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# SCIENCE, HEGEMONY AND VIOLENCE

*A Requiem for Modernity*

Edited by

ASHIS NANDY

The United Nations University's Programme on Peace and Global Transformation was a major world-wide project whose purpose was to develop new insights about the interlinkages between questions of peace, conflict resolution, and the process of transformation. The research in this project, under six major themes, was co-ordinated by a 12-member core group in different regions of the world: East Asia, South-East Asia (including the Pacific), South Asia, the Arab region, Africa, western Europe, Eastern Europe, North America, and Latin America. The themes covered were: Conflicts over Natural Resources; Security, Vulnerability, and Violence; Human Rights and Cultural Survival in a Changing Pluralistic World; The Role of Science and Technology in Peace and Transformation; The Role of the State in Peace and Global Transformation; and Global Economic Crisis. The project also included a special project on Peace and Regional Security.



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A project such as this depends as much on the living intellectual traditions outside the academia as on earlier academic work. It would be unjust not to make at least a passing reference to the traditions of intellectual understanding kept alive in South Asia by those nameless groups and communities who have dared to defy conventional, agreed-upon categories of the knowledge industry, and encouraged us to argue our case in such detail.

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ASHIS NANDY

## I

# Introduction: Science as a Reason of State

ASHIS NANDY

The thinking person cannot but notice that since the Second World War, two new reasons of state have been added to the traditional one of national security. These are science and development. In the name of science and development one can today demand enormous sacrifices from, and inflict immense sufferings on, the ordinary citizen. That these are often willingly borne by the citizen is itself a part of the syndrome; for this willingness is an extension of the problem which national security has posed over the centuries.

Defying protests by (and to the mortification of) pacifists and anti-militarists, a significant proportion of ordinary citizens in virtually every country have consistently and willingly died for king and country. There are already signs that at least as large a proportion of citizens is equally willing to lay down their lives heroically for the sake of science and development. In 1985, one Japanese doctor praised the atomic bombing of Hiroshima and Nagasaki for the indirect benefits they have brought to Japan. In an election held soon after the gas tragedy in 1984, the affected citizenry of Bhopal returned the same regime to power that shared the responsibility for the disaster. Likewise, demands for new steel mills and large dams often come from the very regions and sectors in the third world which are most likely to be the first victims of industrialization.

What are the sources of such commitment to the development of science, and the science of development? Can one identify and challenge the philosophical and ideological framework within which the commitment is located? Can one not

go beyond shedding tears copiously over the misuse of modern science by wicked politicians, militarists and multinational corporations, and scrutinize the popular culture and philosophy of modern science? May the sources of violence not lie partly in the nature of science itself? Is there something in modern science itself which makes it a human enterprise particularly open to co-optation by the powerful and the wealthy?

These questions have been with us ever since Archimedes devised new weapons for his city state with the hope that they would remain the monopoly of his country and not also become the property of the ungodly. But the questions had a different ring for a long, long time. From the halcyon days of Archimedes to the heady days of early colonialism, science was primarily an instrument, not an end; certainly not the end of any nation or state. Even the states which drew the most handsome economic dividends from the discoveries of modern science and technology, or justified global dominance by referring to their scientific and technological power—I have in mind the nineteenth century colonial powers—did not see science as a reason of state. The reader may remember popular anecdotes about colonial adventurers, or scientifically-minded explorers who sometimes scared off or impressed the natives of Asia and Africa with new forms of black magic based on the discoveries of modern science. The civilizing mission of colonialism thrived on this folklore of encounter between western science and savage superstitions. But in each such instance, it was science that was put to the use of the colonial state; the state was not put to the use of science.

The nature of science has since then changed, and so has the nature of human violence. We are concerned in this volume with these changes and their interrelationships. It is the contention of the essays put together here that these changes can be understood with reference to the mediatory rôle played by the modern nation-state, the invitation which the culture of modern science extends to state power to use scientific knowledge outside the reaches of the democratic process and, above all, the growth of institutionalized violence in place of the personalized, face-to-face, impassioned violence associated with traditional concepts of sacrifice and feuds.<sup>1</sup>

Ivan Illich has traced the contemporary idea of development to a speech President Harry S. Truman made in 1945.<sup>2</sup> Till then, the word 'development' had had other associations which had very little connection with what we understand by development today. But such was the latent social need for a concept akin to development that, once Truman gave it a new meaning, not only did it quickly acquire wide currency, it was also retrospectively applied to the history of social change in Europe during the previous three hundred odd years.

In a similar way, we can trace the idea of science as a reason of state to a speech made by President John F. Kennedy in 1962. The speech declared one of America's major national goals to be the scientific feat of putting a man on the moon. Though mega-science had already become an important concern of the state during the Second World War, science was, for the first time, projected in Kennedy's speech as a goal of a state and, one might add, as a substitute for conventional politics. A state for the first time on that occasion sought to out-rival another state not in the political or military arena, nor in sports, but in science redefined as dramatic technology. The formulation might have been older and might have been tried out haphazardly earlier but never had it been made so directly a part of the mainstream idiom of politics as in Kennedy's speech. Perhaps Kennedy was reacting to the Russian claim that the Sputniks showed the superiority of the socialist system and, especially, that of 'scientific socialism'. Perhaps he was trying to strengthen his political image as a leader who could help American society to cope with the scientific age. Whatever the reason, for the first time Kennedy's speech showed that a wide enough political base had been built in a major developed society for the successful use of science as a goal of state and, perhaps, as a means of populist political mobilization. Spectacular science could be now used as a political plank within the United States in the ideological battle against ungodly communism.

Kennedy's speech had another implication. The boundary between science and technology had been softening for about two hundred years. The histories of science and technology could at one time be written separately. But since the early years of the Royal Society, modern scientists had intermittently been

seeking legitimacy not only from the philosophical implications of their theories but also from the practical pay-offs of science. The process reached its symbolic culmination in Kennedy's concept of science—a concept which not merely incorporated technology; it gave spectacular technology the central place in science. The speech in fact anticipated the vision which occupies so much space in the popular culture of our day, namely, the image of a science which, by the beginning of the twenty-first century, will be coterminous with technology. By the mid-1980s the proportion of pure scientists to all scientists in the world had fallen to less than five per cent, and the proportion is reportedly falling at a faster rate now. The pure scientist today is an even rarer species than the scientist who does not participate in military research and development.

Yet, at the same time, we can be reasonably sure that the concept of pure science and the conceptual difference between science and technology will be carefully retained. It will be retained not because of the demands of the philosophers of science but because it is only by distinguishing between science and technology that all social criticism of science can continue to be deflected away from science towards technology. A shadowy, ethereal concept of science that has little to do with the real-life endeavours of practising scientists can then be politically defended as the pursuit of truth uncontaminated by human greed, violence and search for power.

The studies assembled in this volume have these two basic issues—science as a new justificatory principle, and science as technological intervention—as their points of theoretical departure. However, these issues also intersect with a cultural dimension: all the studies are by Indian scholars and have primarily the Indian experience as their backdrop. This is only partly due to the accident of having an Indian editor for this volume. I shall argue that things could hardly have been otherwise.

India has been a remarkable example of an open society in which, since the early years of independence, the political élites have deliberately chosen to see science as the responsibility of the state and have, at the same time, treated it as a sphere of knowledge which should be free from the constraints of day-to-day politics. Every society decides what content to give to its

politics and what to keep out of politics. The Indian state, representing the wishes of a powerful section of the nationalist movement and being led in the early years of independence by Jawaharlal Nehru, a gentleman Fabian steeped in the nineteenth-century vision of human liberation through science, decided to keep the practice of science outside politics but ensured that the scientific estate had a direct, privileged access to the state. It was as a part of this 'double vision' that Nehru, the modern élites which gathered around him, and the Indian state began to build science as a major source of justification for the Indian state as well as for their political dominance. That the formula did not keep science out of politics but only introduced another kind of politics into science is one of those paradoxes which lie at the heart of the distinctive relationship between science and society in contemporary India.

Thus, to mention a sector which enters the pages of this book often enough, the powers and freedoms that were given to nuclear scientists in India since the days of Homi Bhabha, India's first nuclear boss, were near-total. Firstly, nuclear scientists were freed from all financial constraints. The budget of the nuclear programme—the entire budget, not the budget devoted to research and development—was routinely pushed through parliament without any scrutiny whatsoever. And the expenditures—the entire expenditure, not only the expenditure on laboratories—were never publicly audited. All data on performance—this often boiled down to data on performance failures, unsafe technology and insufficient regard for human rights—were protected by law from the public gaze. And all enquiries made from outside the nuclear establishment were pre-empted with the help of a special act which made it impossible to mount any informed, focused, data-based criticism of India's nuclear programme.<sup>3</sup>

Secondly, nuclear scientists were given enormous scope for research if they moved out of the universities into special research institutions. While universities were starved of funds and allowed to decay, research institutions were richly funded. This might not have been a matter of deliberate policy but it certainly set a context to India's nuclear policy, because what scientists gained in research opportunities in the new institutions, they lost in personal political freedom. As I have already

said, the specialized institutions set up by the state were strictly guided by the requirements of secrecy and political 'clearance'; they were expected to be professional, not academic. In other words, a systematic split between political and intellectual freedoms was institutionalized in this area right from the beginning and every young nuclear scientist was forced to choose between the two kinds of freedom.

Thirdly, once some of the finer minds of India were netted by the state in this manner and some of the less scrupulous among them were given access to power, the Indian nuclear programme could be safely handed over to the civilians; the army or the defence ministry did not need to be in the picture at all. The nuclear scientists could be their unofficial proxies. Thus, India's first nuclear explosion in 1974 was a civilian enterprise, with the army only playing second fiddle. Civilian scientists planned, initiated and executed the programme; the army and defence scientists played a peripheral role, providing organizational back-up, on-site security, and control or management of the villagers to be uprooted.

In fact, contrary to popular stereotypes, modern science or scientists in India have not been used by blood-thirsty generals, scheming politicians, and greedy businessmen. Rather, the science establishment, on its own initiative, has taken advantage of the anxieties about national security and the developmental aspirations of a new nation to gain access to power and resources. Not surprisingly, the record of mainstream scientists in India has been particularly poor in the matter of protecting democratic rights in the country. In fact, in recent years the privileged among Indian scientists have often been the most vigorous critics of civil rights groups struggling for protection against the hazards of a callous nuclear establishment.

I give the example of the Indian nuclear establishment not to make a scapegoat out of it but to draw attention to the manner in which the link between science and violence in India has been strengthened by forces within the culture of Indian science, forces which in other cultures of science in some other parts of the world have been either less visible or less powerful.

The curious case of the nuclearization of India has not one but three morals to it. First, as modern science gets more and

more incorporated into technology, it necessarily has to be increasingly justified in terms of technology. The frequent exhortations to have a more 'scientific temper' (exhortations to which all Indians, but particularly the 'less civilized' traditional Indians, are subjected by the scientific and political establishments) and the repeated references to the scientific worldview as a philosophical venture in learned seminars in India are not taken seriously by 'normal' scientists (who do 'normal' science à la Thomas Kuhn), or by their political patrons and their admirers. For both, the slogan of the 'scientific temper' is a means of legitimizing their new-found status in Indian society. Both like to define the 'temper' as the spirit of technology and the instrumentalism which is an inescapable part of that spirit. The invocation of the 'temper' almost invariably goes with a negative reading of India's traditional cultures and ways of life, seen as impediments to a modern technological order, and with the search for uncritical legitimacy for all forms of technology—seen as an undifferentiated mass of knowledge, institutions and persons.

As a result, conspicuous technology has become gradually the official goal of science in India, as well as the main source of legitimacy for science among the Indian middle classes. Thanks to the media, government-controlled as well as uncontrolled, and thanks to the values propagated by the westernized education system, the Indian middle classes have come to see science as primarily spectacular technology. They expect this technology to allow the country to tackle its basic political and social problems and thus ensure the continued political domination of an apolitical, that is technocratic, modern élite over the decision-making process, defying the democratic system. This expectation partly explains why science is advertised and sold in India the way consumer products are sold in any market economy, and why it is sought to be sold by the Indian élites as a cure-all for the ills of Indian society.<sup>4</sup> Such a public consciousness moves from one euphoria to another. In the 1950s and 1960s, it was Atom for Peace, supposedly the final solution of all energy problems of India; in the '60s and '70s it was the Green Revolution, reportedly the patented cure for food shortages in the country; in the '70s and '80s it is Operation Flood, the talisman for malnutrition through the easy availability of

milk for every poor household in the country. In this environment it does not matter whether the technology is innovative or replicative, moral or immoral, obsolete or new. For technology comes to represent an escape from the dirtyness of politics; it becomes an indicator of Brahminic purity, a form of social change which ensures a place in the sun for portions of the middle classes whom the democratic process otherwise tends to marginalize, an anxiety-binding agent in the public realm, and often a media-based exercise in public relations. That is why, as with nuclear science, the adaptation in India of decades-old western technologies are advertised and purchased as great leaps forward in science, even when such adaptations turn entire disciplines or areas of knowledge into mere intellectual machines for the adaptation, replication and testing of shop-worn western models which have often been given up in the west itself as too dangerous or as ecologically non-viable.

The second moral of the story is more disturbing. Because the concept of science in this model of scientific growth is that of the ultimate key to all problems facing the country, scientists subscribing to the model can lay claims to the charisma which in some other political cultures belongs exclusively to god-kings. In the process, scientists become one of the two ultimate sources of legitimacy for the Indian state among the middle classes—the others, as I indicated at the beginning, are development experts and experts on national security. These three kinds of specialists—the scientists, the developmentalists and the security experts—are the ones to assess and pass final judgement on Indian culture, on what is good in it and what is defective. Generally it turns out that what is good in the Indic civilization, according to these specialists, is exactly that which is good for modern science and what is defective in the civilization is exactly that which impedes modern science. Predictably, this presumption of a total fit between the needs of a good society and the needs of modern science leaves no scope for any assessment and evaluation of scientists by non-scientists, particularly by those rooted in the 'little cultures' of India. Nor does it give any scope for instituting controls on the scientific establishment through a competitive political process and democratic participation.<sup>5</sup>

The political asymmetry or inequality between the scientist

and the laity is endorsed not only by the concept of expertise which dominates the culture of modern science globally, but also by a philosophy of science which allows the laity to criticize modern science only in terms of its use value, that is, its social and political deployment and not in terms of its end values, that is, the social and philosophical goals and assumptions built into the heart of the culture and the text of modern science. Even this limited criticism of the social and political relationships of science has to be ventured, to be audible to the modern world, in terms of the criteria specified by the dominant philosophy of modern science itself. Thus, a plethora of critical evaluations of the practice of modern science in recent times have ended up by arguing, rather pathetically, that they, the evaluations, are motivated more by the spirit of modern science than the normal practitioners of modern science themselves, that the criticisms are in fact congruent with the latest discoveries of post-Einsteinian physics, microbiology and post-Freudian social psychiatry. From Erich Fromm to Fritjof Capra to Maharishi Mahesh Yogi, it is roughly the same story.

The third moral of the story is even more painful. By the very nature of its instrumental-managerial orientation to Indian society, modern science has established a secure relationship with the philosophy and practice of development in India. Indian developmentalists are now faced with the obvious fact that the developmental vision cannot be universalized, for the earth just does not have the resources for the entire world to attain the consumption levels of the developed west. It does not have such resources now, nor will it have them in the distant future. The developmentalists, therefore, have a vested interest in linking up with the drive for theatrical science to create the illusion of spectacular development which, in essence, consists of occasional dramatic demonstrations of technological capability based on a standard technology-transfer model. Under this model, highly visible short-term technological performance in small areas yields nation-wide political dividends. This model includes a clearly delimited space for 'dissent', too. While some questions are grudgingly allowed about the social consequences of technology—about modern agronomy, large dams, hydel projects, new dairy technology, modern health care systems, space flights, Antarctica expeditions, et cetera—no question can

be raised about the nature of technology itself.

Roughly similar links have grown between science and the elite perceptions of the security needs of India. Like other third-world societies such as Brazil, India too has begun to show a high growth rate and export potentials in defence-related industries and, like some developed societies such as France and the United States, India, too, is perfectly willing to make security anxieties a central plank of its political identity.

Apparently, what Robert Jungk says about nuclear energy holds good for modern science in general.<sup>6</sup> Namely, that modern science has the capacity within it to sustain a culture of science which is incompatible with democratic governance as well as with the democratic rights of those who are turned into the subjects of modern science and technology. In India at least, the culture of modern science *has* built an inverse relationship with the culture of open politics and has begun to produce new forms of secrecy, centralization, disinformation and authoritarian organizational structures. Nuclear science in this respect has only been true to the overall cultural design of modern science and technology in the country.<sup>7</sup>

Science, I have said, has become a new reason of state. The state and its various arms can kill, maim or exploit in the name of science. Science in turn, as a *raison d'état*, can inflict violence in the name of national security or development and—this is the change—increasingly under its own flag and for its own sake. There are now scientists, political leaders and intellectuals in India—as in other similarly placed societies—who are perfectly willing to close the polity if that ensures faster scientific growth. And there are now scientifically-minded Indian citizens who are as willing to sacrifice millions of ordinary Indians to advance the cause of science and science-based development.

In such a world, the intellectual challenge is to build the basis of resistance to militarization and organized violence, firstly by providing a better understanding of how modern science or technology is gradually becoming a substitute for politics in many societies, and secondly by defying the middle-class consensus against bringing the estate of science within the scope of public life or politics. This plea for the repoliticization of science

—by which I primarily mean the political audit of science by those outside the estate of science and by its victims, not state control or mechanical parliamentary or legislative scrutiny—will not be popular with those who run the one-million-strong Indian estate of science, the world's third-largest mass of scientific manpower, nor with the urban middle classes, increasingly hostile to the idea of politics. But it might be more acceptable to those seeking to survive the loving embrace of an increasingly violent science and an increasingly violent model of scientific development at the lower rungs of Indian society.

Fortunately, India also happens to be a country where the intellectual tradition—if for a moment we forget the colonial overtones of such a statement—is truly bicultural. It has had six hundred years of exposure to the west and at least two hundred years of experience in incorporating and internalizing not merely the west but specifically western systems of knowledge. It need not necessarily exercise the option that it has of defensively rejecting modern science *in toto* and falling back upon the purity of its traditional systems of knowledge. It can, instead, choose the option of creatively assessing the modern system of knowledge, and then integrating important segments of it within the frame of its traditional visions of knowledge. In other words, the Indic civilization today, because it straddles two cultures, has the capacity to reverse the usual one-way procedure of enriching modern science by integrating within it significant elements from all other sciences—premodern, non-modern and postmodern—as a further proof of the universality and syncretism of modern science. Instead of using an edited version of modern science for Indian purposes, India can use an edited version of its traditional sciences for contemporary purposes.

This argument can be pushed in another direction. Contemporary India, by virtue of its bicultural experience, manages to epitomize the global problem of knowledge and power in our times. There is a continuity between the Indian experience of an increasingly violent modern science, encroaching upon other traditions of knowledge and social life, and the western experience with modern science as the dominant cultural principle resisting the emergence of new cultures of knowledge. There is a continuity between the experiences of the two civilizations

even at the level of élite and middle-class responses to the situation. The modern Indian élites and middle classes have a fear of the present, explained away, with the help of some forms of history, as only a fear of the past. The western élites and middle classes have a fear of the future, explained away, with the help of some forms of futurology, as only the fear of a future unrestrained by or disjunctive with the present. Evidently, the élites of both worlds have in common the ambition of containing the future by controlling the present politics of knowledge. The former fear the process of democratization of India which is marginalizing them; the latter fear the possibility of future democratization of the world which will marginalize *them*. And, as if to spite those who pin their hopes in matters such as this on generational changes, on the expectation that the youth will liberate them from the certitudes of the past, in India the emerging middle-class élites seem to nurture the same hope of substituting science for politics, because politics for them is irrational and messy, and science is rational, neat and controllable. Meanwhile in the west a project takes shape which seeks to derive all politics from science for roughly the same set of reasons.

Put simply, the challenge for the movements for alternative science and technology in the west is to generate new knowledge in the future by participating in the politics of knowledge today. But to participate meaningfully in the politics of knowledge today, they must take into account and build upon the ongoing intellectual and political battles in societies where alternatives, or at least alternative baselines, exist in the present, in the form of traditional systems of knowledge that have survived and are struggling against the hegemony of modern science. In India, traditional systems of knowledge may not have provided ready-made solutions to the present crisis of knowledge and power, but they have certainly become a part of the repertoire of the dissenting movements of science. Seen thus, the crisis of science in India becomes, for all practical purposes, coterminous with the crisis of science globally. And the crisis of global science, in turn, becomes an extension of the Indian experience with modern science over the last 150 years.

The essays in this volume and the volumes which will follow

take up the intellectual challenge of these linkages between science, violence and culture in the east and west, and the role which the modern nation-state and the ideology of development have begun to play in these linkages. They provide a critique of the domination and violence which accompany modern science not as part of a 'mystical', 'life-denying' or 'ascetic' attempt to return to the so-called purity and innocence of pre-modern India but as one aspect of the point of view of marginalized Indians who have less and less voice in the 'expert' decisions which shape their lives, and who often have to use the language of mysticism and life-denial to resist being brainwashed into applauding each onslaught on their dignity, autonomy and survival as a momentous achievement of the modern Indian nation-state.

These essays seek to give voice to such semi-articulate protests. That is why the essays make no clear distinction between what is supposedly sacrosanct about modern science and what is by common consent lamentable about it, between that which is professionally admissible as a critique of modern science and that which is not. Nor do they pretend to be impartial according to the idea of impartiality which modern science seeks to impose on the laity. Together, the essays try to make a case the way a task force or a research team in a modern scientific laboratory pursues one particular hypothesis to the exclusion of others. It is for the readers and the intellectual community to judge if the case has indeed been made.

In this, our first volume, we concentrate on three aspects of the relationship between science and violence. The volume opens with an essay which examines the issues of dominance and violence as they are encoded in the cosmology that gets telescoped into the culture of modern science. Jatinder Bajaj is concerned with the way power has become—and indeed must become—central to the enterprise called modern science. His ironic essay is not only a biographical enquiry into the 'genetic equipment' of modern science, it is also a philosophical audit of the scientific vision and values of Francis Bacon, popularly viewed as the father of modern science and its first and most important philosopher. Bajaj argues that violence is written into Bacon's concept of true and useful knowledge, in his home-centric vision of the natural world, and in his masculine per-

ception of nature, including human nature. To Bacon nature was an enemy which needed to be defeated and tortured—the expression was his—so that its secrets or powers could be extracted for the benefit of the human race. Thus not only was he the first to provide philosophical legitimacy to the human quest for omnipotence and omniscience through science, he was also the first to reconceptualize the non-human cosmos as an experimental subject fit only for manipulative intervention. It is implicit in Bajaj's argument that what at one time may have looked like innocent metaphors about the natural world are now major clues to the character of science in our times. For the scientific enterprise, which attained its full stature in the two world wars, had actually been worked out in some detail two centuries earlier, by the acknowledged father of modern science himself.

Bajaj, while not dealing directly with the issue of culture or with the cultural context which produced the inner contradictions and ambivalences of Bacon, nevertheless includes in the analysis a significant cultural critique. The critique, ventured with the help of three examples, proposes that at some plane the Baconian worldview fits the concept of true and useful knowledge in the European worldview. The fit explains, according to Bajaj, why even those who want to break out of the Baconian grid end up by accepting the two basic Baconian premises that (1) the positive sciences yield absolute truths and (2) the western hegemony in science and/or life is inevitable, for the hegemony is ultimately based on Baconian truths about the natural world and on Baconian methods of reaching these truths. That Bajaj uses as his examples three of the best-known post-positivist thinkers—Thomas Kuhn, Joseph Needham and Edmund Husserl—gives his analysis especial relevance and, one might add, poignancy.

In the second essay, Claude Alvares locates the main argument of the first essay in a larger and more contemporary political framework. Alvares provides an impassioned social and philosophical survey of the domain in which knowledge and power intersect in a politically hierarchized world, and examines the bonds between science, colonialism and violence. In the process, he makes a case for what philosopher Ram Chandra Gandhi calls a self-conscious 'cognitive indifference' towards

Galilean science and its products, for, in fact, a luddite vision.

Alvares organizes his paper around the assumptions and consequences of the scientific method. He argues that the scientific method itself has become not only anti-rational, it has become culturally and socially oppressive, ecocidal and generally anti-life. Using two overlapping 'scales of restrictions', one representing the continuum from pure experience to pure abstraction, the other from organism/nature to machine/science, he argues that modern science has come to represent the end of the continuum where abstractions and machines predominate. To the extent modern science seeks to replace the experiential by the ahistorically abstract, and the natural by the man-made (or rather expert-made), it has to have an expansionist thrust, and it must necessarily deny democratic participation in the production, validation and evaluation of scientific knowledge. This process cannot but lead to close links between science and violence. Alvares draws upon individuals and movements which represent the experiential apprehension of the natural world, providing a philosophical baseline both for the social criticism of science and for the exploration of new forms of knowledge reflecting the visions of those who live in—and with—the world of experience, which are simultaneously a compassionate statement on nature and on human nature. On the basis of the work of these individuals and movements, Alvares suggests that social critics and political activists in the third world will have to move towards a luddite position to defy the middle-class demands for 'sane', 'constructive' criticisms of the 'mis-applications' of science in our times.

In the next essay, Shiv Visvanathan develops some of the themes implicit in the second part of Bajaj's essay. Visvanathan's analysis explores the scope and limits of the contemporary liberal critiques of modern science and technology through a sociological scrutiny of the popular works of Robert Jungk on the social and historical contexts of nuclear weapons, development and nuclear energy. Using the example of individual scientists, Visvanathan argues that the life histories of the major nuclear physicists in this century have been a movement from innocence, freedom and conviviality—from play, discovery and *communitas*—to the tyranny of secrecy, control and, in some cases, elatory nihilism. The biographies reflect not

so much the varied responses of scientists to science and society as the prototypical relationships between nuclear science and the scientists' self-defined social responsibility, which in turn reflects the culturally-defined relationship between knowledge and power in the modern west.

These larger psychological and cultural forces, Visvanathan suggests, are mirrored in the works of Robert Jungk, read as a documentation of public awareness and as a testament to the liberal imagination. Jungk's works identify three major changes in the movement from pre-war to post-war science: 'the de-generation of science as a play form; the shift within science from epistemic uncertainty to vivisectionist hegemony; and the displacement of science from the university to the company town'. Visvanathan deals with each of the three changes in considerable detail and, later, in the essays by Veena Das and Vandana Shiva, the last two processes of change re-emerge as perceived problems in popular imagination, people's movements, and in the popular philosophy of science. In Shiva's work particularly, Visvanathan's analysis of the issue of survival, of both humanity and nature, in its encounter with the disembodied structures of modern science comes full circle.

The human predicament of confronting science-as-disembodied knowledge is also the major theme in the following essay. In it Manu Kothari and Lopa Mehta grapple with the elusive problem of the sources of violence in the disciplinary culture of modern medicine. They search for these sources in (1) the worldview of modern medicine which perforce stresses diagnosis, investigation and intervention, even where none of them can be of any use whatsoever to the patient or to the process of healing; (2) the self-interest of the doctor, the hospital, the pharmacist and the multinational pharmaceutical company—all of which have become interdependent institutions under the regime of modern medicine; and (3) the nature of the expectations the lay persons have from modern medicine, expectations which modern medical specialists have encouraged and nurtured. Kothari and Mehta's elegantly wry essay should be read as an analysis of how the doctor gets caught in his self-created image of being omniscient and omnipotent and how the specific links between knowledge and power work in practice in the modern system of healing.

Unlike the first three essays, Kothari and Mehta end their critique with outlines of a prospectus for a nonviolent science of medicine which would be a syncretic structure of both modern and nonmodern forms. The liberation of modern medicine lies, they seem to argue, not in the sophisticated criticisms offered from within the bounds of formal medical sociology and medical anthropology, but in the everyday morality of the ordinary citizen, in the wisdom of the body, and in the very different kind of intervention which bases itself on the philosophy of non-intervention. (In a recent paper T. S. Ananthu has argued that the creative powers of some like Masanobu Fukuoka, alternative agronomist and the author of *One-Straw Revolution*, come precisely from a worldview which rejects over-intervention in and over-manipulation of nature; it is a worldview which enjoins one to do what one cannot but do, untouched by and beyond the reach of the modern concept of intrusive activism.)<sup>8</sup> In this respect Kothari and Mehta take to logical culmination the anti-professionalism implicit in Alvares' essay.

Veena Das handles the issue of the everyday morality of ordinary citizens in a different way. She examines in her work the popular construction of the links between science and violence in the modern west, and suggests that an awareness of the nature of the problem and a radical criticism of modern science subtly inform popular literature even in the science-dominated societies of the west. Analysing the works of the popular writer of science fiction, Ira Levin, she shows how he indirectly acknowledges that an understanding of contemporary evil requires examination of the way any system of knowledge becomes a new source of violence and oppression, once it has acquired power or the capacity to bestow power.

In the four paradigmatic situations which Das defines with the help of Levin's novels, human ordinariness is seen simultaneously as a cause of, a protest against, and a protection from the violence induced by four orders of technology. In the first case violence comes from the technology of magic, from witchcraft in a modern apartment house which produces the ultimate evil as a byproduct of everyday greed and competitiveness. That evil in turn is offset against the innocence and humane instincts of everyday life which protect the violated

from being fully brutalized (*Rosemary's Baby*). In the second case, technology seeks to duplicate the satanic in everyday life through genetic engineering, by using the rhythm of parent-child dynamics and by carefully and 'scientifically' altering the developmental milestones of normal childhood. The plan is subverted by less ingenious minds, operating from within the bounds of normality (*The Boys from Brazil*). In the third situation, violence is connected with the magic-like technology of robotics within the boundaries of a relatively isolated community. The violence comes in a sanitized form as a consequence of attempts to actualize middle-class daydreams derived from the world of advertisements and commercials. Once again, ordinary, unheroic womanliness provides the critical consciousness which sees through placidity, order and community feelings and uncovers the hidden core of technological terror, even though in the process of this discovery the source of the critical insight is herself destroyed (*Stepford Wives*). The fourth situation is that of a magic-less, total technology of a society which is in a state of perfect violence through not being unnecessarily violent, and by not allowing violence to become an end in itself. The technology of control is so perfected in the society that the accidentally uncontrollable has been given a place in the decision-making structures of the society. This higher-order co-optation is seen through and subverted by a person with human imperfections, motivated by the alternative rationality and wisdom associated with ordinariness (*This Perfect Day*).

In all four situations, the most fearsome part of technology, as recognized by the popular consciousness projected into the novels, is the way dissent is destroyed or sought to be destroyed—through a direct, demonic technology of anti-rational violence deployed rationally (*Rosemary's Baby*), by hiding a source of future nihilistic violence, the Hitler gene, under the 'benign' psychotechnology of everyday child rearing (*The Boys from Brazil*), through semi-institutionalized scientific violence (*Stepford Wives*), or by fully institutionalizing a science of violence which is so perfectly structured and monitored that, paradoxically, it does not have to be violent (*This Perfect Day*). In the process, we are made aware that while violence is ubiquitous, it acquires a particular tonality when it enters human relationships riding piggyback on modern science and technology.

Vandana Shiva returns to the issues raised by Alvares, Kothari and Mehta through a different route—she deals with the growth, dominance and possible decline of a science which is quintessentially reductionist and, thus, necessarily violent. This violence is directed not merely towards the objects and alleged beneficiaries of modern science but also towards its subjects and, ultimately, towards scientific knowledge itself. Using examples of violence inflicted through and by science and of popular resistance to it in agriculture and health, Shiva argues that the regime of a violent, reductionist science typifies a compact between modern capitalism represented by the multinational corporations, and the third-world élites, won over through a share of the profits from such science and through slogans about progress, development and the scientific temper.

The most damaging—some may say, encouraging—part of Shiva's critique is her reference to the self-destructive capabilities of modern reductionist science. Not only does such a science cut off its practitioners from each other in the name of specialization, it also pushes into the scientific unconscious those scientific findings which go against the grain of the dominant culture of science. It is possible to argue on the basis of her essay that modern, reductionist science is increasingly dependent on only its coercive might to perpetuate its dominance. For its earlier dependence on ideology and on its own internal self-corrective mechanisms have declined noticeably in the post-war period.

Though this introduction has dealt with the issue of the state as it mediates between science and society, most essays in the book recognize but do not directly grapple with the links between the secular power of the state and the new hierarchies set up by modern science. In the final essay by Shiv Visvanathan, therefore, a central concern of the editor has come full circle. The essay establishes a continuity between the technological managerial vision, seen as an inescapable part of the modern nation-state system, and the quality of violence associated with modern science in recent decades. Visvanathan sees the world-views and the ways of life of the tribal and the peasant as a statement against—and often a defiance of—the hegemonism of a vivisectionist science which ultimately has to end up as a mandate for triage. The part-object relations endorsed by the

scientific method, as Sigmund Freud might have diagnosed the psychopathology, is ultimately projected on to the human world. The laity are increasingly seen as dispensable experiential objects, and the victims' cries of agony gradually become the identifiers of a silent species waiting to be classified or analysed as a set of symptoms in a clinical laboratory. Objectivity becomes objectification. It is thus that the well-known instances of the violent application of science, such as nuclear weaponry, become blown-up versions of normal, everyday science committed to social relevance and political pragmatism.

At another plane, Visvanathan in his second essay transmits a live issue of rights (of minorities, populations displaced by development projects, and of the socially or politically 'disabled') into a formidable theoretical poser about the nature of the modern nation-state and its links with modern science. He makes a powerful plea for a place for the spiritual and the sacred in the public realm as the basis of resistance against the 'laboratory state'.

Three points should be emphasized at the end. First, the authors of these essays were invited to include in their analysis a discussion of the philosophical and ethical assumptions of their work on science and violence and not to produce overly-specific scientific papers. Most of them have done so and this has resulted in some minor repetitions. We have allowed this to pass because we wanted the authors to complete their statements; we thought such completeness necessary for a better understanding of the burgeoning movements for alternative science and technology in India and in other third-world societies. Another volume in this series will try to provide a social and philosophical audit of these movements, which have now in some cases moved into class-rooms and laboratories from villages and slums. It suffices to say here that these movements often claim that the kinds of science and technology they advocate are less violent, more compassionate and more respectful towards traditional systems of knowledge, culture values and nature. It is partly in the context of these claims that we have tried here to explore in detail some of the worldviews from within which the critiques of establishment science and of the science establishment have emerged.

Even at the risk of being repetitive, I must draw the reader's attention to the fact that many representatives of such dissenting movements, when they speak of violence and non-violence in science, do not have in mind only the environment of science but also its text. They try to relate to other science movements operating from the baseline of a science-for-all kind of ideology only to the extent the latter are willing to go beyond the idea of equal sharing of the fruits of modern science and willing to build upon not only the experiences of suffering but also the cognitive orders of the victims of modern science.

This volume provides an insight into the worldview from within which such outsider's criticisms of science and technology in South Asia are increasingly being mounted. And it is certainly not an accident that most of the authors in this volume have links, direct or indirect, with intellectual and/or grassroots movements in India for a more humane science, in fact for a more humane relationship between knowledge and power in general.

Secondly, one must emphasize that the contributors to this volume do not share the same theoretical frame. At least two of them do not grant science the plurality which others take for granted; one of them takes a clear *luddite* position. The commonalities among the essays lie elsewhere—in their concern with the ethics of knowledge; in their belief that the text, in addition to the context, of a knowledge system encodes the categories of the culture which produces the system in the first place; in their belief that the growth of modern science at the expense of all other forms of science need not be the primary civilizational goal in a world in which the culture of modern science has consistently endorsed existing global hierarchies and shown utter disregard for defeated societies and systems of knowledge; and in their faith that modern science need not be perceived as the last word in human rationality, it being like all human ventures, limited by space, time and human consciousness.

Finally, the essays are held together by two important but latent intellectual concerns which are not easy to define. The first is a certain sensitivity to institutionalized, as distinct from the direct, violence associated with science in our age. Science violates not merely through the super-bombs powered by para-

noia and super-greed; science violates also through bureaucratization of human suffering and through 'scientization' itself. The principle of clinical iatrogeny is not merely a differentia of modern medicine; it is built into the culture of modern science in general. That is why science is often the most violent when it looks the least violent and when the urban middle classes are most prepared to applaud its products and performance. All the essays in this volume are sensitive to this double-edged nature of scientific violence. Even Visvanathan's first essay, which deals with the overt violence of nuclear weaponry, looks at that violence through a theoretical scheme fully sensitive to the other face and the other violence of science.

The second intellectual concern which binds the essays together is their attempt to relate the critique of modern science to an implicit, almost unwitting, sensitivity to the problems of violence which the 'common man', the 'savage', the 'insane' and the 'childish' often show. The essays in this book are a celebration of the dissent from the standardized formats of dissent in the modern world which we, in the privileged sector of the third world, have internalized as parts of our socialization and acculturation to the modern world. Indeed, the essays take seriously the feelings, ideas and values which the victims of modern science share in many traditional societies and push these feelings, ideas and values to their theoretical conclusion. That the authors often support their insights with examples drawn from the western world through a mode of discourse comprehensible primarily to the moderns should not mislead us. What Chinua Achebe says in another context can also, with a slight alteration, be said about these studies: Let no one be taken in by the fact that we deal with western issues in a western language; we want to do unheard-of things with them.

#### NOTES

1. Veena Das and Ashis Nandy, 'Violence, Victimhood and the Language of Silence', *Contributions to Indian Sociology*, 1985, 19, pp. 177-94. Also Ashis Nandy, 'Science, Authoritarianism and Culture: On the Scope and Limits of Isolation Outside the Clinic', in *Traditions, Tyranny and Utopias: Essays in the Politics of Awareness* (New Delhi: Oxford University Press, 1987), pp. 95-126.

2. Ivan Illich, 'The Delinking of Peace and Development', *Gandhi Marg*, 1981, 3, pp. 257-65.
3. See Dharendra Sharma, *India's Nuclear Estate* (New Delhi: Lancers, 1983).
4. For instance, P. N. Haksar et al., 'A Statement on Scientific Temper' (Bombay: Nehru Centre, 1981).
5. See a brief discussion of this in Nandy, 'Science, Authoritarianism and Culture'.
6. On nuclear energy see, for instance, Praful Bidwai, 'Atomic Power on the Run', *The Times of India*, 13-15 October 1986; and Dharendra Sharma (ed.), *The Indian Atom: Power and Proliferation* (New Delhi: Philosophy and Social Action, 1986). On modern agronomy see, for example, the assessments by J. K. Bajaj, 'Green Revolution: A Historical Perspective', *PPST Bulletin*, 1982, 2, pp. 87-112; and Claude Alvares, 'The Great Gene Robbery', *The Illustrated Weekly of India*, 23 March 1986. On dairy technology see Claude Alvares (ed.), *Another Revolution Fails* (Delhi: Ajanta, 1984); Shanti George, *Operation Flood: An Appraisal of Current Indian Dairy Policy* (New Delhi: Oxford University Press, 1986); and 'Faulty Lactometers', *Economic and Political Weekly*, 31 May and 7 June 1986, 21, pp. 963-71, 1020-8.
7. See note 6 above. Also see Sharma, *India's Nuclear Estate*; Ashis Nandy, 'The Bomb', *The Illustrated Weekly of India*, 4 August 1985; Jatinder K. Bajaj, 'The Bhopal Tragedy: The Responsibility of the Scientific Community', and Sunil Sahasrabudhey, 'Bhopal: Science Must Share the Blame', *PPST Bulletin*, 1985, 5, pp. 6-14, 25-9; Shiv Visvanathan 'Bhopal: The Imagination of a Disaster', *Alternatives*, 1986, 11, pp. 147-65.
8. Masanobu Fukuoka, Interview with *East-West Journal* (Brooklyn, Massachusetts), quoted in T. S. Ananthu, 'Towards a New Methodology in Science', paper presented at the National Institute for Science, Technology and Development, New Delhi, 13 January 1986.