperal fever and was for some time seriously ill. It was held that the hospital was liable.

Privy Council also accepts the liability of the hospital in cases where a patient contacts some contageous disease through infection or otherwise while in the hospital. In *Vancouver General Hospital* v. *Mc Danial*,[57] the appellants were a statutory corporation which administered a hospital for small pox and other infectious diseases. The respondent had been a paying patient in the hospital suffering from diphtheria, But about nine days after she had been cured and discharged, she developed smallpox. She alleged that she had contacted small pox owing to the negligence of the appellants. The negligence alleged was that while in the hospital she had been placed in a room on the same floor as patients suffering from small pox and had been attended by the same nurses who also attended small pox patients. The appellants denied negligence and pleaded that the technique adopted in the hospital for the prevention of infection was adopted under competent medical advice, and was in accordance with approved modern practice, though the appellants conceded that the respondent had contacted small pox by what was described as crossinfection while in the hospital The court conceded that though the hospital was generally liable in these circumstances, yet as the appellants had shown that they had acted in accordance with general approved practice, and accordingly were not negligent.

A hospital cannot rely on the decision of Privy Council in case where several surgical operation patients are kept in one ward and one of them develops infection in the wound. For sometime the surgeons could not find out the infection because of their carelessness and by the time it is known other patients contact it and they have to spend more time and money for the cure of their new ailment. In such a case the hospital is liable because the surgeon-incharge was negligent in not finding out the infection in time or in not removing the infected patient from the ward to some place of isolation.

Last but not the least, the hospital may be liable in case of wrongful admission or treatment. There may be cases when a patient who is

56. 1937 A. C. 97 : (1936) of All E. R. 1076 (H. L.).
57. 1934 W. N. 171 (P. C.).

badly injured in a road accident and when his status or identity is not known and he is brought to a private practitioner who refuses to admit him or refuses to administer treatment and as a result the patient dies or his injuries are aggravated. Cases in India are not infrequent when an accident takes place in front of a private nursing home and the doctor incharge or other staff of that home do not take any cognisance of the accident whereby the person so injured required immediate attention of a physician. Cases have been brought to the notice of the public when a doctor refuses to administer treatment to a poor person who, in the opinion of the doctor may not be able to pay as much fee as demanded by the doctor. Is it not a case of malpractice ? Unfortunately, the patients do not generally resort to judicial remedies in these circumstances in India. Can they succeed if a suit is filed ? There is no direct law on the point governing the matter. However, there has been a change in the judicial attitude towards this branch of law in other countries. The main hurdle in this regard is that the doctor does not owe any legal duty in these circumstances but it is a moral duty only. However, in recent time this distinction is losing ground and new rules are being laid down by the courts.

The liability of the physician or the hospital in the above cases depends upon the question whether there was any duty upon them to take care. If no duty is established an action in negligence must fail.[58] In the particular circumstances it must be proved that the defendant owed a duty at least to somebody to act or refrain from acting or there must be one of those general situations which the law recognises as being capable of giving rise to duty.[59]

At present, it has been held in *Barnett* v. *Chelsea Kensington Hospital Management Committee*,[60] that a hospital is under a duty to pro-

58. *Heaven* v. *Pender* (1883) 11 O. B. D. 503 at p. 507 (per Brett, M. R.) (C. A.) *Thomas* v. *Quartermane* (1887), 18 Q. B. D. 685, at p. 694 (per Bowen L. J) (C. A.); *De Lievre* v. *Gould* (1893) 1 Q. B. 491, at p, 497 (per Lord Easher M. B.) (C. A.); *Grati* v. *Australian Kitiing Mills, Ltd.*, (1936) A. C. 85 (P. C.) at p. 101; *Hay* (or *Bourhill*) v. *Young* (1943) A. C. 92 (H. L.). See Street : *Law of Torts* 5th E. p. 102 F. N. 5.
59. Street : *Law of Torts* 5th Ed. p. 102.
60. (1968) 1 All. E. R. 1068. The history of the evolution of duty situation goes back to 1883 when in *Heaven* v. *Pender* (1883) 11, Q. B. D. 503, Brett, M. R., tried to provide a workable solution at p. 508 :

> ".....whenever one person is by circumstances placed in such a position with regard to another that everyone of ordinary sense who did think would at once recognise that if he did not use ordinary care and skill in his own conduct with regard to those circumstances he would cause danger or injury to the person or property of the other, a duty arises to use ordinary care and skill to avoid such danger."

vide treatment to any one who presents himself complaining ailment to the casualty ward maintained by the hospital. If the hospital does not admit him or administer treatment, it is a breach of duty and the hospital is liable for negligence. The concept of implied duty was also developed in *Gaylord Container Corporation* v. *Miley*[61], where the court observed "a person in no way responsible for the previous situation of another is generally under no duty to rescue such person, but, where a person is placed in such a position with respect to an ill, infirm, or otherwise helpless person that it is obvious that, if he does not use due care in his own conduct, he will cause injury to that person, the duty at once arises to exercise care to avoid such danger." Thus it is an actionable negligence where a person, who was so seriously ill as to be unable to care for himself, is turned down out into cold and inclement weather as a result of which he suffers injuries;[62] to allow the Negro patient brought into hospital to bleed to death for lack of attention;[63] to delay treatment because seriously injured boy was considered drunk;[64] to leave child unattended while he vomitted;[65] to refuse treatment to the diseased who walked to the hospital while ill and collapsed on his return home[66] and to send back home two year old child who died the other day.[67]

Turning now to the Indian situation, it may be said that neglect of patients is a common thing in the government hospitals and hospitals

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In *Le Lievre* v. *Gould* 1893, 1 Q. B. 491 at 504 A. L. Smith L. J, observed :

"The decision in *Heaven* v. *Pender* was founded upon the principle that a duty to take care did arise when the person or property of one was in such proximity to the person or property of another that, if due care was not taken, damage might be done by one to the other. I think that this sufficiently states the truth of proximity be uot confined to mere physical proximity, but be used, as I think it was intended, to extend to much close and direct relationship that the act complained of directly affects a person whom the person alleged to be bound to take care would be directly affected by this careless act."

The above observation was cited by Lord Atkin when he propounded his famous theory of duty situation in *Donohgue* v. *Stevension* 1932 A. C. 562 (H. L.)

61. 230 F. 2d 177 at 181.
62. *Depue* v. *Flatan* 111 N. Y. 1.
63. *New Billoxi Hospital* v. *Frazier* 146. 50 2d 288 (Miss. 1962)
64. *Methodist Hospital* v. *Ball* 362 S. W. 2d 475 (Tenn Appeal 1961)
65. *Crowe* v. *Provost* 374 S. W. 2d 645 (Tenn Appeal 1963)
66. *ONeill* v. *Montefiore Hospital* 202, N. Y. S. 2d 436. (1960).
67. *Barcia* v. *The society of the N. Y. Hospital* 241 N. Y. S. 2d 373. See also for further cases and materials : *Corpus Juris Seeundum*, vol. 65 Note 63 (106) p. 857.

maintained by educational institutions. The recent rules in the All India Institute of Medical Sciences (AIIMS), Delhi, the largest and best equipped hospital in the country, provides that a patient can only be admitted to the hospital on the consultation of a consultant and depositing at least Rs. 50/- for ten days @ Rs. 5/- per day. The further requirement is that the patient must be examined by the consultant within two hours of his arrival at the institute. In such a big institute quick means of communication are not easily available. The consultant may not be available within the time limit specified and the patient may not be admitted and consequently he may suffer serious injury which may prove in some case a fatal one. Is the AIIMS liable for the injury or the death ? In other words, is there any duty on the institute to bring the consultant immediately on the spot so that the patient may properly be attended ? So for as not attending the patient or refusing to administer treatment is concerned, the judicial opinion in U. S. and England is that the hospital is liable for negligence. But this rule in the AIIMS is a noval situation where the admission is conditioned and the institute may argue that the patient did not comply with the rules. But who is at fault ? How can a patient locate a particular physician in such a huge complex ? And how can the institute admit the patient without a certificate of the consultant ? Common sense demands that one must not be allowed to sit on the rules and let the patient suffer and in some cases suffer death. It must be held to be the duty of the institute to see that the consultant is available all the time at the specified place so that a patient who does not know the intricacies of such a huge complex may not suffer for the non availability of a consultant. The rule of law stems from the rule of life and it also demands an imposition of duty on the institute in these circumstances. The Indian condition will bc more favourable to the patients due to the welfare state concept. The government maintains hospitals to provide free treatment to sufferers and if the hospital provides a rule and does not see whether facilities exists or not to comply with the rule, it will be a violation of the people's mandate and frustrate the very purpose for which the hospital is established.

Conclusion

The question as to what is the nature and scope of the liability of a physician or the hospital for care and treatment of patients has received negligible attention of the legislators and the courts in India. Only two cases, one by the Supreme Court in 1969 and the other by the Bombay High Court in 1975 have laid down some principles with respect to the doctor and patient relationship. In spite of the fact that millions of patient are admitted per year in the hospitals and more than that are

treated by private practitioners no suit is filed in courts for damages. The statistics in this regard is not available and the government hospitals refuse point blank to provide any information regarding treatment or the number of deaths and cures per year or for any number of time. However, the following data provides some information.

The data available in the S. S. Hospital, B. H. U. in Appendix show that there were 16062 deaths between the period 1963 to 1978 including 1434 and 1533 deaths in 1977 and 1978 respectively. Can any reasonable man accede to the suggestion that the physician or the hospital was not negligent in any of these cases ? Out of these, half the deaths were within 48 hours of the admission of the patient and the other were after 48 hours. The hospital's liability stands for the deaths occurring after 48 hours because treatment had started and the patient died either because of some carelessness in treatment or because he was doomed to death.

The ignorance of law on the point, financial difficulties, the rigourous procedure in the courts, duty consciousness of the Indian people and forget and live principle are some of the reasons that have brought minimal cases in the courts in law of torts. Therefore, it is not strange that thousands of persons die while going under treatment and hardly a single case is filed. Is it that the physicians have not been negligent ? If it is so, then salute to the Indian medical community. But it just can't be true specifically in the hospitals maintained by the educational institution and the government hospitals. It is not that the law on this area is lagging behind these scientific and technological developments but unless a care is brought before the court it cannot lay down any rule governing the subject. At present the law of negligence is much developed and is capable of governing the problem which arise in doctor-patient relationship.

However, there, are still a few suggestions that require adaptation whenever a case is brought before the court for alleged malpractice on the part of a medical practioner. A duty has been imposed by the courts on the doctor to take care at the time when he decides to admit a patient for treatment but have left untouched the issue as to what will be the position when the doctor decides not to take under treatment and the patient suffers more injury. The American experience on the topic may serve good purpose in this regard.

The burden of proof places a heavy burden upon the patient to prove negligence and it is most likely, as it happened in the Bombay case, that in good many cases the plaintiff looses because he is unable to prove negligence on the part of the doctor, remembering the fact that

most of the sufferers are from village where they cannot afford to engage good lawyers. And therefore, the doctrine of *res ipsa loquitur* may be helpful in this area.

Much judicial emphasis is given on the consent of the patient and in good many cases the physicians have been held liable even if they were not negligent. The American courts have decided the cases on the basis of one's absolute right to safety of the body. In the majority of cases there is an implied consent to do what the surgeon, considers necessary or desirable. This consent would be negatived by express instruction not to do certain things, but, if a surgeon found that it was necessary to do those things and did them against insrtuctions, it is difficult to see, what damage the patient would have suffered[68]. No actual damage was suffered by the patients in *Tabore* v. *Scobee* or in *Mohr* v. *Williams* because their ailment was removed but since that was done without the concent the surgeon was held liable. The courts, in their zeal to protect individuals' body, have inadvertenly taken out the discretion of the physician and have done harm to the patient. We suggest that the concept of consent should not be dragged too far if the doctor is not negligent in providing treatment or while performing the operation.

The hospital authorities must provide proper facilities for attending the patient. And if the patient dies because no medical attention was given the hospital authorities must be held liable. But in this regard one must not forget the ratio of the doctors and patients especially in the developing or under-developed countries, However, inefficient hospital administration causing grave injury to the patient, spread of infactious disease to other patient, wrongful refusal of admission to the hospital are some of the points where a rigid control through legislative and judicial hands is the need of the day. Unless the above objectives are achieved, the concept of welfare state will have no meaning from the point of public health.

68. The position is unchanged even after the case of *Chelsea Kensignton* care, Because in that case the hospital maintained a casualty ward and on refusal to admit a liability was imposed on the hospital. This case is not the authority for the situation where an accident patient is brought to the doctor and he refuses to admit or to provide elementary medical aid.

Appendix

HOSPITAL STATISTICS 1963-1978

	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
1. Bed Complement	300	332	550	556	600	625	644	650	660	660	660	660	692	702	702	
2. Total Admission	6010	6895	9736	10383	11725	12999	13316	14143	14514	15146	15280	13910	16405	19808	20145	19199
3. Total out door patient	170989	208752	249274	215669	221432	246600	276335	252371	312056	350145	361133	357391	429330	394128	435366	476018
4. Total operations	9366	9643	10424	12148	16143	21087	29909	31658	35919	36041	36558	36880	37179	37502	42602	39200
5. Daily average operation	26	26.4	28.5	33.2	44.2	57.7	82	86.7	93.4	101.1	101.00	102.6	102.6	116.7	85	
6. Daily average outdoor patients	546	666	796	689	707	788	882	808	996	1118	1153	1142	1371	1259	1390	1408
7. Total deaths	214	352	521	616	758	831	858	975	1013	1155	1114	1018	1319	1257	1434	1533
8. Death rate	3.5%	5.1%	5.3%	5.9%	6.5%	6.3%	6.4%	6.8%	6.9%	7.6%	7.2%	7.3%	8%	6.3%	7.1%	8.01%

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INTERACTION OF SCIENCE, TECHNOLOGY AND SHIPPING LAW : (SAFETY OF LIFE AT SEA)

DR. (MRS.) NARMADA KHODIE

Safety of sea comes from a series of interlocking systems and various disciplines of science, technology and law. Safety can best be achieved by combination of all. In shipping the impact of advanced science and technology is the most incisive of the decisive forces which are reshaping the contemporary shipping affairs on a scale and at a rate unprecedented in human experience. Shipping law seeks to maximise the contributions of scientific and technological researches and inventions for the welfare of human society. A most important feature of the present era has been the growth of international co-operation in various fields as seen through the workings of UNO and its various agencies like IMCO, UNCTAD, UNCITRAL and ILO. IMCO i. e. Inter-Governmental Maritime Consultative Organisation was created in 1948 specially for purposes of preparing international legislation in those areas of shipping which require interaction of technology, science and law. It has a special responsibility for the safety of life at sea.

Since the establishment of IMCO, various shipping Conventions, Codes, Agreements and Recommendations have emerged affecting ships in international trade. Some of the important conventions have come into force as the requisite number of members owning specified amount of tonnage have ratified safety conventions by enacting legislation. Even in respect of those IMCO conventions which have not been ratified so far but it cannot be said that efforts have been wasted. They serve as the basis for further consultation and negotiations among member States.

Following are some of the contours of shipping legislation motivated by the strides in technology affecting manifold aspects of shipping contributing in the end towards safety of life at sea.

1. Safety Legislation

Safety of ships, cargoes, passengers and crew is obviously a matter of vital concern to all of us. The statistics of maritime losses reported in Lloyds Register of Shipping create a constant awareness for finding out new measures for accident prevention. The main causes of shipwrecks are

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foundering, fire, collision, stranding, striking rocks, sinking, scuttling and shipbreaking.

The domestic law on safety has moved along the lines prescribed by series of International Conventions on Safety of Life at Sea of 1929, 1948, 1960 and the latest of 1974. Each time some new filip to safety was added by replacing the existing convention by its improved version. These conventions are replete with technical details relating to Surveys, Casualties, Construction-sub-division and stability, Machinery and electrical installations, Fire protection, detection and extinction, Life-saving Appliances, Radio-telegraphy and Radio-telephony, Safety of Navigation, Carriage of Grain, Carriage of Dangerous goods and Nuclear Ships. These details are worked out in consequence upon constant research into the behaviour of sea and sea load. The complex inter-relationship between wave motion, Sea loads and dynamic structural behaviour of ships and marine structures is studied in the model test tank by Naval Architects with the help of Advanced computer technique. The introduction of automation, sophistication, higher power ratios, speed regulation of temperatures, installation of radar, echosounding device, gyrocampus and radio equipment, effective fire fighting equipments are some of the milestones of technological progress enforced through international legislation. The target date for the coming into force of the 1974 Convention is June 1979 when it will replace the 1960 Convention on Safety of Life at Sea which is in force today.

Tanker Safety :

A Protocol to the 1978 Safety Convention deals with tanker safety. It is intended that new and existing tankers will be variously required to use either Clean Ballast Tank (CBT), protectively Segregated Ballast Tanks (SBT) and Inert Gas Systems (IGS) for which international standards are planned. These developments give us an idea as to what is possible technologically for improving upon the efficiency of shipping operations. However, legislation does not follow immediately as legislators are alive to the difficulties in the financial feasibility of introducing new technology. There are demands of a formidable triangular fence viz., of technology, consumer and the supplier. Capt. Naphade, a noted marine technologist, says that it becomes difficult to draw the line between the desirability of "Degree of Safety" and the very viability of the project in financial terms. But every new step in safety technology holds out the hope of increasing the degree of safety although machinery of law takes its own time.

2. Containerisation

Containerisation of shipping transportation is the most impressive gift of technological developments. The Indian ports are today being

geared-up to handle containerised traffic. Until the advent of the cargo container, the movement of ship determined the packing, routing, handling and storage of cargo. But in modern times, containerisation influences packaging etc. of cargo, and not the ship.

It has been now increasingly felt that there is no option for general cargo liners dealing with developed countries' trades but to go in for containerisation. However, containerisation represents a complete new system, It entails introduction of new technique not only of cargo handling but of entire infrastructure in transportation. Container transport demands considerable investment, even for participation on a limited scale. The container is designed equally for sea, road and rail transport and can therefore, be sent from port or factory in one country to warehouse in another. This has given boost to intra-modal transport.

The demand for containers is coming from Indian exporters who increasingly find their foreign customers asking for containerisation. In view of this the Shipping and Transport Ministry has decided to give added emphasis towards the setting up of container facilities at Bombay, Cochin and Madras. A full fledged container terminal is almost ready at Haldia docks.

The degree of mechanization involved in containerisation is very expensive. India has plenty of cheap labour engaged in handling all types of cargo in break bulk form. The technology and trained personnel in an efficient container service is completely out of step with the technology and personnel available in most developing countries.

While the economic feasibilities of large scale container orientation transportation are being worked out as far as developing countries are concerned, it must be noted that in the western countries it has already replaced the conventional cargo system. Meanwhile cases regarding the liability of shipowner for the loss of container or its contents have arisen and the existing law has proved to be inadequate. The thorny problem is whether the container or each package within the container constitutes a package or customary freight unit for purposes of determining the liability unit of the carrier.

The introduction of intra-modal transport system gives rise to several legal problems concerning documentation, customs and insurance. Thus containerisation has stimulated and necessitated amendment of the long time tested laws relating to Carriage of Goods by Sea.

The first fully containerised shipping service to Australia from Bombay and Cochin to be operated by the Shipping Corporation of India was inaugurated on 12th September 1978. This monthly express service

would complete a round voyage in 70 days as against 140 days at present and call at ports like Cochin, Colombo, Singapore and Australian ports of Fermantle, Adelaide, Melbourne and Sydney. It is to be seen how long the gap between law and technology is to be tolerated. The technology of containerisation has already made inroads into sea transportation but the necessary legislation is yet to emerge.

3. Load Line Conventions

The 1930 Convention on Load Lines was replaced by the 1966 Convention. The latter Convention takes note of major changes in the design and technique of ship construction and latest meteorological data and modifies the criterion formulae which determine the loading capacity of a ship. The 1966 Convention permits deeper loading of ships durings the major part of the year especially of large tankers, carriers, and bulk carriers of 100 meters or more in length. The Convention came into force on 21st July 1968. By the Merchant Shipping Act 1958, the master or the owner are liable to a fine which may extend to ten thousand rupees and to such additional fine not exceeding one thousand rupees for every inch or fraction of an inch by which appropriate load line is fixed by new technology as held out under the 1968 Convention and its sanctity is maintained by punitive legal provisions. The legal regulations for fixing the load lines have kept pace with the latest developments. It has been reported that some new technological measures are in the offing which will soon replace the position established by the 1968 Convention.

4. Marine Scientific Research

Until about twenty years ago, almost all hydrographers considered hydrography and oceanography to be basically separate activities the former was to supply mariners with the documents and information necessary to enable them to navigate in safety; the aims of oceanography were many-some of a practical nature (exploitation of the resources of the Sea). Oceanographers want to know more about the drift of continents, under water storms and currents, and other hidden processes at work on the abyssal plains. Now the trend is to work jointly and hence we have hydro-oceanography.

The issue of marine scientific research has provoked a fair amount of controversy at the Law of the Sea Conference. Many coastal States, primarily those in the Third World, charge that data collected by foreign scientists off their shores could be used against them either militarily or commercially. It has been contended that "freedom of scientific research" is merely a self-serving slogan that primarily benefits the technologically and scientifically advanced countries. Hence they propose that all scientific

research in jurisdictional area be conducted only with proper consent of the coastal state.

Over the past 30 years, as the rate of technological advance has accelerated, there has been a steady trend toward much more extensive seaward claims by coastal nations. Attempts to lay down ground rules for the exploitation of seabed resources have come up against a wall of resistance from the developed nations because they clearly donot want to share with others the ocean's colossal wealth-conservatively estimated at Rs. 2, 700 crores. Modern technology has given man the keys to this storehouse of treasures in the ocean. Some 20 per cent of the worlds oil and natural gas now comes from underwater wells on the continental shelves. Mining companies are developing techniques to scoop valuable minerals off the cold abyssal plains two to three miles down.

National claims to offshore waters and resources continue to increase in variety and breadth, creating a potential jumble of jurisdictions that not only holds the seeds of conflict but makes rational development of ocean resources difficult if not impossible. "There are no easy answers" says Kay Chernush "for like the waves on the shore every issue overlaps every other issue".

It is being considered that special laws be laid down and tribunals be established to resolve disputes concerning fisheries, pollution and scientific research because these issues are of highly technical nature. It is expected that an international convention on this subject will be signed in not too distant future.

5. Nuclear Ships

The crises arising out of the new dangers posed by the introduction of nuclear ships, in a bid to provide alternative fuel to oil, is shaking the very foundations of our civilized living. Nuclear ship is a mobile nuclear plant and has to cope with the traditional maritime hazards of collision and grounding. Radiation pollution from nuclear ships may not be noticed immediately. Some pollutants stay on in the bioshere for millions of years and cause damage to both people and property.

Japan's first and only nuclear powered ship '*Muttsu*' emitted radiation near the shores of Japan. Japanese fishermen rebelled against the very existence of that ship anywhere near the fishing waters. For nearly six and a half weeks she was under repairs by engineers who assured that there would not be any recurrence of nuclear radiation but nobody was prepared to believe them. The government of Japan ordered her to be put out of service and kept far away from Japan in the North-Pacific Ocean. The Japanese fishermen were given £ 1.7 million by way of

compensation and one sport stadium to be constructed at a cost of £1,45,000.

Nuclear ships are not given entry into the world's major commercial ports for fear that if any accident takes place, the damage caused by radiation will be catastrophic. Americans were the first to own The *Savanah*, a nuclear propelled ship. In 1964 when she was bound for Southhampton with full load, the British authorities did not allow her to enter the port until a guarantee for full compensation was given by the American owners. Again in 1971 the British authorities banned the entry of a West German nuclear vessel *Autohan*.

Even the dock workers refuse to unload cargo from a nuclear ship since they are afraid that during transit the goods might have been contaminated with nuclear emission. It is now well known that nuclear radiation causes cancer and affect healthy growth of future generation. In the circumstances it is not surprising that hardly three or four nuclear merchant vessels have been constructed in the last three decades. Even these ships are not in use and are mostly meant only to enhance the prestige of the country concerned. Meanwhile the Convention on the Liability of Operators of Nuclear Ships concluded in 1962 under the auspices of the Comite Maritime International continues to have little legal control in this field. However, the crises arising out of the new dangers entailing the use of nuclear ships is so deep that legal mechanism is inadequate to control and regulate it.

6. Liability for Damage by Oil Pollution of Sea

Oil is discharged into the sea from tankers and ships either when there is a shipping accident like grounding, collision or explosion or when oil bilges from the ships tanks are pumped out in routine cleaning and washing operations. Oil on the surface of the sea is extremely harmful to sea birds, especially the diving species. On account of pollution of beaches swimming becomes a risky venture. Tourists would not like to take a tour round the beaches with tarry substances, waxy lumps and thick layers of black oil. A study conducted by the Director of the Contral Institute of Fisheries Education, Bombay and National Institute of Oceanography, Bombay Centre, a downward trend in fish production has been observed from inshore areas owing to pollution. A major oil spillage accident like that of *Torrey Canyon* off Scilly Isles in England in 1967 can cause tragic environmental damage. The spillage from the *Torrey Canyon* caused death of thousands of birds and did untold damage to fish stocks in the areas affected. The port authorities were not sufficiently equipped to carry out the cleaning operations for saving marine life and the coast line from being polluted. The *Torrey Canyon* was

bombed in a bid to end the source of oil spillage. The final insurance settlement about $ 8.4 million was less than the estimate expense of the attempted clean-up.

This incident of 1967 motivated IMCO to strengthen the law relating to oil pollution. IMCO worked out in 1969 an International Convention on Civil Liability for Oil Pollution Damage and other Conventions which define the liabilities of shipowners and attempt for the first time to provide adequate compensation for the damage caused by sea pollution. The shipowner's liability is subject to a legal maximum of 2000 gold francs (roughly $ 160 million) for each ton of the ship's tonnage or 210 million goldfrancs (roughly $ 16.8 million) whichever is less. Insurance to the extent of the above limits of liability is compulsory for each shipowner carrying more than 2,000 tons of oil in bulk as cargo. In case the total damage suffered by victims of oil pollution exceeds the limits of liability, the victims are likely to be deprived of full compensation. It was for this reason that the International Compensation Fund for Oil Pollution Damage was devised in 1971.

While the legal battle against oil pollution is concerned with providing compensation to victims of oil pollution, technological developments aim at preventing oil pollution accidents and eliminating or mitigating oil pollution arising from an accident.

In an attempt to seek legal enforcement of such technological developments, IMCO adopted the International Convention for Prevention of Pollution from ships in 1973. This Convention has been acclaimed as a break-through as it aims at complete elimination of pollution of the seas by oil and noxious substances other than oil and the minimisation of accidental oil spillages. It deals with various aspects of tanker building, limitation of tank size, subdivision and stability to tankers etc., with a view to minimising the risk of tanker casualties. To discourage violations of any of its provisions, it is stated that the Convention country should provide for adequate and severe penalties.

Wide acceptance of the 1973 Convention has been delayed by certain technical problems related to Annex II, notably the treatment and disposal of chemical tank washings. In view of this, IMCO adopted a Protocol to the 1973 Convention in February 1978. This Protocol will enable the implementation of technical provisions contained in Annex I while deferring acceptance of Annex II for a period of three years within which the technical problems are likely to have been overcome. The target date for entry into force of the 1973 Convention as modified by its Protocol of 1978, is June 1981.

Thus enforcement of safety and anti-pollution measures having purely technological bearings on the one hand, and providing compensation to victims of oil pollution damage on the other hand, is being achieved. Meanwhile the United States has built huge oil recovery vessels called skimmers. The biggest, most efficient of its kind yet launched, is the *Bay Skimmer*. The massive 100 ton, 20 meter *Bay Skimmer*, also called *5001*, can handle any major oil spill, and can operate in two-meter waves. The vessel opens big double doors at the front of its hull and moves through an oil spill, literally drinking the oil as it goes. Long clawlike booms on each side contain the spill and guide the oil into the opening. There a conveyor belt takes the oil and water down into the hold of the ship below the water line. Once in the tank, the oil rises to the top, and the water sinks and is expelled, leaving the virtually pure oil to be pumped out to nearby barges for use.

The presence of oil havesters and oil guzzling can keep the harbours and oceans clean, although the cost is high. A *Bay Skimmer* costs $ 1,000,000. The technology is at your service but you have to pay the price. This is one field where law cannot keep pace with the radius of ambitious technology entailing economic problems.

General Remarks

The interaction of science, technology and law is incomplete in the field of shipping law although it is widely felt that sooner it is done better it would be for inereasing the degree of safety and efficiency on board ships. The main constraint is obviously finances. The Legislature is aware of the futility of law commanding use of expensive technical measures.

As recent as last October, 1978 pilots of Bombay Port were agitating for being provided with better communication systems like walkie-talkie sets replacing outdated pocket whistles and megaphones. The pilots said that it was not safe to give signals to tugs particularly at night time without electronic aids. They had also demanded the replacement of rowing boats, used as mooring boats, by motor boats because Bombay harbour is open to Sea. Supply of inflatable life jackets for pilots though a necessary equipment is not so far made on account of economic reasons.

Similarly in the sphere of containerisation of shipping transport we are lagging behind mainly because of financial constraints. To begin with, we required container vessels or at least container oriented vessels. Our docks should be provided with container berths having requisite mobile equipment for handling empty and loaded containers. Further; to facilitate container traffic, it is necessary to plan adequate roadways and infrastructure in and around docks system and up to the factories which manufac-

ture export cargo. As far as Western Countries are concerned containerisation has become the accepted mode of shipment to the extent of 90% of cargo movement. U. K., Europe, U. S. A., Soviet Union, Australia and Japan have gone well ahead in containerisation, so much so that many ports in these countries now refuse to handle break-bulk cargo. Under the circumstances, our exporters, have no choice but to containerise the export cargo. Hence we have made some beginnings towards containerisation. Thus the role of law in making the technology a reality is inevitably limited by many factors. The need of the hour is not to cut the spreading wings of useful constructive technological measures but to gradually prepare the society and the nation for its acceptance. Since technology accelerates the pace of social change, we will have to bring about changes in the existing set up.

The training programme of seamen need to be reorganised. New design and construction of ships having bearing on safety of ships and life aboard much form a part of their curriculum. The society must be prepared for the rate, process and direction of scientific and technological change.

It has been reported that there are examples of vessels steaming through heavy traffic areas of the English Channel and Mallacca Straits with lakhs of rupees worth of electronic equipment not switched on. This reveals that we have put the cart before the horse. So constant training of officers, and engineers in order to understand usefulness, to be able to operate and to appreciate automation and sophistication of modern ships has to progress in step with the advances in technology itself.

To help in overcoming these problems, the IMCO Conference in February, 1978 adopted a Resolution calling upon IMCO to establish a Marine Safety Corps of experts who would be made available by their governments to countries requesting their services. In June 1979 a Conference is slated on "Training and Certification" of Seafarers. It is expected that the introduction of new requirements for ship's crews will make an important contribution to alleviating this problem. In U. K., draft regulations have already been attempted to restructure and re-define the certificate structure. These are healthy trends when the infrastructure is geared-up to participate effectively in the dynamic technological law development and the must not remain behind to keep pace with it.

ISN'T LAW RISING FROM DOGMATIC SLUMBER, (IN CONSEQUENCE OF THE INTERACTION OF SCIENCE, TECHNOLOGY AND LAW IN INDIA).

Dr. VIRENDRA KUMAR*

I. Problem Articulated

Scientific and technological developments, have a contributory influence on the dissolution of a juristic order and that they are posing a major threat to the human society and very essence of man. Should it mean that scientific knowledge is in itself an evil ? Or, could we say as a corollary therefrom that ignorance is ever to be preferred ? The fact of the matter is that all knowledge helps us in procreating power—a power that could be designed for good as well as for evil. But the power of all kind, must be jealously guarded and controlled. Once Socrates turned against the brilliant scientists of his day and said that their progress in knowing more and more about the physical universe would do men no good unless men also learned to understand their own souls and found out what it meant to lead a good life. But goodness would have to be based, he stressed, on knowledge and on reason.

II. Law within the Ambit of Science

The most important influence of science—if one were to name only one—is that the scientific way of thinking has become characteristic of the modern world. Its pervasive ambience now covers the study of man and his dogmatic institutions, and not merely the study of his natural world. This dominant scientific attitude, devoted singularly to verifiable truths, is responsible for rationalising very many concepts hitherto based on dogmas to the extent making them functional.

To exemplify the dominance of scientific attitude in the realm of family law we may illustrate as to how the traditional concept of sacramental marriage has been rationlised through divorce conception so as to make it functional.

According to the Hindu Scriptures, marriage is essentially a *sanskara*, a sacrament, a religious rather than a secular institution. It is a spiritual union—a holy bond of unity—which arises the moment the necessary cermonies are completed.[1] The essential corollary of the sacramental

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1. This term in its proper perspective signifies "a purificatory ceremony prescribed by the religion." Marriage is one of the ten *Snaskaras* necessary for men of

marriage is its "indissolubility". Adopting these precepts as the basis of the secular family law, our courts held that the marriage of a Hindu could not be dissolved by a divorce decree on any ground[2] (excepting where it was permitted under a valid custom).[3] A similar position is reflected under the traditional English law. According to the doctrine of the Roman Catholic Church, whenever the marriage contract is duly made, a "sacrament" is effeeted.[4] The marriage contract and the sacrament are inseparable and indivisible.[5] Thus it was the moral and religious principles, the basis fo secular family law led to the establishment of the doctrine that if marriage is subject to the Divine law, it could not be rescinded by human law.[6] This resulted in nullifying "the humanistic idea of marriage as being a free and freely dissoluble union of two equal partners for life", leading to the development of "anti-humanistic law of divorce."[7] And thus there

the twice born classes and the only one for women : Manu, II, 67-68. See also F. Max Muller, *Sacred Books of the East*, vol. 25. See also Gooroodas Banerjee, *Law of Marriage and Stridhana*, 4th ed., at 29; Radhabinod Pal, *History of Hindu Law*, (1958) at 372; J. D. Mayne, *Hindu Law and Usage*, 11th ed., at 101; G. C. S. Sastri, *Hindu Law*, 6th ed., at 116; Manu, XI. 45.

2. Govt. of Bombay v. Ganga. (1880) 4 Bom. 330; A. G. of Madras v. Anandachari, (1886) 9 Mad. 766; *In the matter of Ram Kumar*, (1891) Cal. 264; *Subbarava* v. *Ramasami*, (1900) 23 Mad. 171; *Narain* v, *Tirlok*, (1907) 29 All. 4; *Pakkian* v. *Chettiah Pellai*, (1923) 46 Mad. 839 (F. B.); *Gopal Krisbna* v. *Mst. Jaggs*, (1936) I. A. 295; *Banarsi Das*. v. *Suma Prvsad*, AIR 1936 All. 641.

3. A departure from the strict rule of indissolubility of marriage may be noticed in the evolution of customary practices, particularly in such communities as Sudras and other low castes. where the influence of religion on social moras is slighter. See Steel, *Law and Custom* of *Hindu Castes within the Deccan Provinces of Bombay Presidency* (1868) at 168, 169; Rattigan; *Notes on Cnstomary Law as Admintstered in the Courts of Punjab*, (1911) at 53-58.

4. *A* "sacrament" is an outward and visible sign of an inward and spiritual grace ordained by the Lord Himself, see R. G. Parsons, "Sacraments;" *Encyclopaedia on Religion and Ethics*. vol. 10, at 902. In the words of Peter Lombard (1164 A. D.) in his fourth Book of Sentences, a "sacrament" not only signifies but also causes grace. *The Catholic Encyclopaedia*, vol, IX, at 700. See also T. A. Lacey, *Marriage in Church and State*, (1947) at 39 : The mutual surrender of man and woman, and the mutual acceptance of that surrender, sufficiently constituate the sacrament.

5. Joseph Sellinger, "Moral and Canonical Aspects of Marriage," *The Catholic Encyclopaedia*, vol. IX, at 700.

6. See Sir Lewis Dibdin and Sir Charles E. A. Chadwyck Healy, *English Church Law aud Dtvorce*, (1912) at 46-47; Pllock and Maitland, *History of English Law*, (1927) at 336.

7. S. L. Greenslade, *ap. cit.*, at 503. 508, citing Fritz's *Classical Roman Law*, (1951). See also David E. Engdahl, "Medieval Metaphysics and English Marriage Laws," (1968) *Journal of Family Law*, vol. 8, No. 3, at 381-97,

arose a discrepancy between the law in dogmatic theory and the law in action, "evading dogma by fiction and subterfuge."[8]

About the middle of the nineteenth century, under the impact of the dominant scientific attitude, it seems to have been realized that the "effort to base legal rules on moral and religious principles leads naturally to casuistry, and away from that commonsense view of human transactions and recognition of practical consequences which ought to be the basis for law."[9] In the sequel divorce came to be judicially sanctioned under English law by the Matrimonial Causes Act of 1857. In reality, this Act, as Dicey very perceptively stated, "gave national sanction to the contractual view of marriage, and propagated the belief that the marriage contract, like every other agreement ought to be capable of dissolution when it fails to attain its end."[10] The spirit that pervaded the Act of 1857 in England was solemnly affirmed in Canada when in 1968 the new Divorce Act was passed. This new Act enables to look beyond the confines of the religious concept of marriage to the human dignity and greater respect for the institution of marriage itself.[11] Almost the similar considerations influence our legislatures in India for introducing divorce conception in Hindu law through the Hindu Marriage Act of 1955.[12] The most remarkable thing to be noticed in the whole process of rationalization is that, along side the introduction of divorce conception, how astutely the concept of the reconciliation has been interjected.[13] The concept of marital

8. Traynor, "Law and Social Change in a Democratic Society," (1956) U. *III, L. F.*, 230 at 236. See also W. Freedmann, *Law iu a Changing Society.* (1964) at 180 ff. See also Gerhard O. W. Mueller, "Inquiry into the State of Divorceless Society (Domestic Relatlons, Law and Morals in England, from 1660 to 1857)," (1 56-57) 18 *Uni. of Pitt. L. R*, at 566-69,
9. James Bryce, "Marriage and Divorce under Roman and English Law" *Studies in History and Jurisprudence*, (1901) at 816.
10. *Lectures on the Relation betweeu Law and Public Opinion in Eugland during the Niueteenth Century*, (1962) at 43.
11. "The Church..must look beyond their own legislation to see what best serves the common good of civil society.." *Proceedings of the Special Committee of the Senate and House of Commons on Divorce*, First Session, Twenty-seventh Parliament, Canada, 1966-67, at 1511. "(T)he fact that more people seek divorce in order to terminate impossible matrimonial relationships may be indicative of greater respect for the institution of marriage," *Report of the Special Joint Committee of the Senate and House of Commons ou Divorce*, (Canada, June, 1967) at 95.
12. See author's paper, "Evolution of Divorce under Hindu Law," *The Law Review*, Vol. XX (1968).
13. See author's paper. "Dynamics of Marital Reconciliation in Divorce Litigation under Hindu Law." presented at *the Tenth Interuational Congress of Anthropological and Ethnological Sciences*, held in Delhi on December 15, 1978.

reconciliation within divorce conception comes close to fruition in the theory of irretrievable breakdown of marriage as a ground of divorce—a theory which is premised on the knowledge derived from the fastly developing sciences such as psychology and psychiatry.

The new avenues envisage a new role and responsibility of the judges and the jurists, the lawyers and the law teachers, and of everybody else connected with the legal order destined to process problem of familial relations. The new emphasis has given birth to the modern concept of the Family Court, which functions in a manner "that it may tend to *conserve* and not to disserve the family life; that it may be constructive and not destructive of marriage; that it may be helpful and not harmful to the individual partners and their children; and that it may be preservative rather than punitive of marriage and family.[14] Our law Commission in its Fifty-fourth Report on the Civil Procedure Code alludes to this concept,[15] when it is stressed that, as far as possible, an integrated broad based service to families in trouble, should become a part of the court system, existing court structure should be so organized that one single court should deal with the problem of preserving families.

Today the rationalisation of the dogmatic basis of the institution of marriage boils down to this : The dissolution of marriage is permissible because the union is man-made (instead of assuming, God-made), but the spouses should be reconciled as far as possible. And the man, with the new shafts of light coming from science and technology, is trying to reconcile what seems to be irreconciliable ! It is in this manner that the religious dogma of sacramental marriage is fully exploded, so that it could functionally meet the conflicting marital interests in concrete situations.

Another area wherein the interaction between science and law is more cognizable is the population explosion in India. Since the past few decades, science and applied technology on the one hand have been credited for increasing the life expectancy of man and at the same time lowering the rate of infant mortality. This silent revolution started in the highly technologically advanced countries, but now it is a phenomenon shared by the people all over the world. However, in India an offshoot of this phenomena is said to be resulting into 'population explosion'—much more powerful than the Pokharan's nuclear implosion-for it is causing a problem of serious imblance in the ratio of people to the availability of calories. It is estimated that during the last thirty years the population in India has doubled and if this trend continues, by 2000 A. D.

14 The statement within quotes is from the *Report of the Special Committec of the Association of Bar of the City of New York*, 1954.
15. Chaptor 32 A.

our number will be crossing over one hundred crore, and that the people would be crawling like insects ! In this predicament it is legitimate to ask : Is it possible that we are being saved from disease only to die of starvation ? Surely, there would be little comfort in substituting one form of human tragedy for another. Of late, even the highly technologically advanced countries are anticipating the dilemma of imbalance. To feed the increasing population whatever improvements in the build-up of food production will be made will prove only a palliative.

Then the question remains : Should we cry all the scientific progress down and abandon it for restoring the balance in Nature ? Obviously that would be unwise and against all the tenets of reason. Moreover, the human genius can never be slowed down, much less than reversed. Then, we are left with two alternatives only. One is that never minding the population explosion, we impinge our hopes on *some* new process or processes that would be found out at *some* time to relieve the growing pressure. But the promises of new prospects of energy and all that are at present nowhere near realization; and therefore, in the meanwhile we must, atbeit with regret, resort to stringent rationing of our food and all other material resources. In this manner we may be able to push the limit of our survival slightly ahead, but it is still there in any case. This leaves us with the Hobson's choice : we must through law licence, restrict, and ration our own 'reproduction', the very source of scourge and all mounting miseries and despairs. We have already started moving in this direction, say, through the Medical Termination of Pregnancy Act of 1972, which is acclaimed a major step in the national fertility control programme.

Another major move was in 1978 when in order to lower the rate of fertility the minimum age of marriage was raised from fifteen years to eighteen for females and eighteen to twenty-one for males. The consequent postponement of marriage does provide an immediate transient reduction in the birth rate, but the problem remained where it was.

In India, where a bady is born every one and a half seconds, and approximately 100,000 children die every month as a result of malnutrition,[16] one may ask pensively : if the magnitude of the population problem is so disturbingly clear, why haven't we succeeded hitherto in making a direct assault on the procreation of the 'devalued children' ? Why haven't we been able to create a legal norm to the effect that every child that is born has a righ and not to be born by a mere biological accident ?

16. From an Official Study brought out to focus the attention on the plight of children in the country as the world celebrates the new year 1979 as the International Year of the Child, cited in *The Tribune*, January 1, 1979.

Perhaps, because the problem of procreation, as a concomitant of the institution of marriage, is intimately associated with, and prompted by, religion, and, therefore, any tampering with it is considered inexpedient (for fear of religious susceptibilities). However, the somber prospect of over population is sure to diminish with the increasing dominance of the scientific disposition, because incantation is everywhere in retreat before fertilizer, the hybrid, the antibiotic, and the harmone,[17]-all products of the advanced science and technology. One may find today that even amongst the most conservative, tradition-bound communities of the world the sciential attitude is gaining grounds.

III. Law Adopting the Sciential Method

The physical or natural science, even in its most rudimentary form, is marked by the fact that it is singularly devoted to the value of 'verifiable truth." Its impact on our social systems in a more concrete form is evident in the very adoption of the sciential method by the social sciences, including law. The processing of the verifiable truth involves, first of all, the formulation of hypothesis, which might have been caused by chance observation or by intuition or by some inductive procedure; and then the rigorous testing of the hypothesis by confronting its prognosis with the results of experimental or to other observations. Agreement with them is taken as corroboration of the hypothesis; clear disagreement is considered as refutation or falsification.[18] In this manner of verification what we finally arrive at is nothing but always the *relative* truth.

Almost a century ago, Sir Henry Sumner Maine "brought to bear a scientific urge to unify, classify and generalise the evolution of different legal orders."[19] In other words, he extended his belief that history could be a science and could have methods like those of science. Accordingly, he framed hypothesis concerning the instruments of legal growth in various societies, and then came out with the stages of social development common to various people, which could be related to his hypothesis[20]. He also attempted similarly to evolve out a correlation between the growth of the centralized government and the extension of individual

17. During the sixties, introduciton of the dwaraf wheates and rices initiated a rising field trend in many Third World countries.
18. K. Popper in *Poverty of Historicism* (1957), while dealing with the method of science stresses rightly that the question "How did you first find your theory ?" is not scientifically relevant. What is important is the question, "How did you test your theory ?" especially in the realm of social sciences where we cannot see and observe our objects before we thought about them. *Ibid.*, at 132-36.
19. R. W. M. Dias, *Jurisprudence* (1976) at 533.
20. See *Ancient Law*, ch. IV.

liberty. In this manner, even with the limited amount of exact information at his disposal, the mid-Victorian path breaker Maine was able to expound the historical and comparative approach to law "in a singularly illuminating fashion and purged of many of the early exaggerations," with a profound effect on Jurisprudence[21].

In the first quarter of the present century, the realist movement in legal theory, on the analogy of behavioural sciences, drew attention to the importance of fact research and analysis in the process of legal decisions[22]. However, since then through developing the techniques of sample surveys and depth analysis, which promise to accomplish for social sciences very much what telescope did for astronomy and microscope for biology, there is enormous expansion of the information-collecting systems. With this new power of articulation, the jurisprudence, notably sociological and realist, have become, to use Lord Loyd's expression, "totally professionalised and interdisciplinary[23]." These recent trends in jurisprudence, as Lloyd recognises, "exhibit a variety of movements linked by an increasing awareness of the fruits of interdisciplinary cooperation, and buttressed by a more sophisticated methodology," tending to take it (with its increasing professionalisation) "if belatedly, into the twentieth century."[24] All this is a clear manifestation of the growing belief in the accessibility of social phenomena to scientific approach for greater articulation, objectivity, certainty and truth[25].

It is often argued that the susceptibility of human phenomena to scientific approach eventually does not bode well for the future of mankind. It is said to be impregnated with most serious repercussions. Mass industrialization, mass production, mass communication, mass education and indentification of masses with state, and mass manipulation of everything, including now genetic engineering, the possibility of 'creating' human life in the test-tube and of manipulating embryos in artificial conditions establishment of sperm-banks for preservation and fertilization by the test-tube method; and researches in mass coloning of human beings with possiblities of fabrication of standardised human beings from genetic blue-prints, are some of the frightening developments having sinister potential to the detriment of mankind, which are nevertheless the consequence of technological innovation.

21. C. K. Allen, *Law in the Making* (1961) at 18.
22. See W. Friedmann, *Legal Theory* (1967), ch. 25,
23. *Introductiou to Jurisprudence*, (1972) at 12.
24. *Ibid.* at 15
25. See W. Friedmann, *Legal Theory* (1967) at 52 : "..The arbitrariness or inarticulateness of choice between competing and conflicting values can be significantly reduced by behavioural research.."

In this continuing trend of the machine replacing the man, what is presaged implicitly yet effectively is that total mechanization would reduce all of our institutional human arrangements to total robotization. Of this process, and its effect upon the law, the most glaring example given is that of ''the whole 'new sphere' of human rights where mechanical, impersonal, equalized rights and/or benefits are assigned to the masses as a whole or stomized aggregates such as 'workers,' 'the aged,' 'Indians,' 'women,' and so on.[26] It is so blantantly evident, in cases of automobile insusance; in the 'small claims' court; in the 'classification' of prison inmates; in divorce proceedings; in the variety of court jurisdictions attempting to deal frequently (and unable to do so) with the same phenomena; in the mental separation of 'practicing lawyers' from 'justice'; from the ever increasing quantity of mechanical litigations swamping both courts and judges.[27] "All are leading to an ever growing necessity to develop a 'better' assembly-line form of justice'[27].

Implicit in these statements is the argument in the world of "mega machine" there would hardly be a need of any human motivation of the law, either on the social plane or on the human milieu. Further, the rise in the prestige of science and technology tends to bring about a corresponding dimunition in the importance of the function of law as well as of the place of the lawyer in the modern society. As our dependence on ever more elaborate system of technology increases, so must our conscious control for counteracting our vulnerability, not only to any slight breakdown at some point in the operation, but also to cover up the consequences (including social, economic and political) that might ensue, directly or indirectly, in short or distant future. (It is, however, entirely a different matter how, and in what form or shape, the human ingenity in effecting conscious control manifests itself). Thus, the functional importance of the law evincing concious control increases in direct, instead of inverse, proportion to "the rise in the prestige of science and technology".

Perhaps, the more severe and serious consequences of the higher level of technology (merely a re-statment of 'the rise in the presige of science and technology) are said to be de-personalizing and declining in moral and spiritual values, showing up varyingly in "violence", 'aggressiveness," self-aggrandizement," "terrorism," "disintegration," "organized

26 William A. Dyson, "Rediscovering the Lost Links between Private and Public Rules and their Implications for a new understanding of Law," a paper presented at the Vanier Institute of the Family on April 16, 1974, at 2. It is indeed a very thought provoking paper, received by the courtesy of the Vanier Institute of the Family, Ottawa, Canada,
27. *Ibid* at 2-3.

and recurrent strikes by workman, student, teachers, and government servants," and the like. All this is tantamount to saying, that aggressive denial of all values is inherent in the very mechanical approach.

Proceeding *ab initio*, one may ask : How do we get at the sciential knowledge, that is, the knowledge which is arranged in an orderly manner? Citing an instance would probably be preferable here to any number of expositions : say for instance, how did the physicians begin to master disease and injury? Not until they learned to look at our bodies as *machines* in which processes were going on, processes which could be checked or helped by the physician's treatment. This is how we moved from the use of incantation to the sciential knowledge—a knowledge based on reducing all phenomena in terms of mechanical processes.

Why do we then abhor the 'mechanical' process, which yields to us all the dependable knowledge? There is nothing in it which bears the slightest connotation of 'lifeless,' 'insensitive,' or 'without spiritual meaning or values'. Professor Lyman Bryson, a philosphic observer of mankind, puts the matter straight by telling us that "mechanical" is a specific term intended to convey the idea that the kinds of reality we can get at with our probing of sensory experience all reducible to events in which energy of many kinds flows through forms of many kinds and results in work.[28] If that is so, "mechanical" processes all the more affirm 'activity,' 'motion,' and 'movement'—all symbolizing life rather than lifeless, from atom to man.

In the very adoption of sciental method by law or in the specific application of the scientific technology of law, it results in de-personalization (and, therefore, de-humanization) and dilution of moral and spiritual values. These values are said to be sacrificed by the normative science, when the 'individuals' or their 'actions,' 'avocations,' 'pursuits,' or 'persuasions,' are put into atomised aggregates, such as "men," "women," "judges," "lawyers," "divorcees," "small causes courts," "small causes claims," "illegitimates," "petitioners who are taking advantage of their own wrong," "petitions on ground of cruelty or adultery," and so on and so forth. Resentment against this so-called de-humanizing trend is made evident in such slogans as, "People are people, not things !" "I am a person, not a robot, a stereotype, a role !"—coined and current in the highly technologically affluent societies of the West, and now spreading like a contagious disease in India also. But that de-personalization and all that are not the result of categorization or grouping (which is an attribute of sciential approach). The fundamental right to equality under the constitutional law, for instance, is made functional only on the basis of grouping or categorization, strictly called classification, stipulating that 'like should be treated alike.' The groupings or classifications are resorted to, so that powers, privileges, immunities, etc., may be conferred in law, as near as possible, on some distinctive individualized basis.

28. "The Uses of Knowledge," *An Outline of Mans' Knowledge of the Modern World*, at 7

Similarly, lumping together of divorce petitions, say, on grounds of cruelty or adultery or impotency, within the framework of matrimonial offence theory is a distinct step towards rationalization when seen in the background of the inexorable concept of sacramental marriage. However, as our 'dependable' knowledge of human nature increased with the new shafts of light, we gradually moved along the line in adjusting our concepts towards progressive individualization. This could be seen most clearly, for instance, in the developing concept of cruelty. In the early Indian cases it was held that if the conduct was such that it did not threaten bodily harm, it did not amount to legal cruelty. In *Moonshee Buzloor Ruheem v. Shamsoonnissa Begum*,[29] for example, where the parties were Muslims, the Judicial Committee of the Privy Council stated :

"The Mohomedan law, on the question of what is legal cruelty between Man and Wife, would probably not differ materially from our own, of which one of the most recent expositions is the following : 'There must be actual violence of such a character as to endanger personal health or safety; or there must be a reasonable apprehension of it.' 'The Courts,' as Lord Stowell said in *Evans* v. *Evans*, 1 Hagg. Con. Rep. 37 ff. 'have never been driven off this ground.'"

The same principle of "actual violence" as an essential requisite of legal cruelty was applied whether the parties were Hindus, or belonged to any other community.[30] Mr. Justice B. J. Wadia in *Cowasji Nuseerwanji Patuck v. Shehra Cowasji Patuck*,[31] referring to the Privy Council decision as quoted above, observed that there was no doubt that cruelty in India meant cruelty as understood in English law, that is, "injury, causing danger to life or limb or health, or reasonable apprehension of such cruelty."

Under English law the concept of cruelty steadily widened so as to include within its ambit mental as well as physical cruelty. Until 1963,

29. (1866-67) 11 Moo. Ind. App, 551.
30. See, e. g., *per* Melvill and West, JJ., in *Yomunabai* v. *Narayan*, (1875) I. L. R. 1 Bom. 164 (where the parties were Kokanastha Brahmins). See, also e. g., *per* Batcholor, J., in *Meherally Mooraj* v. *Sakerkhanoobai*' (1905) 7 Bom. L. R. 602 (where the parties belonged to the Knoja community).
31. A. I. R. 1238 Bom, 81.

cruelty was defined as "wilful and unjustifiable conduct of such a character as to cause danger to life, limb or health, bodily or mental, or as to give rise to a reasonable apprehension of such a danger."[32] The respondent to be cruel must have acted in a manner so that he must have foreseen the harm done to the petitioner.[33] In 1963 the scope of cruelty was widened by the House of Lords in *Gollins v. Gollins*[34] and *Williams v. Williams*,[35] by stipulating that intention is no more a necessary ingredient of cruelty and, therefore, neither a malevolent intention nor a desire to injure nor knowledge that the act done is wrong and hurtful need be present for conduct to amount to cruelty. After the coming into force of the Divorce Reform Act, 1969, the conduct which gives rise to a presumption that the marriage has broken down irretrievably is simply this: Whether "the respondent has behaved in such a way that the petitioner cannot reasonably bo expected to live with the respondent. (Sec. 2 (1) (b)"

In India with the changing social context there was a change from the essential of actual physical harm or reasonable apprehension of it to the simple requirement of a reasonable apprehension of a conduct which is "harmful or injurious,"[36] but not qualified by such terms as "to life, limb or health." Since through the amendment of 1976 our Parliament has done away even with the "reasonable apprehension" aspect on the analogy of English law, emphatically cruelty is to be determined as the cumulative effect of all the circumstances of each individual case rather than applying any single standard objective criteria. Thus, in each case the question to be asked is, in the words of Pearce, J., "whether *this* conduct by *this* man to *this* woman, or *vice versa*, is cruelty."[37] In other words, what is to be determined in each and every case is the effect on a particular of the complained course of conduct rather than the nature of the conduct itself. Implied in this is the realization that the same conduct may affect different individuals in a dissimilar manner. Thus in the movement of the juridical standard of cruelty, what is cognizant is the accent on increasing individualization.

The spirit of enquiry should not cease at any stage of progression, lest what has been verified as 'true' to-day should become dogmatic

32. Tolstoy, *Divorce and Matrimonial Causes*, (1967) at 61.
33. See, e. g., *Swan* v. *Swan*, (1953) 2 All E. R. 854, and *Palmer* v. *Palmer*, (1954) 3 All E. R. 494.
34. (1263) 2 All E. R. 966 (H. L.).
35. (1963) 2 All E. R 994 (H. L.).
36. See note 31 *supra* and the accompaning text. See now section 10 (1) (b) of the Hindu Marriage Act, 1955.
37. *Lander* v. *Lauder*, (1949) p. 277 at 308 (Italics in the original).

tomorrow. From the world of natural sciences we have learnt meaningfully that all 'truth' is relative. It is relative to the dependable knowledge to be deciphered by our senses and by our logic. It thus represeuts an approach of indentifying reality with process, rather than with static substances and fixed attributes. The normative rules are similarly meant to be provisionally believed and to be acted on until they are supplanted by the new generalizations. We test the truth by eliminating falsehood and we must continually distil our concepts by distinguishing significant truth from plausible falsehood or half-truth in the light of the sciential knowlegde, which is essentially based on the new methods of perceiving social information.

However it is alleged that in the analysis of purposive human behaviour relality often involves elusive information, because the value judgment of the investigator get mixed up inextricably with the whole process of selection of study area, formulation of hypotheses, varification, and the drawing up of conclusions. This is inevitable partly because in the realm of social sciences, the investigator, and the fruits of his investigation, are part of the system which is being investigated. The physicist, for example, can usually assume that his universe stays on no matter how he pokes it or how much he knows about it. The sociologist, on the other hand, cannot give a questionaire without changing the respondent, and the economist cannot make a prediction without affecting the outcome.

The social change is less startling in the first place, because its effect is qualified and moderated by the sheer intertia of traditionally held values through the investigator. When Galileo tried to prove and to propagate the Copernican theory that the earth went round the sun, instead of (as every body knew) the sun around the earth, he was suppressed and made mute, because it seemed that he was shaking the venerable myths of the society: he was making all things relative. In the beginning of the twentieth century, when Einstein shook the modern foundations with the theories of relativity, there was less startling effect. From these the valuable lesson that flows for the social scientists is that, if the human mind abhors change even with respect to natural phenomena, which takes place whether one wishes or not, man is likely to offer much more resistance to social change. because we operate in accordance with a simple and unconscious knowledge of our social system all the time, and what is generally pursued is taken to be most natural. Any departure from the established course, therefore, tends to cause disruptions and imbalances, manifesting themselves in terms of dilution of "moral and spiritual values," "dissolution of legal order," or the "legal system losing the base of popular support". Hence, the less startling the social change, more likelihood would there be of its social acceptance.

Another more cogent reason for supporting the value-loaded analysis of purposive human behaviour is that it enables us to conserve and carry forward the residual truths which most of the old ideas contain, and assimilate them with the present, and also, as a result of assimilation, to anticipate the future course of social action. This would not only prevent the erosion of "the faith and confidence in the law, but also win for it the new popular support."

And finally, to the baffling problem of the social scientists as to how to exterminate the inherent bias of the social researcher so as to enable him pursue his research with scientific objectivity, it is not necessary to adopt the clear cut scientific objectivity but that degree of objectivity which is manifest in our philosophy (of daily life) of seeking detachment in our attachments.

IV. Conclusion

Paradoxically enough, it is the science (and its technology) which is enabling the law to meet its own challanges, disruptive as well as constructive. In the past law thrived mostly on disruptions : its role was essentially that of a laggard. Now the science has imparted its veredical outlook to the dogmatic bases of law, rationalizing them to the extant of being functional. The science has also given its *modus operendi* enabling the law to reckon with the present as well as future by moving from unknown and inarticulate to the basics, and from the basics to the specifics. Remarkably it is all done by impregnating the present with the values of the past : This provides continuity as well as saves us from the guillotine process of dehumanization. Law, thus, no more remains merely a mirror reflection of society, but an important mode of leading towards the reproduction of the social order.

However, for the realization of the social objectives science is our most dependable ally. We feel, as if instinctively, that for nurturing our impoverished rural development, eliminating the socio-economic disparities between the urban elites and rural masses, meeting the demands and needs of the ever growing population, verily it is the science which *must* hold answer. We expect indeed we demand that "(s') cience *has to evolve* such means and areas which would bring the goal of freedom from want nearer realisation."[38]

But before we could impinge our most explicit faith in science, we must not forget that so long as the sciential power remains oriented by the normative science, the technology, the end-product of science, could legitimately be the bearer of our hopes. However, this orientation is necessary not only for reaping the benefits of science, but also for avoiding those of its aspects which are detrimental to our interests. This critical interdependence of law and science presages the necessity of holding the interdisciplinary dialogue for orienting and re-orienting ourselves in this accelerating world of knowledge in which one crucial field after other significant thinking is shaping our world not only for today but for the future—a future that moves upon us so rapidly that it is almost indistinguishable from the present. The resultant orientation would enable law to articulate new social concepts especially at an opportune time when the Government of India has decided to give a new thrust and priority to rural development through the application of science and technology.[39] If the law embedded in science, and manipulating the sciential powers, holds the promise to take us towards the new just social order, wouldn't we exclaim, "Isn't law rising from dogmatic slumber !"

38, The Prime Minister, Shri Morarji Desai, addressing the opening session of the Indian Science Congress at Hyderabad on January, 3, 1979. *The Tribune* January 4; 1979.

39. *Ibid.*

SCIENCE, TECHNOLOGY AND LAW : A CRIME AND CRIME CONTROL PERSPECTIVE

R. K. RAIZADA*

THE HUMANITY, today, is experiencing the impact of science, technology and law to an extent as perhaps it has never done so before. The misteries of nature unravelled by science and the natural resources exploited by the technology have led the social being to an industrial and commercial culture. The civilization thriving on manufacture and mercantile has plunged itself into innumerable conflicts and constraints of social behaviour and economic transections. To resolve these conflicts and to ease these constraints law is also enacted on an unprecedented scale. Yet, just as the world of manufacturer and consumers is caught in the vicious imbalance of supply and demand, so is in the field of law where an eternal tussle goes on between the law-makers and law-breakers. Science and technology have opened new vistas for criminals and provided new techniques of crime control. But between the criminals and crime-controllers, the former often appear to have an edge over latter. This may be because the science and technology have strengthened the homo-sapiens externally but weakened internally where the man himself is incapable to counter the increasing crimes and criminality.

I

A number of present day crimes and criminal tendencies can be easily identified with the spread of scientific and technological commercial culture. The most common crimes of the present era, classified as "white collar crimes" were the result of wide ranging academic and investigatory efforts in one of the scientifically and technologically most advanced country, the United States of America. In magnitude these offences are far graver than the old offences. The identifier of these crimes, Edwin Sutherland, has noted that not only "the financial cost of white collar crime is probably several times as great as the financial cost of all the crimes" (such as burglaries, robberies. etc.) and that "White collar crimes destroy morale and promote social disintegration."[1]

Smuggling and blackmarketing are the two illustrative economic offences of this category, which rock the national economy, The crimes

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1. E. H. Sutherland, "While-Collar Criminality" (5:1) *American Sociological Review* 4-5 (1940).

of food adulteration, preparation of spurious or sub-standard drugs and other materials expose the uuwary consumer to graver hazards of life and health than do the crimes of murder or grievous hurt committed in the traditional manner. In this category of offences the most common crime is that of milk adultration.[2] The supply of adulterated milk constitutes not cheating of the consumers who pay for the milk of certain quality and standard, and get actually something else, but is a crime against publie health.[3]

The increase in the above crimes is not just due to poor national economy but the international politics also play an important role. For example, the technology always needs a waste dumping area. When no such area is available and the scope of recycling the waste is also limited, an abnormal situation develops. The drugs and commercial products discarded or outdated in the west find easy market in technologically lagging behind countries. And as the production of newer brands and models is nearing saturation, the civilization is turning to hippiculture and abnormal behaviour[4] which acoording to established norms often fall under the definition of crime.

Bribery and the like offences (palm money, head money, liaison transactions) find ample scope in technological advances as the areas of economic transactions multiply. The technology cannot wait for the slow human actions. In commercial culture bribery and the like offences are as much taken as way of life as the adulterated edibles and other spurious products are normally available in the market.

The "blue collar" crimes are largely due to the technological advances. The role of semi and skilled artisans in daily life of common man has greatly increased. For their labour these technicians often over-charge their customers or render imperfect services. The poor customer is unable to understand the technicalities of the service rendered to him and remains no wiser to the cheating done to him.

2. In the last 25 years amongrt the cases of food adulteration which have reached the Supreme Court and the High Courts, largest number is of milk adulteration cases.
3. The Supreme Court took serious view of milk adulteration as grave hazard to public health e. g. see *Ram Parkash* v. *State of H. P.*, 1973 Cri. I. J. 593 (S. C.).
4. The most recent and glaring example of such ahnormal behavlour is mass suicide in 'Jones Town' Trafficing in drugs and their consumption is on increase on an alarming scale. Science and technology have only helped in large scale availability of such toxic materials by adding synthetic drugs to the list of natural narcotic herbs.

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The increased risk to life and property under technology has given rise to schemes of life insurance, fire and accident assurances etc., and at the same time a flood gate for the cheats is opened. The need of huge capital investments in industrial establishments has given birth to numerous corporate personalities which in turn provide ample scope to a crafty mind to indulge in swindling and money spinning devices.

The role of cinema, privately owned television and broadcasting systems, mass publication of crime and sex thrillers are but few examples of the gifts of science and technology too well known all over the world. Sex which is natural and creative, has been turned obscene and pronographic by its commercialisation.

The large scale scientific interference with human genetic functions and processes may in near future not only need revision of social and legal concepts of marriage and legitimacy but will open new chapters in the crimes of sex. Many societies have already ceased to treat homosexuality as crime.[5] Wide availability of condomes and other family planning devices have lessened the hazards of liberal sex relations. Extra uterine fertilisation of ovum will help the spread of abnormal sex behaviours. The ultimate impact of legally recognised sex abnormalities on human biology, social physiology and psychology will be revealed only with the passage of time. Nature does react to such abnormalities, sometimes quickly, more often slowly. Then their positive or negative influences on criminal propensities will also come to light.

The contribution of science and technology to traditional offences of murder, hurt, kidnapping. abduction. theft, robbery, extortion, cheating, forgery, criminal breach of trust, etc., can be witnessed in the new *modus operandi* of committing these crimes and also in their new dimensions. New surroundings and settings for committing these crimes have been possible due to advances in technology and mechanised commercial culture. Gruesome murders and big robberies are now committed in running trains and automobiles. Hotels, luxurious homes and cinema houses are the places where theft, robberies and cold blooded murders are committed; whereas, refrigerators have made possible blood freezing murders. Armed gangsterism is on the increase. The instruments used by the criminals involved in these crimes are sometime found to be technically more sophisticated and superior than those possessed by the police who go to nab them.

5. E. g. in England, Sexual Offences Act, 1967 legalised homosaxual acts between consenting adult males in private. It is noteworthy that sodomy and lesbianism are becoming known passtimes in technologically much advauced countries such as England, the U. S. A. etc.

Many of the modern modes of committing crimes against person and property are as startling and awesome for a common man as the new achievements of science and technology. Hijacking is one of such crimes. Travellers in aeroplanes are always fearstri-ken till the air-borne plane is landed and the passengers have alighted. The hijackers take advantage of this risk when they abduct the passengers and the crew in the plane and hold them as hostage to get their demands conceded.

II

Science and technology have, no doubt, also contributed much towards the understanding of the genesis of crime and the production of better technological aids for controlling crimes and criminal tendencies. The great criminologists of this era, equipped with technically sensitive instruments which can picturise and trace with great precision human impulses, and with scientific methods of social survey studies, have enunciated various theories of criminal behaviour.[6] These theories help in adopting suitable crime-control measures in different circumstanees. Today the scientists and technologists are busy in providing better tools to crime controlling enforcement setup. Better means of transportation, communication, detection and identification are now at the disposal of crime prevention staff. Electronic and nuclear gadgets; such as computors and satellites are also being put to their use.[7] The laboratories of forensic scientists and public analysts are being fitted with better apparatuses. But still criminality and crimes are on the increase. The reasons for this are not difficult to visualise. The factors responsible for failure in appreciable control of crimes appears to be three-fold :

1. The insufficiency and inefficiency of manpower and effective instruments needed in controlling crimes.

6. The criminologists during the last century and a half, such as Beccarai, Bentham, Lombroso, Garfalo, Tarde, Bonger, Sutherland. Glueck, Reckless have propounded various theories of crime and criminal tendencies, viz., those which attribute criminality to physical and constitution a traits of human personality, those which look at crimes and criminality from psychological, economic social and environmental view points. All these theories provide some clue to the understanding and solving of crime problem. Human personality being multifacet, no single study can visualise or provide solution to all its manifestations.

7. Computors are being harnessed to the service of crime preventive staff, as these electronic machines provide unimaginable capacity for 'storage 'processing', 'programming' and 'retrieving' informations relevant to crimes and criminals. "The Union Home Ministry h s launched a programme to introduce computors in police operations all over India. "*The Times of India*, New Delhi, 11th Jan., 1979, P. 9. Satellites are of immense help in the quickest transmission of news.

2. The legislative failure in keeping pace with crime preventive needs of the society.
3. The judicial inaptitude and limitations to appreciate the needs of changing patterns of crimes and crime-controls.

I. The Lack in Sufficiency and Efficiency of Manpower and Effective Instruments needed in Controlling Crimes :

The questions of quantitative deficiency of the personnel and the adequate supply of effective instruments relate to State's financial resources. These can be tackled if the States realise that like the growth of human diseases and population, the increase in crimes is directly linked with the scientific and technological developments, particularly in the developing countries in the present context, and accordingly revise and enlarge their national fund allocations. However, here our attention is drawn to the working inefficiency of the crime controlling agencies namely the police and the scientists working in various crime detecting laboratories. The slackness of police in crime prevention is evidenced amongst others by its defective investigations and prosecution of criminal cases which often invite judicial strictures.[8] Similarly, improper reports of medical scientists,[9] public analysts[10] and forensic chemists have been responsible for acquittals in many cases. These situations indicate that either the scientific knowledge and apparatuses put to test in these matters are inadequate to answer the criminal problems posed there in, or that the men and machines working in these establishments fail to function as they should. Both these possibilities lead to a common inference that in controlling the crime conditions, science and technology have not helped as they ought to have done so.

II. The Legislative Failure in keeping Pace with the Crime Preventive Needs of the Society :

Never before in human history the law making has been in such a spate as today; still it is unable to cope with the consequences of scientific

8. E. g., see *Suraj Pal* v. *tate of U. P.*, 1955 Cri. L.J. 1004 (S. C.), *Munir Khan* v. *State of U. P.*, 1971 Cri. L. J. 288 (S. C.), and most of cases both of the S. C· and H. Cs, wherein convictions had to be altered from graver to lessor offences or acquittals were made because of faculty investigation and prosecution. Many acquittals are granted in food adulteration cases because the ood inspectors have not taken samples according to legal prescription.
9. E. g., see *Ram Lal* v. *Lelhi Administration*, 1973 Cai. L. J. (S. C.); *Shrikrishna* v. *State of U. P.*, 1972 Cri. L. J. 1313 (S. C.), *Sohan Lal* v. *State of U. P.* 1971 Cri. L. J. 1459 (S. C.), *Surjan* v. *State of Rajasthan* 1956 Cri. L. J. 815 (S. C.) and many other S. C. and H. C. cases.
10. In a large number of cases under Prevention of Food Adulteration Act, 1954 acquittals were made because of the defective reports of the public analysts.

and technological advances. Legislation is mostly based on human experience which is generally gained by the interaction of multifaced human personalities *inter se* and with' nature and technology. But experience is always antedated and the scientific and technological achievements are the products of unlimited human imagination and efforts. The problem arises when the fruits of human aspirations bone by the technology beyond his expcctations. The enacted legislation provides in advance for experience-based reasonably expected situations but it wakes up rather late for the unexpected consequences. For example, population, pollution and dwindling natural resources have caught the imagination of legislators only when much damage was already done. Similarly, in the field of criminal law, the continuing process of amending and re-amending the substantive and procedural laws shows that the ingenuity of criminal mind in committing the crimes and evading the clutches of law outpaces the legislative wit. But there are some other aspects also of legislative limitation in tackling the crime problem. The legislators hale from the same society whose ethos has been dampened and which has been put on fire of greed by the commercial technology. Now, wealth and power are interdependent and are also *sine qua non* for success in any organisation whether it is technological, sociological or political. In all fields of human action 'expediency rules over ethical principles. Legislators go slow, at the proverbial snail's pace, in removing the cobwebs which prevent the social morals from soaring high but provide protection to the vested interest. This legislative attitude strengthens double standard approach which is so common in technological culture, but this weakens social ethics and encourages criminal propensities.

The science and technology have increased the centres of human activity and commercial transactions innumerably. To regulate these affairs a plethora of legislation is being enacted. In the process a dichotomy of authorised and unauthorised actions, as also the number of legislative loopholes increase to widen the areas of crimes and the possibilities of escaping from the legal action.

There is another aspect of legislative limitation in dealing with the situations created by technological advances. The changes introduced by the technology are often so overwhelming that many of the time-honoured concepts of human behaviour and mores are put to great stresses and straines. At the sometime the existent laws and legal notions also have to undergo much strain and twisting or legal hair splitting to accommodate the altered conditions. It was beyond comprehension that the technology will one day expand the vistas for traditionally recognised fundamental freedoms, for example, of speech and movement, so enor-

mously, and will at the same time penetrate so deep into the 'privacy' of the bedroom or strong-room, as to make the difference in 'private' and 'public' interests a most complicated issue. This baffles not only a legislator but also a judge, where, the criminal mind takes advantage of their predicament.

(iii) The Judicial Inaptitude and Limitations to Appreciate the Needs of Changing Patterns of Crimes and Crime Controls :

The Supreme Court[11] and the Law Commission[12] in India have testified that the judiciary, particularly the lower one, has "completely failed to appreciate the gravity"[13] of new socio-economic offences. One reason for this inability of the judiciary appears to be that the judges, like legislators, crime detectors and investigators are drawn from the society and live in the social surroundings where availability of substandard or adulterated consumer goods, indulgence in black-marketing and a lure for smuggled articles have become routine matters. And, that is why, for example, they hold that the offence of adulteration is just 'technical' and deserve no grave legal consequences when the milk used for preparing tea is found to be substandard,[14] or the food material is found to be deficient in purity or food value only by a small percentage.[15] Another reason for the judiciary's failure is that they are not well eqnipped with the societal needs and latest developments in the human knowledge.[16] The technological changes are so quick and new that the legal implications remain unfathomed. For example, use of computers is on the increase but the judiciary and the persons connected with the criminal trial have little training in this direction. And thus it will create problems for the lawmen-legislators, judges, prosecution and defence. These problems may be found more intricate than those posed by the use of tape recorder, rather a simpler instrument, for recording evidence[16].

11. *K. Tejani* v. *M. R. Dange*, 1974 Cri. L. J. 313 (S. C.).
12. Law Commission of India : *Forty Seventh Report on the Trial of Social and Economic Offences* 153 (1972).
13. *Supra* n. 11 at 324.
14. *Sohan* v. *State*, 1963 (i) Cri. L. J. 221 (All.);
15. *Rishra Municipality* v. *Slate of West Beugal*, 1964 (2) Cri. L. J. 281 (Cal.); *State of U. P.* v. *Gaini Shankar*, 1973 Cri. L. J. 910 (A11.).
16. The judicial drawbacks can be removed to a large extent by regular and active participation of Judges and magistrates in multidiscipline seminars and workshops. See also, for simillar views, 47th Report of the Law Commission of India, and the S. C. in *K. Tajani* case, *Aupora* n. n. 39 & 38 respectively.
17. The legality of type recorded evidence has already been questioned in several cases in india and abroad; e. g. *Pratap Singh* v. *State of Panjab*, A. I. R. 1964 S. C. 72; *Yusufulli* v. *State of Maharashtra*, A. I. R. 1968 S. C. 147; *N. Sri Rama Reddy* v. V. *V. Giri*, (1970) 2 S. C. C. 340, *Grant* x. *South Western Country Properties Lte.*, (1974) 3 All E. R. 465,

Further, the use of micro-electronic gadgets for secretly collecting evidence and information in various legal matters may also confront judges with the problem of protecting individuals 'privacy on the one hand and 'public interest' on the other. Today the judges and lawmen are not in a position to comprehend the liability of scientists and technologists using nuclear devices. The 'fall out' from a nuclear reaction is very invisible, but its effects may be visible only after generations gap in the form of physical deformities in the newborns or varieties skin troubles etc. The present theory of "crime causation" (or in torts theory of remoteness of damage" or who is a "neighbour") does not provide answer to these situations.

The judges have another limitation also, namely of the workload. The plurality of human transactions and actions have made it unmanageable for the existing judicial system to cope with the enhanced number of criminal and civil suits. The numerosity of nature of injuries to persons and properties have been multiplied at a rate when it is unreasonable to expect a single judge or a a bench of judges to understand them fully. A solution to this in the form of specialised tribunals has already been adopted in cases of industrial injuries to workmen and other organised labour. But the qualitative and the quantitative multiplicity work may lead us to find, again, a technogical solution in computerised justice. This, no doubt, would lead to many other problems answers to which will have to be found by the human beings by inventing more machines or by reversing the process altogether—the time alone will tell.

III

War, the biggest ctime is now always round the corner. It needs no elaboration to observe that the science and technology are driving the bellicose world to the brink of disaster.

The humanity willing to survive with the treasure of scientific knowledge and technical expertise achieved by it, will have to abandon the evil of commercialisation of science and technology. The whole philosophy of power, pomp and pelf will have to be forgotten. For this, selfrestraint and not the law is the proper device. The former being inborn is more effective than the enacted legislation whose strength lies in extrensic aids. If the truth is not realised in time, the natural law of climax and anticlimax will operate and the advances in science and technology on reaching the optimum will work to their own destruction. The geometriclly increasing dimensions of crime, the multiplying arsenal of advanced nations enhancing chances of global war, the augmenting air

and water pollution and growing victory of baser instincts over the weakening qualities of mankind, are pointers in the direction of self-anihiliation of the present technological civilisation.

The psychology of quick material success in highly competitive and technologically glamorous world dampens the enthusiasm for finer value of life. So long the mateial prosperity and technological supremacy continue to be the uppermost in human imagination, crimes and crime conditions will remain unabated.

The time may come soon when the humanity will yearn for a simple life of minimum necessities supplied by the minimal use of technology and fewer laws. Then peace will be preferred to war of strength. glamour and galore.

SCIENCE, SOCIETY AND LEGAL POLICY : SOME AREAS FOR THOUGHT AND ACTION

Dr. JOHN PULPARAMPIL*

"Law must strengthen the hands of the weak to resist the oppressive strong, must transform society so that each according to his needs shall be ensused through the law. we must remember this revolutionary content of law as the might of the State to fight for the masses and curb the classes and establish a just society".

(Justice V. R. Krishna Iyer, at the Seminar on free Legal Aid, New Delhi, December, 1978).

The question of law in the context of science inclusive of technology arises, because science is seen as affecting society in critical ways. The situation as well as its awareness are of recent origins, for some historical reasons. Hence a historical retrsopect is necessary for placing the problem in the right perspective. In what follows, an effort is made to highlight some aspects of the problem from four angles : 1) Framing the problem, or the perspective on interdisciplinary approach; 2) Science in the social context or the quest for a science policy for integrated development; 3) Science and technology in India or an approach to the problematique; and finally 4) the class character of the legal system in India.

1. Framing the problem : the Perspective on Inter-Disciplinary Approach.

The imperative of inter-disciplinary appraches is that social issues should not be looked upon in isolation, but as elements constituting a system, depending upon and interacting with each other. The idea that the society is an organic whole might frighten us, but practitioners of social analysis have no option but to concede that the various elements constituting a society-people, values, cultures, professions, laws, institutions etc., and all that these imply-do not exist in isolation and operate in unidimensional ways independently of each other; but rather, interact and influence each other in such a way that the end product which is social life is only a cumulative result. It is such an awareness that today we concern for interdisciplinary approaches to social problems. In this direction our approach should be on what kind of laws are called for in the sort of technological civilisation, in which we are living today.

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In other words, our concern should be to think of a sound legal policy for our times.

Such a thinking has to be methodic or systematic enough to avoid pitfalls of distortions, shortsightedness, unidimensionalism, etc. A perspective that is comprehensive, far-reaching and integral will be the best guarantee against such failures. Now best to evolve such a perspective or framework for legal policy is the next question.

A historicity in approach might be a first assurance to begin with. We happen to be living in an epoch with certain fundamental characteristics. To say that we are living in a technological civilisation *par excellence* is significant enough to qualify the *homo faber cum homo sapiens* of today. But there are also other features to be reckoned with.

Our is a time characterised by two important processes of change and transition, the one a process of *internationalisation* and the other a process of *individuation*. We are living in an era when mankind is, on the one hand, tending to be unified in physical terms-thanks to the spread of man's social awareness and the reduction of physical distances as a result of modern technological advancement. As illustrated by Hugo Boyko, the time needed by man to travel around the Globe has been as as follows : a few hundred thousand years in 500,000 B. C.; a few thousand years in 20,000 B. C.; a few hundred years in 3.000 B. C.; a few tens of years in 500 B. C.; a few years in 1500 A. D.; a few months in 1900 A. D.; a few weeks in 1925 A. D.; a few days in 1950 A. D.; but only a few hours in 1960 A. D.[1] As a result of this shrinking of the world through man's conquest of time and distance, it is becoming more and more impossible for human collectivites to exist in isolation from one another. At the same time, the globalisation of mankind is bringing about, through a confluence of many forces in which linguistic identity plays a key role, a more organic union among themselves into geographically identifable units with a greater self-awareness among people. This latter trend in socio-political evolution marks a tendency towards greater individualation, simultaneous with the process of internationalisation. It is this concept of *internationalisation-individuation syndrome of socio-political development* that provides a valid theoretical horizon against which human development can be comprehensively conceived of and planned for[2].

It is imperative for all those who care for comprehensiveness, far-sightedness, and integration in social policies to take note of the above

1. See, Hugo Boytho (ed.), *Science and the Future of Mankind*, 1964; p. 9
2. See also, John Pulparampil, "*Development : A Trans-Disciplinary* perspective," *The Radical Humanist*, Deeember, 1978, pp. 11-15

twin process of change and transition—and also to bear in mind that legal policy is only an offspring of a social policy. It is only within the awareness of this twinfold process that any sound concept of development can be thought of—and when we speak of legal policies or social policies in general, are'nt we having at the back of our heads some notion of human development ?

Much talking, writing, and doing on development was done in the past to enable populations to emulate some other populations considered more developed. But the folly of this is being recognised at least by the more sane elements of the developmental experts. The search is today for turning away from models development which are essentially foreign-looking to models that are evolutionary from within, albeit with nourishments from outside. A central implication of this that indigenous cultures contain seeds of their own development, which can and should of course be nourished by salient elements from other cultures. Developmental strategy would then mean not one of replacing one culture with another, but rather one of organic growth that would in a spirit of aceleraticism borrow from other cultures whatever is really conducive to one' own growth.

II. Science in the Social Context : The Quest for a Science Policy for Integrated Development.

While science is an age-old factor in human civilization (science in the sense of systematic knowledge-seeking with the results that such an intellectual activity produces), sciences as a social phenomenon is its origins and acceptance. The Renaissance in Europe served as the watershed wherein a new sort of scientific activity could germinate and take root. Transplanted to the English soil and watered by associations like the Royal Society, modern science began to assert itself as a new force-first intellectual, resulting in a scientific revolution, and then also as a social force, resulting in an industrial revolution. Thus an intellectual force got transformed into a social force, and in the process threw up a number of political questions. But this was only a first phase to be followed by also other significant phases.[3]

As Science in this modern form was emerging as a truly historical force and also as being recognised as such, it was only natural that it would become a centre of attention among those concerned with the future of man and society. Thus a group of scholars like Prof. Kotarbinski and

3. See, for a comprehensive historical account of this process, J. D, Bernal, *Science in History* (4 vols.), 1967. For an account of the Scientific Revolution, see A. G. R. Smith, *Science and Society in the Sixteenth and Seventeenth Centuries*, 1972.

his associates in the Polish academic circles started subjecting the social phenomenon of science itself to scientific studies and initiated by the mid 1920's a science of science movement, which is gathering increasing momentum today all over the world.[4] But academicians were not alone in taking science seriously. Statesmen and politicians, who become unique by capitalising on new born opportunities, too saw science as important in deciding the destiny of man. The entry of science into the two World Wars was only to be expected. In particular, it was science that changed the course of the Second Words War which gave an opportunity for the scientists as a group to become aware of their power. And this experience inspired them to think of ways that would make life different for themselves and for the World. The result was a science policy movement in which national governments played a key role. The effort was to evolve national bodies and policies for augmenting scientific research with a view to caelerating economic development.[5]

It all started with a work by the American scientist Vannevar Bush the Director of the American Office of Scientific Research and Development. Greatly impressed by the most successful technical development of the War (such as the jet engine, new explosives, microwave, radar, penicillin, DDT, and the atomic bomb), Bush submitted a report titled *Science, the Endless Frontier*, to Presideut Roosevelt in July 1945. Covering such areas as the importance of basic research science within the Government, research in the sectors of industry, medicine, and defense, the renowal of talent and also international relations in science, Bush recommended the creation of a National Research Foundation for guiding and funding American research, as well as the Science Advisory Board to co-ordinate the Government's own research programme. What Bush wrote has become a classical work in science policy.[6]

When in May, 1950, the National Science Foundation was created to function essentially as a body concerned with the strategy and funding of fundamental research, the dream of Bush became a reality. What America did was not to be an event in isolation. The members of the OECD group of nations made collective and individual efforts to set up national science policy bodies and to work out viable programmes of

4. See Stanislav Ossowaki and Marja Ossowaka, "*The Science of Science*" *Organon*, Vol. I, No. 1, 1936.
5. An idea of this can be had from the following Growth Pattern of national science policy bodies In the UN System : During a period of 54 years between 1883-1947, there were established only 14 such bodies, but during the decade 1947-1957, these came to be 22 such bodies and during the decade 1958-1965, as many as 40 such bodies were created.
6. Vannevar Bush, *Science, the Endless Frontier : A Report to the President on a Programme for post-war Scientific Research*, 1960.

action. The Wilgress Mission of 1959, the Piganiol Mission of 1961, and the OECO conferences of 1963, 1966, 1968 and 1971 were milestones that defined and redefined the goals and strategies of this science policy movement.[7]

Apart from the OECD, the UNESCO too has made significant contributions to the global science movement. It sought to internationalise science by deciding to give financial support to the International Council of Scientific Unions, and also to help the member countries in developing policies for research and in building up their own scientific infrastructure. The UNESCO humanist concept of science and technology has been defined and enunciated in a document titled the *World Plan of Action for the Application of Science and Technology to Development*, prepared in 1971 by an Advisory Committee of twenty four scientists with equal number from advanced and developing countries. The world Plan of Action was geared to two goals : a) building up, in the developing countries, the necessary structure of scientific and technical institutions to enable them to make the best use of science and technology in their development and b) the mounting of an attack, through the various organizations of the UN, on a number of specific problems either by obtaining new knowledge or by applying existing knowledge to development. In the pursuit of these goals, maximum attention is to be paid to to building up indigenous scientific and technological capability, while the advanced and industrialized countries can and should prove themselves to be of service to the developing countries by devoting a portion of the science and technology investments of the former to solving the problems of the latter.

The science policy movement that was set in motion by the OECD fraternity had a more limited but ambitious enough aim of augmenting scientific research for purposes of economic development. The success of this movement was seen in the unprecedented prosperity that it imparted to the OECD member countries. But it was a success with also undesirable consequences. Accelerated economic growth through science resulted in depletion of the natural resources, pollution of the environment, as well as in various socioeconomic disruptions with grave political consequences. In the phase these developments, statesmen, scientists, planners and social scientists started realising that unidimensional growth is harmful and so other more desirable forms of developments have to be thought out. And thus arose the present concerns for a science policy for integrated development.[8]

7. See Alexander King, *Science and Policy : The International Stimulus*, 1974.
8. See Harvey Brooks and others: *Science, Growth, and Society : A New Perspective*, 1971.

Over the years, many have attempted to diagnose the ills of science that seems to be, through its very success, threatening the future of man. Such symptoms as definciency of morals, deficiency of love or altrecism, deficiancy of integration in culture, deficieney of honesty among individuals making a career through science, deficiency of prudence on the part of the enthusiasts who want to realise all the potentialites of science without regard for their consequences, deficiency of harmony in the evolution of man, absence of a global political institution to wield authority for humanity as a whole etc., have been highlighted and even suggested as the causes for the malaise of science today.[9]

A major product of the present day concern among science policy experts is the forthcoming UN Conference on Science and Technology for Development (UNCSTED) to be held in Vienna in August this year, and in preparation for which some 10,000-15,000 scientists in about 150 countries are said to be engaged. While the organizational momentum is rising towards this major event, there are also a number of skeptics who have serious doubts regarding the useful outcome of all this.[10]

The map of agenda is clear enough. Science has increasingly been subjected to growing public concern and even public control. There are at least two main sets of reasons why science has to be subjected to further concern and social control : a) the hazards in the applications of science to areas affecting the society, and b) the wide-spread corruption in the management of science. As a result of the first, that is, application of science, the public has to live with such developments and their cousequences as environmental pollution, especially of air and water, depletion of natural resources, social tensions resulting from urban congestion and from growth of unemployment resulting from mechanisation of labour, etc. More often than not, while the society as a whole has to face these bad effeets, the benefits that result from these go only to a few or to some sections of the society that are on the path of profiteering at the cost of the rest. Now, as far as the management of science is concerned, supporting of research, granting of recognitions, creation and filling of higher posts, recruitments to the lower posts and promotions therefrom, sanctioning and obtaining of research projects and their actual execution-all these are subject to wide practices of corruption.

9. See John Puiparampil, "Diagnosing Ills of Science", *Mainstream*, December, 1978; pp. 19-25.
10. For news on the preparations for the UNCSTED, see the bulletin *Update*, being issued from the UNCSTED Secretariat in New York and also *The lund Letter on Scieuce, Technology and Basic HumanNeeds* being issued by the Research Policy Programme, University of Lund, as notes on preparation for the UNCSTED 1979.

Thus, whether it is scientific applications, or the management of the scientific establishment, one has to face the fact that the benefits go only to a few, while the burden has to be borne by the public in general. Hence it is pertinent to ask : whether we have an adequate legal policy, as an integral part of an over-all social policy wherein science policy too will form a part, to deal with the situation described above.[11]

III. Science and Technology in India : Approaching the Problematique

The earliest of the scientific institutions in India, namely the Asiatic Society was established in 1784 in Calcutta, by a group of Englishmen and this was a starting point in a chain of such developments : within less than two hundred years since the establishment of the Asiatic Society, modern science in India has become a social phenomenon in itself, the national expenditure on it as of today being Rs. 500 cores in a year. A directory of the institutions devoted to scientific research and development in India, prepared a decade ago, took note of some 1374 of such institutions, and gave detailed information under fifteen heads on as many as 913 of them.[12] This number may very well have gone up to atleast 1500 by now, with new additions over the past one decade. Thus modern science in India has become big enough to be a matter of concern for those concerned with social policies.

Behind the above explosive growth of scientific research institutions and the national policy towards them, one can see a picture of uncertain approaches and unbalanced development. The presence of anomalies, as well as the absence of coherence in the realm of policies and practices or professed goals and prevailing actualities are facets of the social phenomenon of science in India calling for detailed probing,

The growth of scientific institutions in India over the past decades has created problems of disparity. Inferring from the data given in the Directory referred to above, out of a total of 772 scientific institutions about which details were available[13] as many as 225 or 29.5% of them are in the seven big cities, as shown below :

This shows that while seven cities have cornered as many as 225 or 29.15 of a total 772 listed institutions, the three metropolitan cities of Bombay, Calcutta and Delhi together cornered as many as 143 or 18.52

11. See also, for a more comprehensive discussion of this theme, John Pulparampil, *Science and Society : Perspective on the Frontiers of Sciencee Poltcy*, 1978.
12. See T. K. Rajagopalan and K. Satyanarayana (eds), *Directory of Scientific Research Institutions in Indta*, 1969.
13. Ibid, pp 1003-1011.

No.	City	Scientific Institution	Percentage to the total
1.	Bombay	52	6.74
2,	Calcutta	46	5.96
3.	Delhi	45	5.83
4.	Bangalore	26	3.63
5.	Madras	22	2.85
6.	Hyderabad	18	2.33
7.	Ahmedabad	14	1.81
	Total	225	100.00

per cent of the total. Statewise, seven states were found to be having scientific institutions between 100 and 50 (Maharashtra 94; Karnataka 81, Tamil Nadu 75; Uttar Pradesh 72, West Bengal 66, Gujarat 56, and Andhra Pradesh 50), while there were five states with scientific institutions between 50 and 20 (Delhi 45, Kerala 41, Madhya Pradesh 38, Bihar 37 and Rajasthan 26). When five States were found to have scientific institutions between 20 and 10 (Assam 17, Punjab 15, Himachal Pradesh 14, Orissa 13 and Haryana 10) Jammu & Kashmir had only seven institutions with the Union Territories of Chandigarh, Goa and Pondicherry having 8, 2 and 1 respectively. The first group of seven States contains 495 or 64.12 per cent of the total scientific research institutions, whereas the last group contains only 18 or 2.33 per cent of the total listed.

The above picture of disparity is an aspect which is vary significant in the context of enquiries into the social character of science and scientific institutions in India. Looking back to the year since 1784, one should not expect to find coherence and co-ordination in the evolution of the scientific institutions in India, because it resulted in response to different pressures and interests. But this does not mean that the impact of their present unbalanced existence and operation on the society at large can be set aside as having no consequence at all. The close link between urbanism and concentration of scientific institutions in big cities has the potential of neutralising all efforts at integrated development in India, because these scientific institutions will indefinitely continue to draw both students and job seekers to the cities and thus keep the forces of urbanism well alive. Another implication is that the domination of the rural areas by the urban centres too will continue, neutralising efforts at balanced development between the two dichotomous spheres of Indian society. Thus the very mode of existence of scientific institutions in the country contri-

butes to socio-political tensions that call for sound legal policies. In fine, we have a situation where the logical and intimate relationship between legal policies, science policies, and social policies in general has to be accepted and faced.

One can draw similar conclusions regarding the growth of Universities as well. The picture is one of continuing proliferation. In 1900, there were only four Universities in India (Bombay, Calcutta, Madras and Allahabad—the first three established in 1857 and the last in 1887). The are of proliferation started only after 1915, the pattern of which can be judged from the number of Universities established during the decades as shown below.

No.	Decade	No. of Universities established	Percentage to the total
1.	1916-1925	8	8.16
2.	1926-1935	3	3.06
3.	1936-1946	2	2.05
4.	1946-1655	16	16.34
5.	1956-1965	83	33.67
6.	1966-1976	36	36.73
	Total :	98	100.00

The picture is one of continuing growth and proliferation in response to the socio-political forces which made such a process unavoidable today.[14]

The social consequences of the above constitute a problematique as far as government and legal policy are concerned. With the number of Universities and the number of recruits ever on the increase there are formidable problems of administration. Even as the existing institutions are not able to accommodate all who seek entry therein internal pressures mount within them, which also spill over into the wider society outside. When degrees are status symbols and essentials for job-getting and promotions in career, feverish quest for degrees through means fair and unfair creates its own problems. With the prevailing degree of unemployment of the educated, all institutions, whatever be their scope and objectives, become centres of wide spread corruption, creating a situation where academic achievements get subordinated to such forces as money, power,

14. See also (for detailed discussion) John Pulparampil "Growth of Modern Science in India : Some Historical and Theoretical Issues", unpublished paper (Mimeo) New Delhi : JUN/SSS/CSSP, 1978.

social contacts, gangsterism, trade unionism and the like. Now, the question to be asked and answered in the face of all these is : do we have an adequate legal *cum* administrative policy to deal with this special situation created by the unprecedented growth of educational and research institutions in India ?

Of special significance is the question of having an adequate legal *cum* administrative policy to deal with trade-unionism in educational, research, and scientific institutions. Without the sort of institutionalised science that we are having today, we would have certainly a lesser degree of the ramifications of institutions of all sorts. But then, the ability of organised groups—whether students or the professionals of various categories—to harass and to hold the unorganised society at ransom and to resort to tactics of extortion too would have been much less—meaning that the common man would have been able to enjoy a much higher degree of peaceful life.

Organised labour in the specialised sector is obvioualy a gift of advance in science and technology. While it may have been instrumental in increasing social production in general, the sector-wise impact of it in society is a complex issue. While GNP increase might present a rosy picture of "development" to planners and propagandists, these are social realities which are either ignored or sought to be suppressed. The fact is that in an uneven society, mainly due to the uneven power equations depending upon the uneven distribution of economic power, major portions of whatever developments are achieved will be cornered by the strategically placed and organized strata in the society Hence the tendency of science in an uneven society to favour the already favoured ones and thus to perpetuate the existing class structures, and hence the impotency of the existing legal systems to deal with the oppressive nature of science—a characteristic that springs not from within science itself, but from the society wherein science is enmashed and is differently disposed to different people.[15]

The problems arising from the unequal bargaining power, amounting to extortion by holding the society at ransom. enjoyed by the organized professionals in such services as banking, medicine, public transport, public communications, etc. *vis-a-vis* the unorganized citizens will be sufficient to drive home the point being raised here.

15. The theme of the class character of science is too classical to be mentioned here. See J. D. Bernal, *Science in History*, 4 vols. 1967; and Hilary Ross and Steven Rose (eds) *The Political Economy of Science*, 1976.

IV. The Class Character of the Legal System :

An implication to be drawn out from the above is that a legal philosophy that is based on the assumption that all are to be treated as equal before the law is in practice an unjust one. The reason being that such a philosophy for legal policy can be valid only in a social situation where every citizen,-whether trained or untrained, organised or unorganised-is equal in actual terms, especially as far as the ability for self-defense, bargaining and interest-promotion are concerned. But that is a situation that can be visualised only in utopias, and therefore, the implication is that the philosophy in question too is one appropriate for utopias alone. What is needed in practice is a philosophy of law that would advocate a discriminatory legal policy-a policy that would seek to strengthen the oppressed and weaker sections as against the present one which is in practice discriminatory in favour of the strong and oppressing.

A good exposition of the class character of the Indian legal system was made recently by Justice V. R. Krishna Iyer in his valedictory address at the Seminar on Free Legal Aid held in New Delhi.[16] Convinced that "our judicial system remains substantially the same since the day of the Raj", Mr. Justice Krishna Iyer argued that "if the poor are to have a stake in the rule of law, we may have to create a new jurisprudence". According to him, "The people remain despondent because *juridicare* is not only a non-starter, but is beset with conceptual confusion, ideological ignorance, governmental dubiety, and absence of adequate *cadres*" ? It was also his view that "The popular myth that if some indifferent lawyer was assigned at State expense to a poor litigant, potential or actual, to do his case or give advise equal justice under the law would have become a social reality in constitutional cosmetics, not social justice therapeutics".

In a social situation where "the judiciary as a class, the bar as a profession, the government as an instrument, and the political echelons as power-wielders are still half-informed about plenary legal aid ideology, and half-afraid of legal aid potential, and half-hostile to radical legal services programmes", there was little that the weak and the oppressed could hope for from the prevailing legal system. According to Justice Mr. Krishna Iyer, the situation could be changed if we were ready in the name of the poor millions, to radicalise the entire judicial system, to set up new courts like evening courts, small claims courts, *panchayat* courts with real powers, itinerant courts and other adaptations of people's courts' to abandon the far-too-sophisticated Evidence Act and the untolerable

16. See V. R. Krishna Iyer, "*Legal Aid : No Will to Changs*", *Matnstream* December 23, 1978; pp. 24-26

evils of Civil Procedure Code, etc. But such a willingness is not yet in sight today.

Well, it is for legal experts with the sort of commitments raised above to detect and decide what needs to be done where and in what detail. As a social scientist concerned about the fate of man and society in the face of science and its impacts, we can only point out the class character of science in India, the tendency of the well-entrenched social strats to further fortify themselves with the blessings of science and to point to the directions in which a sound legal policy should move if the weak and the oppressed are to be assisted by it. And hence the proposal here of the validity of a discriminatory legal policy in favour of the weak and the oppressed whom science tends to weaken further.[17]

However, having emphasized the role of a legal policy and the need for a discriminatory legal policy, we should remember that no society is governed by law alone. Socioeconomic pressures and popular preferences supported by the developments in the technological front constitute the background for politics in any society. Since human goals constitute a complex spectrum and never a unidimensional pursuit, it is essential that those who are concerned with social futures should seek to be comprehensive in their understanding and outlook so that fragmented policies and sectarian developments can be minimised and the scope of integrated development further widened. And this alone would constitute a sufficient rationals for more and more interdisciplinary approaches to social problems.

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17. In stating the following, Swami Vivekananda can be said to have favoured such a discriminatory legal policy : Aye Brahmins, if the Brahmin has more aptitude for learning on the ground ofheredity than the Paraih, spend no more money on the Brahmin's education, but spend all on the Pariah. Give to the weak, for there all the gift is needed". As quoted by V. R. Krishna Iyer, op. cit. p. 26

SCIENTIFIC AND TECHNOLOGICAL CHANGE AND THE NEED FOR THE DEVELOPMENT OF A VIABLE ALTERNATIVE INSTRUCTIONAL TECHNOLOGY IN LEGAL EDUCATION IN INDIA

I. P. MASSEY*

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The question of the future is deeply rooted in human conscience; it can be viewed as an integral aspect of the human condition. It is because of this reason that from times immemorial man has evinced keen interest in the future. This interest and concern has become still more intense in the present century because of the phenomenal development in science and technology which, though on the one hand, has contributed to the happiness of human beings yet on the other, has spelled discord and disharmony in the perpetual equilibirum which sustains human life on this planet and on the basis of which the futurologists are debating the stark question of survival of human beings.

The forces which science and technology has unleashed have not only added tremendous speed to life in all its facets but has also added new dimensions and problems with near crisis situations. Ruthless exploitation of natural resources, haphazard industrialization, erratic and chaotic production and distribution patterns, enviornmental pollution, dangers of genetic engineering, increased war capabilities and numerous other problems generated by the interplay of these factors are threatening the very existence of man. It is no denying the fact that this crisis situation can not bs met except with the combined efforts of all in which scientists and lawyers can play a major role. Therefore, the task of equipping the law students of today to face this new challange, makes the legal education and training a subject of serious thinking and delibration. Today what we lack in our law schools is a viable instructional technology which can handle additional courses with varied contents, specialization and continuing education, within the constraints of time factors and prepare the students to face the new challanges which science and technology has thrown open.

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From generations a constant search is going on for a relevant, viable and improved instructional technology in the field of education to make its products more acceptable in the fast changing socio-economic context. Therefore, it is natural that the legal education is no exception to this phenomenon. Transfer of instructional technological know-how and the development of alternative technology have been the facinating subjects of discussion at various conferences expecially in India. Langdellian case-method, Oxbridge tutorial method, Redbrick textbook and lecture method, Hypnopaedic tution method, structural communication, method, programmed instruction method, or any combination of these are some of the various alternatives of instructional technology over which legal educationists are seriously pondering in order to make legal education best suited to the needs of the society.

The term 'Instructional Technology' in its broad sense includes course content, classroom interaction, preparation of teaching material and evaluation. These may be termed as various selectively exclusive yet mutually dependent chain-links in the whole process of legal education. However, the preparation of teaching material is a base in the instructional technology. The reason is that the 'Teaching material' provides a feedback for the whole instructional technological process and determines its quality and effectiveness. It is no denying fact that in the legal education in India the above base is still in its crudest form.

The worst genetic trauma of legal education in India is that chead nutshell popular series and one-hour-before-examination charts have become the Bibles of the present generation of law students. In the alleged alibi of 'student indifference' for this state of affair, if the idea of improving instructional technology is lost, we may slip into disaster which will spell catastrophe for legal education in India. In fact the responsibility for this sorry state of affairs lies on the law schools which have failed to develop desired technology for improving teaching and reading material and to place them at the disposal of the students. Though various devices (i. e. lecture synopsis and case-law material) are in current use yet the latest development in instructional technology which is being used in some of the developed countries in many important disciplines such as medicine, engineering, and law cannot escape attention of any legal educationist in India espeeially at a time when we are in desperate search for any technical know-how which can develop improved teaching material and also when we are thinking in the near future to switch over to the new pattern of legal education (10+2+5). This technology is popularly known as 'Programmed Instruction.'

Programmed Learning is the latest revolutionary[1] development in instructional technology which has caught the attention of young educationists and psychologists. It started in U. S. A. in 1960 and is now being used tremendously in almost all important disciplines. This techneque is also widely used in U. K., Australia, Sweden and U. S. S. R. For India this concept is relatively new and therefore, the research and development of programmed instruction material is still in its infancy. The work done by the N. C. E. R. T. (National Council of Educational Research and Training) and N. I. E. (National Institute of Education) deserves special mention though it is just a beginning. Universities of Baroda, Meerut and Himachal Pradesh have also taken a lead in this direction. Besides these the defence services and medical services are taking keen interest in developing programmed material.

What is Programmed Instruction Technology :

It is a software technology based on certain psychological principles and may be defined as planned sequence of learning leading to proficiency. It can help in increasing student's capabilities, thinking habits and even quantum of knowledge. It is a method of giving individual instruction where a student is an active participant and proceeds at his own pace. This also provides him with immediate knowledge of the result. The stratagy in this instructional process is that the material is presented to the students in small frames which require active response at every step. The response though prompted yet requires a deep understanding and therefore, provides an ideal substitute for the current repetitive-reading approach of the average law student. Though there is repetition in this process, yet the repetition of knowledge in small steps in special technological setting leads to the fixity of learning. Therefore, programmed instruction is half science and half art.

Basis of programmed instruction technology

This technology finds its basis in Pavlov's 'Spitting dog',[2] Delton's 'Project work'[3] and Thorndik's 'Law of Effect'[4] yet Skinner's 'reinforce-

1. Some writers are of the view that this technology is neither new nor revolutionary. They trace its roots to the times of Greek Philosophers.
   (a) *A Handbook of Programme Learning.*, G. O. M. Leith.
   (b) *Practical Programming.*, Peter Pipe.
2. Paviov developed 'conditioned response' theory from his famous experiment where dog salivated when bell was sounded. From this the Programmers have borrowed in the use of a mediator in frame construction.
3. Best known as 'Dalton Plan' which emphasises that a student learns more by individual assignment and project work.
4. This states that learning which is accompanied by satisfaction on the part of the student is likely to be more permanent than learning which is accom-

ment' laid the foundation for the development in its present from. He conducted various researches concerning the shaping and conditioning of behaviour. The studies conducted on animals were later on used in the realm of human behaviour. The essence of Skinner's research is that a creature can be led to a desired resultant behaviour by means of a series of carefully structured small steps provided each correct step is reinforced by some kind of favourable experience or reward. Extending this to human behaviour, a student is given a small amount of information (the stimulus) and then is called upon to answer a question on the information (response). As soon as a student responds, he is given the desired answer, which is usually a confirmation of his response, because the programme is so structured as to keep the error at the minimum. If the student does err, he is merely exposed to the correct answer and no other correctional steps are needed. Therefore, the basic feature of programmed instruction are : (1) information is given in small steps; (2) student responds to each step; (3) immediate knowledge of result and (4) self pacing i. e. student can take his own time.

Construction of Programmed Instruction Material

Writing of a goods programme is an art and requires the knowledge of various skills and techneques, hence, must be learnt like any other art. Ideally, it is a team project. Programme writing is divided into three interdependent stages : (1) Preparation; (2) Writing the Programme; (3) Validation and Revision. These stages are not selectively exclusive but tend to run into other.

Preparation stage can be further subdivided into various small componants :

1. Selection of topic : The topic must be precise and must contain that basic principle of Law which the teacher wants his students to learn as a basic knowledge for a better understanding of other juridical principles. For example, before a student can learn anything about contract it is essential that first he must know what contract is. Therefore, for writing programme for a contract law class, first programme must be on 'what is a contract'. Thereafter, rest of the elements of a contract may follow.

2. Writing a general statement : It means writing of an introduction for the topic. In short it is a catchall for everything the teacher wants to teach to a student. It must indicate the depth to which you expect the students to go on that topic.

panied by frustration and dissatisfaction. The successful actions are also more likely to be repeated than those which bring displeasure or discomfort. The reward received by the learner is said 'reinforce' his behaviour.

3. Defining Objectives : Here the teacher has to explain to his students as to what is the level of their acceptable performance and what a student is expected to do. Objectives must be defined clearly and in realistic terms.

4. Drafting prerequisite skills : Here the programmer will write his assumptions about the prerequisite skills of the students. For example if a teacher is writing a programme on 'Matrimonial contracts' he can assume that the students know already the meaning of 'matrimony' and 'contract'.

5. Writing Criterion Test : It is done to know if a student has learnt everything one wanted to teach through his programme. On every objective atleast two questions must be set. These may include questions on prerequistte skills. The performance of the students in these tests would determine the correctness and efficacy of the programme material which one has prepared. One must know that the thesis of programmed instruction is that if a student flunks, the teacher fails. Therefore, the present indifference of a teacher towards the ultimate performance of his students in the examination can not exist if this form of instructional technology is adopted.

6. Writing a programmed material sequence : A programmer may adopt a 'Linear' form or a 'Branching' from depending upon the need, quality of the student and the concept to be taught. In Linear form the information about the subject is given in small steps logically related to each other. At every step a student is asked to respond and the correct response is given in the beginning of the next frame or in any other manner convenient to to the programmer. In 'Branching' form the information about the topic is given in large steps followed by multiple choice questions. For every answer a student selects, he is referred to a particular page where he finds whether his answer is right or wrong. There he also finds an explanation that why his answer is right or wrong. If his answer is correct, he is allowed to proceed further and if he is wrong he is referred back to the same page again to make a fresh choice of answer, for which he is given additional information through the frame sequence and then directed to proceed to the main stem. A mixed programme combining the characteristics of 'Linear' and 'Branching' may also be prepared.

7. Validation and Revision : After the programmed material is prepared it is first tested on a representative sample. The programmed

material is valid if the students achieve atleast 90/90 average[5] or any criteria set by the programmer. Thus the programme is standardized after revision and published for being used by target population.

Prepared programmed instruction material at a glance :

The following sample of programmed material will illustrate as to how programmed material in law can be prepared and will also give an idea as to how this whole process works.

Subject : *An Introduction to the Law of *Contract*.

Topic : *Offer and Acceptance.*

Notes :
1. This programme is primarily concerned with introducing technical terms which the students must be able to recognise. They are consequently used repeatedly and a student is also required to write them down as an aid to memory.
2. In frames 5, 7 and 10, information is introduced which will be required in the suceeding frame. The information is thus connected or 'chained'.
3. When technical terms are first used, they are printed in Bold to give extra emphasis.
4. In frame 9, the question is direct and the response is to be given in students' own words after reading the Panel I thoroughly.
5. No answers are given separately as they can be found in the actual material.

Instructions : Fill in the blank spaces with a suitable word or phrase.

*** : indicates that more than one word is required.

tt : indicates that technical term is to be used.

1. An agreement exists when two or more minds come together with a common intent. If I ask you to come to dinner and you think that I am asking you to lunch there is no..... because there is no common intent.
2. An agreement exists when two or more minds come together with a common.....

5. First '90' indicates that the class average should be 90% on the criterion test taking into consideration all the students in the representative sample. Second '90' denotes that each item on criterion test should be attempted correctly atleast by 90% of the students.

* This programme has been adapted from 'Programmed Learning its development and structure' Patricia Callender.

3. The technical term (tt) for a genuine agreement between two minds is CONSENSUS AD IDEM. Copy down the technical term for a genuine agreement : (tt).....
4. Consensus ad idem is the technical name for a.....
5. Although to have agreement there must be (tt)....., a bare agreement may be no more than an agreement concerning some social relationship.
6. Another name for bare agreement is (tt) NUDUM PACTUM. Copy this down, taking care to spell the words correctly (tt)..... .....
7. *A nudum Pactum* is an agreement not intended to be legally binding, so if you promise to attend my party your promise (is/is not) ..... legally binding on you.
8. Although Consensus ad idem is necessary even for a (tt)..... a *Nudum Pactum* (is/is not)..... ...legally binding

PANEL I : Case : Balfour V. Balfour (1919)

A husband, a civil engineer, about to return to work in Ceylon, promised to make his wife an allowance for housekeeping and clothing. He failed to keep up with the payments and his wife sued him.

It was held by the Court that the the agreement between the Balfours was a mere domestic arrangement, not intended to be legally binding and the wife could not maintain an action against her husband on it.

9. Why did the court hold that the agreement between the Balfours was not legally binding ? ***
10. *Contract* is a legally binding agreement made between two or more parties. Was a contract made in the case of *Balfour* V. *Balfour* ?.... Note : The answers to the following section L/S are in the answers sheet given below.
11. A contract differs from a *Nudum Pactum* because it creates ..... rather than social or domestic relationships.
12. The technical term for a genuineness of consent is.....
13. In addition to *consensus ad idem*, parties to a contract must have the intention to create.....relationships.
14. A 'gentleman's agreement' is not a contract because :

(a) Every body is a gentleman.

(b) There is an intention to creat legal relationships.

(c) There is no intention to creat legal relationships.

15. An example of *nudum pactum* is the case of.. ....

16. A contract must have both

(a) an agreement between two or more minds which is called.....

(b) an intention to creat.....relationship.

17. The leading case on types of agreement which are not contract is.....

18. The technical term for an agreement which is not intended to have legal significance is.....

19. What two things must be presented in a contract ?

(a) .....

(b) .....

ANSWER SHEET

Frame No. 11. Legal

12. *Consensus ad idem*

13. Legal

14. (c) it is a *nudum pactum*

15. *Balfour V. Balfour.*

16. (a) *Consensus ad idem*

(b) legal

17. *Balfour V. Balfour.*

18. a *nudum pactum*

19. (a) *Consensus ad idem*

(b) an intention to creat legal relationship.

As shown in the above sample, the programmed material can be developed by law teachers on selective basic topics. Certain programmes may be so developed in collaboration with other faculty members on inter-disciplinary topics to enable students to comprehend the relationship of science and technology, society and the law.

Programmed material thus developed may also be placed at the disposal of the students either in a book form or the students may be required to do these programmes during tutorial periods. Such programmed material can supplement verbal instruction in the class and can also supplant classroom verbal instruction in few short topical courses. Researches have proved that a student develops deep understanding and

even learns more through this method than through conventional techniques. Programmed criterion tests material can also be used in supplementing existing examinatian system which certainly needs immediate modifications if not immediate replacement. This instructional technology besides developing basic legal skills which a law student of today must possess will also equip the students to solve effectively various problems created by the development of science and technology. Further, the 'programme instruction' will be best suited when the legal education go for 10+2+5. After 10+2 the student will not be so matured as in the case of today's pattern. And, therefore, the existing instruction technology will be unsuited to the new pattern of legal education.

ENVIRONMENTAL PROTECTION AND LAW

Prof. D. N. RAO*

We are all travelers on a spaceship-the earth. Our survival depends upon the continuing function of the vital life support system of the spaceship-the air, the water and the soil. Unfortunately, we neglectfully dump poisons into our spaceship at a faster rate than our support system can handle them. The danger now looms ahead that we may even bring these systems to the point of collapse. Our survival in the coming decades will depend in part, on our ability to regulate and control the freedom of each individual to pollute our common spaceship earth.

Environmental Disruptions

The physical character of our planet is changing as forests, jungles and deserts become farms and cities, and as clear living spaces become polluted. Environmental degradation is rapid, even in the most remote parts of the world. If the degradation of the environment is increasing, it is because man, far too long a time, has considered himself apart from nature rather than a part of nature.

The spaceship earth is becoming overcrowded, the quality of life aboard is deteriorating and the support systems are functioning less efficiently. Also, the spacecraft is cared for poorly, poisons spread through the system-into the air supply, the water supply, the food supply (Table 1). There is no real understanding of the recycling processes involved in the support system. Though the warnings are there, yet most of the occupants seem totally unconcerned. They are still interested in what they can steal from the supplies.

Ecology and Ecosystem Balance

The earth that has been considered as infinite is now being discovered as finite. Man needs to develop an ecosystem approach to the management of his world. The elements of the environment do not occur singly in nature or in culture, but in complex interacting systems. One has to take a holistic point of view to understand the interconnections, interactions, consequences and in fact the systems of man and nature together (Fig.1).

Today ecology has increased the knowledge of keeping up balances between all interacting components of the ecosystem[1] and this has led

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to recognise the importance of ecology in understanding the environmental problems produced by technology. It may be mentioned here that man's ecosystem also includes social, political, economic, technological and legal systems superimposed on the environment. It is hightime that law-makers, law-enforcers and law-interpreters have some understanding of ecology and ecosystem-balance.

As aggressive human demands upon the environment keep thrusting forward, some general design for control must absolutely be set up within a short time for controlling the demands of man to produce an environment which may be able to sustain what is required of it over a future of indeterminate length.

Environment Versus Population-Technology Versus Quality of Life

Environmental pollution can be said to be the result of three factors : population size, per capita consumption, and an environmental impact index that measures, in part, how wisely we apply the technology that accompanies consumption. Thus we could establish an equation as follows.[2]

Environmental deterioration = population size + per capita consumption + environmental impact per unit of production.

However, according to Commoner and Stamler[3] the predominant factor in our industrial society's increased environmental degradation is the increasing environmental impact per unit of production due to technological changes.

The significance of the population-size in the well-being of the human environment can be further realised through the following equations :

$$\text{Standard of Living } (SL) = \frac{\Sigma\text{production}}{\text{population}}$$

$$(SL) = \frac{\Sigma\text{production-}\Sigma\text{losses}}{\text{population}}$$

$$\text{Quality of life} \quad (QL) = \frac{\Sigma\text{production-losses,}}{\text{population}} + \frac{\text{service/time}}{\text{population}} + \frac{\text{experience/time}}{\text{population}}$$

As material comforts increase, it is likely "the good life" will be defined

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to a greater degree by services, such as pertaining to health, education, recreation, transport, etc. As services become more abundant, the emphasis may shift towards experiences. Services may well increase in abundance and excellence with continued growth. The quantity of experiences may also increase. However, the quality of many experiences is likely to decline, especially if the environment deteriorates seriously.

Thus, the quality of life (QL) at any place and at any period in the human history can be represented by conceptual equations as given below :

$$\text{Quality of life} \propto \text{Happiness} = \frac{\text{Acquisitions}}{\text{Desires}}$$

$$\text{or } QL = \frac{M.\ E.\ N.\ G.\ I.}{P\ \ P\ P\ H}$$

where M and E represent material and energy resources respectively, P is population, N is nutritional and health facilities, G and H are geographical and historical factors and I the average (political, social, economical, technological and legal) ingenuity factor. The plans and strategies for development can be regarded as a kaleidoscopic arrangement of these factors with their interconnections and interdependances (Fig. 1).

Environment and Law

From the United Nations Conference on "Man and His Environment" in 1972, the realzation of the crisis in the environment has appeared in legal circles. Law, of course, can contribute directly to sustaining a stable use of resource by way of environmental protection. In a time of exploding technological change, the technology and rising demands have outpaced the rate of the law's ability to create control measures. There is a gap between the existing and the needed conditions but the law has failed to fill it. In closing such a gap lies the difference between the survival and the demise of the kind of the urban-industrial civilization that has spread over the entire world since the eighteenth century.

Perhaps the greatest potential for reversing environmental deterioration and for bringing our population under control lies in effective utilization of our legal system. The new problems of local and global overpopulation and pollution clearly require new rules of conduct and new customs and in turn new laws. The present laws are failing to meet the needs of the changing society the unrestricted reproduction and pollution continue. We are today witnessing increases in violence and disorder around the world because the legal system has not changed fast enough in response to the changing needs. Such symptoms may be just a small taste of what is to come if our legal system does not more effectively assist in solving the population-environment crisis.

Laws for Pollution Control

The growth of pollution requires increasing regulation and control on both personal and governmental levels. Legislation to control pollution must, in some way, lead to controls on the types of materials produced by industry, on the location of the disposal, on the waste products that may be released into the environment and on the quantities of materials released. If we are to adequately control pollution, certain individual freedoms will have to be curtailed, such as open-trash burning production, of excessive noise, dumping waste in certain areas, etc. The environmental protection measures need to be evolved at local, national and international levels. However, it is important that emission control standards for different pollutants must be laid-down before any environmental protection legislation is considered.

The law ought to be a means of solving problems. It could take one of several approaches in enforcement of environmental protection; such as :

1. The laws should be enacted to realise pollution-tax or residual-charges proportional to the quantity of pollutant emitted. Such a scheme would encourage ecologically sound manufacturing processes. Residual charges present the polluter with a choice either dump waste and pay the fine, or deal with the waste in some other way-treat it, recycle it, store it or minimize its production. However, if the residual charge is too low, the industry will pay the low cost and allow the untreated pollutants to be dumped into environmental sinks.
2. Laws should be enacted to forbid the release of pollutants and to permit persecution of violators as felons. Polluting industries be required to purify, reduce or eliminate the effluents. Emissions should be decreased to a degree with the "available technology".
3. Laws are needed now to prohibit the use of certain substances, for example tetraethyl lead in petrol and such persistent insecticides as the chlorinated hydrocarbons.
4. For an affirmative action, a reward may be promised which would be more effective than the threat of punishment. Bonuses for not having children would certainly raise fewer constitutional questions than jail for over-reproducers. Similarly industries which are able to control and contain pollution may be rewarded. Increased support of new pollution control technology would also tend to favour environmental repair. Economic incentives may persuade polluters to refrain from despoiling the environment-a subsidy for cleaning-up,

to a greater degree by services, such as pertaining to health, education, recreation, transport, etc. As services become more abundant, the emphasis may shift towards experiences. Services may well increase in abundance and excellence with continued growth. The quantity of experiences may also increase. However, the quality of many experiences is likely to decline, especially if the environment deteriorates seriously.

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for instralling anti-pollution devices. However, criticism of subsidy approach is that it uses tax money to fight pollution caused by industry.

5. The polluter should be punished as well as forced to pay for the actual injury he had caused to the complainant.
6. Punitive damage (damage in excess of the rupee value of the injury suffered) should be permitted in cases where the polluter could have avoided some or all the pollution, This will give incentive to private individuals to initiate law suits against polluters.
7. The nuisance doctrine should be expanded to include people who are hurt by the pollution but who do not necessarily occupy nearby property.
8. Law of trespass can also assist in stopping pollution, especially invisible pollution by chemical fumes which are health hazards.
9. Individuals should be permitted to bring actions not only on their own behalf, but also on behalf of all other individuals in similar circumstances who are being affected by pollution.
10. Public-spirited scientist should be organized so that they might become a more readily available source of testimony.
11. There should be continuing public pressure to force changes in the environmental policy.
12. Municipal or governmental-owned waste recycling centres be established.
13. The environmental protection costs must be added to the total project costs at the planning phase itself.

To summarise the legal aspects of pollution, some simple economic models are presented in Fig. 2. The ideal situation will be when a manufacturing process is pollution-free (Fig.2a); an impossible situation, because industries can't help but produce some waste materials and untrapped heat energy. However, currently the industries emit a variety of toxic substances such as smoke, noise, odour, dirty-water, chemicals, gases, etc., into the environment and thereby pollute it (Fig. 2b). This situation can be regulated with law suits, when citizens make complaint to the government about the erring industry (Fig. 2c). The sanction enforcing a law will be affirmative and more effective, if it is by reward and economic incentive rather than by punishment (Fig. 2d).

Environment Legislation Hurdle

There are three difficult problems in getting effective legislative action. For example, if Parliament enacts a law regulating a certain kind

of pollution, it will leave a limited field for the local authority to control measure. The second difficulty with legislative action is that legislators are often not cognizant of new problems and some are notoriously at the back and call of established pressure groups. And last but not the least, the legal protection measures cannot save the environment, if citizens do not play an active role and they fail to offer cooperation in this respect. To arrest deterioration and destruction of the environment, everyone must feel concerned about the 'total environment' and the quality of life as such. This will necessitate population control, curtailment of demands, living in harmony with nature, growing of more and more trees (at least one big-size tree per 10 persons in a community), recycling of wastes and conservation of air, water and soil resouces (Fig. 3), However, some legislative action, may be required, nevertheless, only an inner mechanism of restraint, acting as a social conscience forbidding the individual to p epetrate certain acts, can ensure protection of the total environment *vis-a-vis* the survival of life on earth. The citizens should realize that past, present and future are very closely connected, and therefore, what has been done affects what is being done; and this in turn, determines the future.

Conclusion

The consequences of widespread environmental problems continuing into the twenty-first century are unknown. Some predict dire catastrophe : crime, starvation, war, anarchy, and drastic deterioration of environment and man's life. Today in metropolitan areas hungry people are living in crowded, dirty, polluted conditions, and such populations continue to increase. If this is allowed to happen, the man will eventually be faced with the ultimate cost—the cost paid by many past species—the cost of extinction. Therefore, for the ultimate survival of human race, the precious environment must be protected from deterioration and conserved by the men of law.

Table 1. Major Environmental Disruptions

Sector of Biosphere	Environmental resources misuse					
Nature of disruption	LAND & WATER			STRUCTURES	PEOPLE	
	Depletion	Pollution	Breakdowns	Shortages	Individual waste	Social failure
Area of disruption	1. Energy resources	6. Air quality	11. Transportation	15. Housing	17. Employment	21. Civil disorder
	2. Water sources	7. Water quality	12. Energy distribution & communication	16. Community facilities	18. Education	22. Security
	3. Wild lands & open spaces	8. Soil character	13. Solid waste		19, Health	
	4. Agricultural land	9. Noise			20. Recreation	
	5. Species	10. Visual order	14. Disaster-prone structure			

DEATH : EUTHANASIA AND THE LAW

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Introduction

With advances in Medical Science and Technology, the mortality from various diseases has substantially diminished and with a steep rise in the life expectancy of poople all over the world, geriatric morbidity has become a challange to the medical profession. Painful old age diseases that prolong the suffering of crippled elderly individuals, have time and again evoked demands from sufferers and their kith and kin for a remedy, be it by administering fatal doses of killer drugs. Besides the above, when an individual with transplantable organs is in a state of vegetative existance by prolonged resuscitative measures, the transplantation teams are posed with the problem as to when to stop resuscitation procedures to bring about an officious end to the life being prolonged. Thus the twin problem of death and euthanasia has assumed phenomenal importance of-late. As a result, therefore, the time is ripe for redefining the moment of death, for carrying out legislation to help transplantations and also to draw a line as to the extent to which the natural process of dying and death can be aided or assisted.

Moment of Death

The legal concept af the moment of death always has considerable importance in some branches of the law e. g. in relation to tort, the financial interest of surviving relatives and the payment of estate duty, but introduction of organ transplantation has given it an increasing importance.[1] In most respects medical evidence alone establishes the fact of death although as between certain life and certain death, definition is often extremely difficult. When faced with such a case, the courts decide on expert medical evidence whether or not a person is dead.[2]

Death may be taken to mean that a return to consciousness is impossible and that breathing and circulation have ceased and these must be actual facts and not opinions.[3]

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1. Martin, C. R. A., *Law relating to Medical Practice*, 1973, p. 448.
2. *Ibid.*
3. *Ibid.*

This conception of death appears to be very fast losing its credibility. There are any number of cases where the circulation and respiration have been artiffcially maintained in an unconscious patient. For instance, a twenty year old woman was kept alive in eomma for seven months in Morris Town, New Zersy[4] inspite of the parents' desire to let their daughter breath her last by switching off the resuscitative measures[5]. The parents filed a petition in the court praying for the sam: and judge Robert Muir Jr. ruled that the nature, extent and duration of care was the responsibility of physician. What justification is there to remove it from control of medical profession and plaoe it in hands of courts ? He said that there was a duty to continue the life assisting apparatus if within the treating physician's opinion it should be done. The judge also said that the decision on whether to turn off the respirator must be left upto her doctors and not to the court or church or her parents.

However in a recent case where a boy had been in comma for more than three months after being knocked down by a car, a judge in Los-Angeles signed a court order authorising the patient's father to order the doctors to halt the life support system. In contrast, Prof. Hammerli, Chief of the Medical Clinic, Jarich City Hospital was suspended and an official probe was ordered against him on suspected intentional manslaughter because pure liquid therapy was administered by him to unconscious people who had no chance of improving and often vegetated in this state for months.[7] In other words the present day medical doctor is faced with a dilemma as to whether he should sympathise with his irrevvocably moribund patients and try to assist the nature in attending the natural culmination the death or keep on trying various medicaments in his armoury with a hope (non-existing) of revival.[7a]

One of the steps being taken in many parts of the World, to ease the problem, is redefining of death. Recently the conference of Medical Royal Colleges and their Faculties in a memorandum entitled 'Diagnosis of Death', have sugg sted that a person is 'truely dead' when the brain ceases to function and not when the heart or other organs stop working.[8] Medical profession, by and large, has agreed to the concept of brain death as the real death of an individual.[9] Whether the physicians are

4. *Hindustan Ttmes,* 10-11-1976.
5. *Ibid.*
7. *Medical News,* Medicine and Law, March-April, 1976.
7a. Protection of Human rights, in the light of Scientifie and Technological Progress in Biology and Medicine, 8th CIOMS Round Table Conference, W. H. O. Geneva.
8. *Hindustan Times,* Feb. 19, 1979.
9. Camps, F. E. *Gradwohl's Legal Medicine,* 1976, pp. 50-56.

morally obliged to prolong life by artificial means or to permit death by disallowing the use of artificial sustainers if the human dimension of life has been destroyed.[10] This is a moral question which can not be ignored by Medical Jurisprudence. There are authors who do not approve of removal of organs for transplantation when brain death has been diagnosed, but before the heart has stopped beating.[11] These advocates appear to believe that the medical doctors may be over enthusiastic to declare death of a moribund patient, just to facilitate the organ transplantation to another patient in whose welfare they are more interested.

The criteria upon which the medical doctors can base their decision must be clearly established and widely accepted so as to leave them free from risk of litigation for withdrawal of care.[12] Surgeons are also concerned with transplantation of organs, which may be lawfully taken only from a dead body and not from a living one. Therefore there is an absolute need to have an ethical, legal, moral, social and technically acceptable definition for the moment of death.

The Philadelphia Protocol has very clearly defined death and its diagnosis with which any medical man can disagree.[13] It determined death on the basis of :

A. Lack of responsiveness to internal and external and environment.

B. Absence of spontaneous breathing movements for 3 minutes, in the absence of hypocarbia and while beathing room air.

C. No muscular movements with generalized flaccidity and no evidence of postural activity or shivering.

D. Reflexes and responses :

1. Pupils fixed and dilated, non-reactive to strong stimul.
2. Corneal reflexes absent.
3. Supra-orbital or other pressure response absence (both pain responsc and decerebrate posturing).
4. Absence of snouting and sucking responses.
5. No reflex response to upper airway stimulation.
6. No reflex response to lower airway stimulation.
7. No ocular aesponse to ice water stimulation of the inner car.

10. Layons, C. Organ transplans, The moral issues, 1970.
11. Calne R. *A Gift of Life,* Observation on organ transplantation, 1970. Woodruff M., *The One and the Many,* 1970.
12. Camps, F. E., (1976) *Gradwohl's Legal Medicine,* 1976, p. 54.
13. The Philadelphia Protocol (Report, 1969).

8. No deep tendon reflexes.
9. No superficial reflexes.
10. No plantar responses.

E. Falling arterial pressure without support by drugs or other means.

F. Iso-electric electro encephalogram (in absences of hypothermia, anaesthetic agents, and drug intoxication) recorded spontaneously and during auditory and tactile stimulation.

It is further laid down that these criteria shall have been present for at least 2 hours and that death should be certified by two phyaicians other than the physician of a potential organ recipient.

The Kansas Supreme Court gave a ruling in 1967 that death is complete ceastion of all vital functions without possibility of resuscitation.[14] The California Law was amended in 1974 to accept total and irreversible ce ation of brain function as indicative of death.[15] We, in India, too, are quite advanced in medical science and techoology and transplantation of organs is being carried out at various centres. In these circunstences it necessary, to decide as to the definition of death, as to when to stop the life saving durgs or artificial, mechanical prolongation of life and also as to whether we should permit euthanasia for the sole purpose of relieving pain.

EUTHANASIA

As on today, administering a killer drug or withholding or withdrawing a life saving procedure is likely to land the medical doctor into litigation on a charge of culpable homicide, as because no one has any right to take away the life of any person. Euthanasia (Eu = good, normal; Thanatos = Death) or Mercy-Killing for medical reasons should convince a logical mind for varied reasons.[16] There are certain medical conditions for which there is no known cure. Patients of advanced malignancy, autoimmune disease or even extensive Tuberculosis are very much crippled and welcome a permanent relief from the distress and suffering even it be, by the termination of life itself. Under such circumstances, if the medical science accepts its helplessness and the patient and all his well-wishers including the attending physicians, come to a unanimous opinion, that there is on other way out except giving permanent relief than by allowing him a peaceful death through a powerful drug, then is it not reasonable ?

14. Camps, F. E. *Gradwohl's Legal Medicine*, 1976, p. 51
15. California Law (1974) *Sen Francisco Chronicle*, 28 September 1974, p. 1
16. Jean Joncheves, *World Health*, January, 1976, pp. 8-12,

If the sufferer himself chooses to get a permanent relief by taking away his life, it becomes suicide. It is not a crime in many of the countries of the World and even in India the Law Commission has receommended that it be removed from list of crimes. It is well appreciated that now-a-days an attempt to commit suicide and its victim are viewed on compassionate grounds. Medical euthanasia at best becomes an' assisted suicide' if it is done with the consent of the victim and then the doctor may be liable to be punished as an .abetter.

To overcome such possibilities and to give to the suffering patient relief when medical science is otherwise absolutely helpless, the ruling of the Nagoyo High Court appears to suggest a solution. The Court laid down the following six conditions :—[17]

(i) that the victim must be suffering an incurable illness and that death is imminent.
(ii) that he must suffer from unbearable pain, obvious to anyone;
(iii) that the purpose of the mercy killing is the relief of pain;
(iv) that the ailing person's conscience is clear, and that he, in all seriousness asks for or approves the mercy killing;
(v) that it is performed by a physicians, unless that is not possible; and
(vi) that the method of killing is morally acceptable.

In a recent National poll in Britain 62 per cent of the public supported doctor assisted suicide in cases of terminal illness. Japan, Holland, Australia, France and Switzerland have strong pressure groups in the population demanding mercy killing.[18]

As for as Indian conditions are concerned, the authors are of the firm opinion that while on one hand the public opinion should be mobilised in favour of euthanasia, constitutional steps should be taken to legalise mercy killing based on the ruling of Nagoya High Court cited above. While it is not possible to delink the question of the moment of death and organ transplantation; however, they can be delinked from euthanasia by redefining death to facilitate organ transplantation. As long as brain death is not accepted as legal definition for death, removal of organs amounts to homicide and the medical doctors shall continue to face the risk of litigation.

Today, there is need for anatomical gifts legislation which permits transplantation of various organs in patients who are dead and also which

17, Mehta, H. S., *Medical Law and Ethics in India*, 1963, p. 417.
18. Chris Middleton *Northern India Patrika*, Feb. 20, 1979.

incorporates in itself the definition of death so as to mean brain death.[19] Further, the doctors may be permitted to use the organs though not willed, if they can be used for transplantation purposes, with the consent of the legal heirs. These steps will be a great boon to the transplant-needy and ailing patient. Moreover, mercy killing or euthanasia on request from a crippled, suffering and dying patient should be made legal.[20] In this regard an application may be made to a judge who may order the euthanasia after the consultation with a committee consisting of attending physicians, medical experts, lawyers, sociologists, theologians and the relatives of the applicants provided he is satisfied that death is otherwise inevitable and that the only cure for his suffering is the extination of life itself

Allowing the patient to continue to take some palliative drugs just to give a symptomatic relief from suffering is probably the line of least resistance that can be adopted by the medical profession in consonance with Hippocratic Oath.[21] But this approach neither helps organ transplantation to the needy nor gives the 'death-longing' patient any sign of permanent relief. If the doctors choose not to administer the life saving drugs or deliberately withhold or withdraw artificial ventilation that prolongs the life process, then again they face the question of negligence as also penal charge. The best remedy therefore is to have a clear cut anatomical gifts statute incorporating the definition of death and also to have a legal sanction for euthanasia under specific situation as explained above.

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19. Walts, J. R. and' Inbau, F. E., *Medical Jurisprandence*, 1971, pp. 220-232.
20. *Medicine, Science and Law* Oct., 1978.

HIPPOCRATIC OATH

I swear by Apollo Physician, by Asclepius, by Health, by Heal-all, and by all the gods and goddesses, making them witnesses, that I will carry out, according to my ability and judgement, this oath and this indenture.

To regard my teacher in this art as equal to my parents; to make him partner in my livelihood, and when he is in need of money to share mine with him; to consider his offspring equal to my brothers; to teach them this art, if they require to learn it, without fee or indenture; and to impart precept, oral instruction, and all the other learning, to my sons, to the sons of my teacher, and to pupils who have signed the indenture and sworn obedience to the physicians' Law, but to none other.

I will use treatment to help the sick according to my ability and judgement, *but I will never use it to injure or wrong them.* I will not GIVE poison to anyone though asked to do so, nor will I suggest such a plan. Similarly I will not give a pessary to a woman to cause abortion. But in purity and in holiness, I will guard my life and my art. I will not use the knife on sufferers from stone, but I will give place to such as are craftsmen therein.

Into whatsoever houses I enter, I will do so to help the sick, keeping myself free from all intentional wrongdoing and harm, especially from fornication with woman or man, bond or free.

Whatsoever in the course of practice I see or hear (or even outside my practice in social intercouse) that ought never to be published abroad. I will not divulge, but will consider such things to be holy secrets.

Now if I keep this oath and break it not, may I enjoy honour, in my life and art, among all men for all time; but if I transgress and forswear myself, may the opposite befall me.

A SELECT BIBLIOGRAPHY ON THE INTERACTION OF SCIENCE, TECHNOLOGY AND LAW IN INDIA

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Break-up of the Bibliography :

O General.

I. Social Consequences of scientific and Technological Development with particular reference to India and the Demands of the Society.

II. The Bearing of Scientific and Technology change on Indian Legal System and *Vice Versa*.

(A) Relevant Acts passed by the Indian Parliament.

(B) Relevant Books, articles, etc.

III. Scientific and Technological change and the Implications for Legal Education.

List of abbreviations used in citations of Periodicals :

AALCC Rep : Asian-African Legal Censultative Committee Reports.

AAZ : Annals of Arid Zene.

Adel L Rev : Adelaide law Review

AICC Econ Rev : All India Congress Committee Economic Review

AIR Jl : All India Reporter (Journal Section)

AJIL : American Journal of International Law

AL : Asian Labour

An LT : Andhra Law Times

ASIL Prec : American Society of International Law : Proceedings

Aust LJ : Australian Law Journal

Br J Crim : British Journal of Criminology.

Bull Czech : Bulletin of Czecheslevak Law

BYBIL : British Year Book of International Law

Can B Rev : Canadian Bar Review

CBI Bull : Central Bureau of Investigation Bulletin

* Law School Library; Banaras Hindu University,

C EV : Current Events

Columbia JTL : Columbia Journal of Transnational Law

Columbia L Rev : Columbia Law Review

CS : Chartered, Secretary

CWN : Calcutta Weekly Notes

DLR : Delhi Law Review

Econ Dev & CC : Economic Devclopment & Cultural Change

EPW : Economic & Political Weekly

F A Rep : Foreign Affairs Report

FTR : Foreign Trade Review

GM : Gandhi Margy.

Harv L Rev : Harvard Law Review

IAMR : Indian Administrative and Management Review

I & Rev : Indian and Foreign Review

I. SO : International & Comparative Law Quarterly

IESHR : Indian Economic & Social History Review

IIA : Indian Industries Annual

IJAE : Indian Journal of Adult Education

IJIL : Indian Journal of International Law

IJIR : Indian Journal of Industrial Research

IJPA : Indian Journal of Public Administration

IJPRVD : Indian Journal of Power & River Valley Development

IJSR : Indian Journal of Social Research

IJSW : Indian Journal of Social work

IO : International Organisation.

IPJ : Indian Police Journal

IQ : Indian Quarterly

IYBIA : Indian Year Book of International Affairs

JBCI : Journal of Bar Council of India

JIER : Journal of the Institute of Economic Research

JILI : Journal of the Indian Law Institute

JIT ; Journal of Industry & Trade

JLSAA : Journal of Lal Bahadur Shastri Academy of Administration.

L&CP : Law & Contemporary Problems

L & S : Law and State

LQ Rev : Law Quarterly Review

LR : Law Review (Chandigarh)

L Sec Gaz : Law Society of Upper Canada Gazette

LU : Lok Udyog

MLJ : Madras Law Journal

Modern L Rev : Modern Law Review

Netherland IL Rev : Netherland Internationai Law Review

RBI Bnll : Reserve Bank of India Bulletin

SA : Social Action

SCJ : Supreme Court Journal

SSS : Social Studies of Science

Ta :Taxation (Delhi)

Tax L Rev : Tax Law Review

Tech & C : Technology and Culture

UMKCL Rev : University of Misseouri-Kansas City Law Review

U Pa L Rev : University of Pennsylvania Law Review

VUWL Rev : Victoria University of Wellington Law Review

YBASL : Year Book of Air and Space Law

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III. SCIENTIFIC AND TECHNOLOGICAL CHANGE AND THE IMPLICATIONS FOR LEGAL EDUCATION.

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