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Editorial

Science Re-organization

In his Founder Memorial Lecture of Shri Ram Institute for Industrial Research, Dr. D.S. Kothari has called for substantial re-organization of the Scientific Advisory Committee to the Cabinet as regards its position and functioning. He has also suggested a serious examination of the respective role and responsibilities of the various agencies in the country concerned with the use and promotion of science such as Council of Scientific & Industrial Research, other research councils, Atomic Energy Commission, University Grants Commission etc. He is of the view that quite a few of the agencies have assumed responsibilities beyond their respective purpose and functions. He suspects that some of these organisations have become too big and emorphous to make efficient contribution to science in the country. In this context he recalls the abolition of DSIR in U.K. (which corresponds to the Council of Scientific & Industrial Research in India), and the distribution of its functions to the Science Research Councils and the Ministry of Technology. A performance audit is called for to determine if the present science organisations are making optimum contribution to the process of industrial and economic growth of the country.

Coming as these do from an eminent scientist who has been intimately connected with the Scientific Advisory Committee to the Cabinet and the Governing Body of the CSIR since more than a decade, these remarks should occasion a serious concern and heart-searching among the scientific circles and authorities on the adequacy or otherwise of the present structure of science and technology in India.

Over the last 25 years, the CSIR has grown into a large organisation which encompasses fields as diverse as electronics engineering to botany, oceanography and road building. It is a moot question whether the present unitary control of industrial research and development is conducive to its optimum utilisation by user Ministries responsible for industrial development. An incipient hostility comes to surface occasionally and has led to the creation of technical departments within the Ministries sometimes duplicating and bypassing the activities of the research laboratories. The unitary controlling body may also not have the right perspective for investment of adequate inputs in research and development effort requisite for the sustained industrial growth of different areas. For example, electronics research related as it is to a fast moving field with vast potentialities and recognised as one where the industry is entirely science based, would need a different order of investment as compared to coal or textiles. While massive investments are contemplated in the field of petrochemicals and fertilisers, the financial allocation to the petroleum and petrochemical research may have to stand in a queue with other laboratories and its financial allocation may appear to have no relationship to the requirements of development. The question arises if the Ministries in charge of particular industries themselves, in some form or the other, would

not be the better judges of the research requirements and investment inputs for the related areas of research. While the idea of transfer of research organisations to user Ministries may appear attractive, there is a real danger that the atmosphere required for creative research may be stiffled in the bureaucratic atmosphere prevalent in the Ministries.

The idea of a Ministry of Technology apparently owes its inspiration to the corresponding developments in Britain. Science and technology may get a better deal under a separate Ministry than as a minor wing of the Education Ministry. Even otherwise Science & Technology would profit by being closer to industrial development. One may even hope that staffing in the Ministry of Technology may be Science & Technology oriented in preference to the predominantly administrative bureaucracy prevalent elsewhere thus preserving the benefits of autonomy enjoyed by the research institutes of the C.S.I.R. The idea of Ministry of Technology would thus appear useful and important because it would lend strong support to maintaining the country in technological forefront for industrial and economic growth. Notwithstanding the setting up of a new ministry, arrangements will have to be worked out whereby while the administrative control of the research organisations may remain with the Ministry with a view to co-ordination of policies, the inputs, utilisation, planning, functional responsibility and financial investment in these institutions should be closely linked with the programmes of the user Ministries or industrial organisations concerned.

So far as the Scientific Advisory Committee to the Cabinet is concerned, one can whole heartedly agree with Dr. Kothari that it needs drastic reorganisation. This should be achieved by removing deadwood and infusion of fresh blood into the Committee. There is need for improving lines of communication between the Committee and organisations of scientists and technologists. The functioning of the Committee should be put on a scientific basis by providing it with an infrastructure capable of collecting data on different aspects of scientific activities rather than its members, however eminent, basing advice on their fads and fancies.

Grateful Thanks

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Education, Science and Development*

DR. D.S. KOTHARI

It is more than an honour to be invited to give the Founder Memorial Lecture of the Shri Ram Institute for Industrial Research in commemoration of its deeply esteemed and eminent Founder; and I am grateful to the Chairman and the Director of the Institute for the invitation. I appreciate this all the more as it gives me an opportunity to pay my respectful homage to the sacred memory of Lala Shri Ram, and to recall even so briefly the immense and lasting debt we owe to him. Lalaji was a pioneer in many ways; a man of ideas and idealism; and a sincere, warm and generous friend of education and science and the academic community. He achieved outstanding success in diverse fields and gained great fame and honours. But he always retained his innate modesty and simplicity, humility and quiet dignity; he was mild of manners, and yet, when he felt necessary, firm and unbending. He built from small beginnings a huge and progressive industrial complex. He was from the beginning a powerful supporter and closest associate of the C.S.I.R. and chairman and member of its numerous committees. What he did for the promotion of education in Delhi will be remembered with gratitude for a long time to come. Whether it was at the meetings of the governing bodies of the several colleges over which he presided, or meettings of the C.S.I.R. or at gatherings of educationists and scientists, his presence was always arresting and his contribution always notable and informed by an extraordinary degree of acumen, commonsense and deep humaneness. Lalaji was a great man in the true sense of the word, and greatness is much more than a combination of uncommon abilities, perseverance, success and dedication.

Science-based world

What is new and characteristic of the contemporary world is the explosion of rising hopes and aspirations for economic betterment, for education, and for national self-assertion, on the part of hundreds of millions of people in countries which after centuries of subjugation have, in the last two decades or so, obtained their political independence. Many of these countries have great traditions and a highly sophisticated culture, but almost all of them have an underdeveloped economy still at the level of mere subsistence, and their agriculture still largely exploitative using ploughs, unselected seeds, and methods that go back to the Middle Ages. There have been great civilizations in the past but in all of them the people, except for a negligible minority lived in ignorance, squalor and poverty. In India the condition of the lower castes, the untouchables and scheduled tribes, has been particularly deplorable for centuries. At the height of the Greek civilization, Aristotle said that to abolish slavery would be to abolish Athens itself. He observed that slavery would continue till man could discover machines to do the work of slaves. The realisation of this has taken more than two thousand years. It was

* Founder Memorial Lecture of the Shri Ram Institute for Industrial Research.

Gandhiji who said that his ardent wish was to wipe every tear out of every eye. For the first time in history, science and technology have provided an instrument of unprecedented power, which if wisely employed can eradicate poverty, disease and ignorance. This imposes a unique responsibility and obligation on man to use the great powers of science for the common good and continuing upliftment of mankind.

The present world is science-based, and in this there could conceivably be no going back unless civilization itself suffered a total collapse because of man's folly or inability to deal in a human way—that is, in the true interests of mankind as a whole—with the forces of almost cosmic dimensions that nuclear energy has placed in man's hands. By debunking magic and sorcery, which aimed to control nature by cheating or cajoling her science which controls nature through understanding, through reason, has radically transformed the relationship between man and nature and given a new meaning to it. By providing a framework of objective knowledge of natural laws, ever expanding and deepening as each generation contributes to it, science has given man a new outlook and a new destiny. Man now faces himself. He is on the way to *learn and master* the process of his own organic evolution which got an explosive start about two million years ago with the development of the frontal lobe. (It is this front part of the brain which distinguishes *Homo Sapiens* from the erect apes, and its important function is cooperative behaviour). The development of the human brain, through the discovery and development of tool making, speech and language, cooperative and social behaviour, and ability for abstract and logical thinking, led to a process of rapid *secondary evolution* running parallel to man's biological evolution. The secondary evolution has proceeded at a rate orders of magnitude faster than the organic evolution. In the years to come, it is likely to give man knowledge and power to modify the direction of his biological evolution as well. It may be mentioned that if today man's rational behaviour, when put to individual or group test, often appears to be no more than skin deep it is an expression of the fact that enough time has not elapsed for the 'saintly' genes to have become sufficiently abundant in the genetic pool of mankind. We may have to wait, may be, for tens of thousands of years for this to happen.

It is almost certain that intelligent life, and possibly super-intelligent, may be discovered elsewhere in the universe before too long and man may succeed in linking himself to a 'galactic telephone system.' At not too distant a future, the span of individual human life may be increased to a few hundred years.

Science is hard work; and a relentless and passionate search for truth. A serious pursuit of knowledge and discovery, and unceasing quest of truth is no routine undertaking. It is not something which can be manipulated by administrative tricks or secured by issuing directives and instructions, whether by Government or any other agency. It demands high mental competence, but above all, it demands courage and unflinching dedication. And by bringing an elevating and spiritually satisfying experience which comes from such pursuit, within reach of a large number of people everywhere science has contributed immeasurably to strengthening the commitment of man to free enquiry and to the quest of truth as his highest duty and obligation. But the process is by no means automatic. It needs careful watching, and nurturing through education, research and wise counsel. Too much emphasis on technology and material achievements

of science , as distinct from the spirit of science, which one sometimes comes across in "advanced" countries, can lead to serious imbalance in man's culture and to an erosion and weakening of the sense of fundamental values of life and the moral foundation of society. Too much preoccupation and involvement with means of production and material gains, and too little reflection on values and purpose of life can, in the end, for individuals as for societies, lead only to self-defeating activity and soul-killing frustration.

In its ultimate analysis the motive power of science is the hunger of the human mind and spirit to understand nature and to seek an answer to the ever challenging question: What is man? Why is he here? What is the purpose of the universe?

The opening lines of the Kena Upanishad are today in the age of science, as valid and soul stirring as they were thousands of years ago:

> "By whom missioned falls the mind shot to its mark? By whom yoked does the first life-breath move forward on its path? By whom impelled is this word that men speak? What god set eye and ear to their workings?"

It will be wrong to expect any final or even partially satisfying honest answers to these fundamental questions. In an evolving universe, man's understanding of himself and the universe is also a continually evolving and deepening thing. "Many wonders there be, but nothing more wonderous than man", is true for all time.

Even more important than the tangible achievements of science is the spirit of science. Perhaps, nothing comparable to the scientific revolution has occurred in man's history since the Neolithic times. The language of science is a common language, and its achievements are the heritage of all—the only truly common heritage. Science is growing and expanding at a terrific pace. It is well recognised that the *doubling period* of science and technology is about ten years. This has been demonstrated by considering a number of relevant indices, such as, the number of research publications, number of scientists and engineers, output of electricity, and so on. So rapid is the progress of science that, as has been said, a graduate (in science and technology but not, say in humanities) is almost obsolescent on the day of his graduation. A research paper, if a good one, is almost out-of-date on the day of its publication. A military weapon is nearly obsolete if it works. An expensive research equipment is out of fashion by the time it is procured.

The work in a developing country often tends to follow the fashion set by the "advanced countries", even though the needs of the developing country may be quite different. Whatever the field of science, with the growth of science and technology there is a general tendency for the tools of investigation to become more complex and more expensive. This is sometimes referred to as the *sophistication factor.*

In fields such as high-energy-physics or space research the cost of some of the facilities is fantastically high. To give an example of the scale of *big science,* the 200 Bev high energy accelerator which the U.S.A. is planning to build is likely to cost about $300 million and may be more. It will take about a decade to design, construct and put the machine in working order. The running cost is likely to be more than a hundred million dollars per year.

Science Policy

Interaction between science and society, between science and Government is a very complex thing. Many aspects of this interaction are difficult to define with any

precision. Even in the advanced countries the mechanism for formulation of science policy and goals is still in a most rudimentary stage. Partly the difficulty is inherent in the situation, because of the inherent unpredictability of fundamental discoveries in science which in a few years may have an altogether new and far-reaching impact on the life and progress of society. Also, and essentially, the difficulty arises from the simple fact that science policy almost invariably goes far beyond science. It involves complex political and social issues and decisions. Science policy has two components, somewhat related but distinct. It is concerned with policy about pursuit and development of science, but it is even more concerned with utilization of science to meet national needs and goals. The national goals which involve science range over a wide spectrum: agriculture and industry, improvement and control of environment, medical care, science education, computers and automation, population control, and so on. Whatever the resources big or small, there is always the problem of deciding what not to do in order that something can be done with reasonable speed and chances of success. If resources are distributed over everything worthwhile which one wishes to do, then the effort will get so diffused that nothing really would be done. This problem of concentration of effort is a basic issue for every country, and if anything, it is crucial for a developing country like ours. Even advanced countries (such as the U.K.) are now finding that several areas of *big science* such as thigh energy physics and space research are now getting almost beyond their resources.

It is most important that there should be some mechanism whereby Government at the highest level can get as competent, objective and unbiased an advice as possible on matters relating to science policy. An important aspect of science policy which needs serious examination is about the respective roles and missions of the various agencies in the country concerned with the promotion and use of science, such as the C.S.I.R. and other Research Councils, the U.G.C., the A.E.C. the Defence Research Organisation and other Government departments concerned with science.

At present quite a few of the agencies have moved into fields and assumed responsibilities which go beyond their respective purposes and main functions. In all countries, and especially in a developing one, there is a marked tendency and danger for this to happen. Some of the organisations, with passage of time and the operation of the Parkinsonian law of proliferation, become too big and amorphous to make efficient contribution to science and development of the country. A situation can even arise when the organisations forget their proper role and responsibilities. Where aims, targets and responsibilities are ill-defined, an unbiased assessment of work and evaluation of achievements of the various agencies becomes near impossible. In such a situation the relative allocation of the slender available resources between the competing agencies depends more on the pulls and prestige of the leaders of those agencies, on the current international fashion in science than on the worth-whileness of the agencies' programmes and their contribution to meet national needs. In the context of what has been said above it is relevant to recall that recently in the U.K. the D.S.I.R. (which corresponds to our C.S.I.R.) has been abolished. The functions of the D.S.I.R. relating to fundamental research have been transferred to a new Science Research Council. Many of its functions concerned with applied science and industry have been taken over by the new Ministry of Technology.

The usual mechanism is to have a high level Science Advisory Committee. For such a committee to function properly, it is perhaps necessary that a major part of its membership belongs to persons who enjoy confidence of the scientific community, but are themselves not in charge of big science agencies or science related departments. Another important consideration is that the committee should include among its members economists, social scientists and persons knowledgeable in the fields of industry and management. When the committee consists largely of people who themselves are in charge of science using agencies, it becomes almost impossible for the committee to go into any critical discussion of problems and to reach objective and unbiased decisions. Viewed in this light, the Science Advisory Committee in our country needs substantial reorganisation as regards its composition and functioning.

The support for science depends much on the understanding and vision of the political leadership, and on the general awareness in the country, about the role, strength and limitations of science. It would serve a distinctly useful purpose if a 'Science Report' dealing with the progress of science and important questions bearing on science policy was placed annually before our Parliament. A discussion in the House on such a report would serve a valuable purpose. The C.S.I.R. could be assigned the responsibility for preparing the report for submission to Parliament.

It is important to recognise that in an age of science and technology, universities in advanced as also in developing countries have acquired a new role and a new significance. Through the powerful and symbiotic combination of teaching and research, education and discovery, youth and age, orthodoxy and heterodoxy, universities in the modern world make a contribution to science and its growth as no other organisation or agency can or does. The experience of more than a century, starting with the great German Universities has demonstrated beyond doubt that teaching and research flourish best in combination. The best of either is achieved in an atmosphere where both are cultivated, and in this invigorating combination of teaching and research lies the real strength of universities.

A face-to-face confrontation and critical dialogue between the professors and their bright inquisitive students, without the inhibition and constraints which generally operate in non-university type institutions, acts as a powerful stimulus to original thinking and creativity and helps to open new horizons of thought. Also scientific work is now becoming increasingly more and more of a team effort, and in promoting team work a university atmosphere has a distinct advantage. When there is shortage of trained men of first-rate ability, as we face today, it is wiser to invest them generally in the universities than elsewhere. This would result in a high degree of multiplication effect, as the top men would not only contribute to research but also to the training of the younger generation. It is important to ensure that the effort exceeds a certain critical mass so that it can generate and sustain a sort of chain process producing many more and more of able men. For the progress of science, education and research, and for the improvement of its quality, it should be almost a basic policy that university type of work should not be done in government establishments or other institutions which are divorced from teaching. This is a matter which needs serious attention. Laboratories for scientific work outside the universities, unless these happen to be directly concerned with applied research and for

a clearly defined mission, are unlikely to have a fruitful and vigorous life of more than a few decades (if not less). This arises from a variety of causes. The top men around whom the laboratory was originally organised may have left or would have passed the prime period of their creative activity and inspiration; the laboratory unlike a university lacks the continuing stimulus and challenge of fresh students joining every year; and the purpose for which the laboratory was set up may no longer be relevant as entirely new lines of development may have made to some extent obsolete the field of work for the laboratory was originally set up. A deteriorating laboratory, whatever the cause of its degeneration, always poses a serious problem. What is to be done with the expensive equipment and the huge staff? It often tends to bolster up its scientifically weak case by asking for more funds, more buildings, and more men. Unable to compete in quality science, it shifts its endeavour to compete in terms of prestige buildings and expensive but not-to-be used equipment. It tends to believe that people would judge the quality of its work by the quality of the buildings—marble floors and high salaries, may be taken in as an index of quality work and quality scientists. It is much easier and quicker to achieve high quality, even international standards, with regard to buildings and imported equipment than in science education and research. Spending money, specially someone else's money, is far easier than spending thought. In a developing country such as ours the highest priority must go to the strengthening of the universities. If research institutions outside the universities expand too rapidly it would result in depleting the universities of their competent men, and may be also of the money which should go to them. In the long run weak universities would inevitably weaken the entire research effort of the country.

It is often suggested that one way of meeting the situation would be to encourage national laboratories and other research institutes outside universities to undertake some teaching work either in association with universities or on their own. This should be fully supported and encouraged. At the same time it is a relevant question to ask as to what extent such an arrangement would strengthen the universities. As a recent editorial in *Nature* on the U.K. Report of the Working Committee on Liaison between Universities and Government Research Establishments (Sutherland Committee Report—1967) has pointed out: "As things are, the evidence the Committee has compiled of the willingness of the establishments to help with teaching can be interpreted not only as a proof of goodwill but also as a sign that the establishments have been endowed with resources which might have been better spent in universities."

Universities and the Community

Knowledge is vitally important; but if it is to transform society from a state of relative stagnation to one of dynamism and progress, there must be a general willingness and determination to make use of it in the service of the community. Sir Cyril James in his Presidential Address (August 1965) to the International Association of Universities observed: "Universities are not ivory towers, of cloistered bases of peace in which to escape from the problems and frustrations of the contemporary world. They are centres of struggle. They are battlefields (often of fiercely contending forces) on which the victories will largely determine the future pattern of our society." But, in a developing country the general academic atmosphere, apart from notable individual excep-

tions, here and there, is one of timidity and apathy.

In the modern world, education should explicitly recognise and foster as its two basic aims (*i*) imparting knowledge and (*ii*) imparting of a sense of social responsibility and commitment to the community—willingness to use knowledge for economic and social betterment. The world today has a stock of knowledge which is unmatched in its extent and power, but there needs to be a comparable sense of dedication and responsibility to make use of this knowledge for the service of the community and mankind.

It is the universities which provide the focal points for importing science and technology from where it is in abundance and transmitting it to the local community. They alone, or at any rate, much more than any other agency, function as the 'ports of commerce' in the great ocean of international science. They act as powerful 'pumps' drawing science and technology from 'advanced' countries, and creating some more in the process, and spreading it wide to irrigate the native soil. *But if the universities in a developing country are to truly serve their country they must be close to the native soil, close to the poor and the needy.* They must be close to the people and to their aspirations and close to the government.

Sir Eric Ashby says with regard to the new African Universites (*African Universities & Western Tradition,* Harvard University Press 1964): "For an African the impact of a university education is something inconceivable to a European. It separates him from his family and his village.... It obliges him to live in a western way, whether he likes it or not. It stretches his nerve between two spiritual worlds, two systems of ethics, two horizons of thought. In his hands he holds the terrifying instrument of Western civilisation: the instrument which created Jefferson's speeches, the philosophy of Marx, the mathematics and chemistry of atomic destruction. His problem is how to apply this instrument to the welfare of his own people. But he has no opportunity to reflect on this problem. For one thing, the gap between himself and his people is very great.... the universities and their graduates are isolated from the life of common people in a way which has no parallel in England since the middle ages. This is the peculiar dilemma of the African University."

And these are words which we need to ponder over seriously—they are of much more than passing interest in relation to our situation.

Reconstruction of Education

In the context of our times it is hardly necessary to argue that the improvement and strengthening of universities should receive the highest priority and be treated as a fundamental national goal. If the universities are weak, as several of them are, they cannot and should not absolve themselves of their share of responsibility. This does not mean, however, that the government and the public and other agencies concerned are less responsible for the unhappy situation. A national goal can only be achieved on a national basis and through the active collaboration and participation of all the elements concerned. The attainment of a national objective has to be conceived as a national responsibility.

In a world permeated by science which makes in some fundamental way the future shape of things unknowable and unpredictable, it is most important that the educational policy contains a built-in element of flexibility so that it can adjust continually to changing circumstances. It underscores

the importance of experimentation and innovation. Perhaps, the single most important and urgent need in our education is to get out of the rigidity of the present system. In the rapidly changing world of today, one thing is certain: yesterday's educational system will not meet today's and even less so, the need of tomorrow.

The basic points that should characterise the reconstruction of our educational system may, perhaps, be summed up as (*Education Commission Report*—letter of transmittal)

* Introduction of work-experience (which includes manual work, production experience, etc.) and social service as integral parts of general education at more or less all levels of education;
* Stress on moral education and inculcation of a sense of social responsibility;
* Schools should recognise their responsibility in facilitating the transition of youth from the world of school to the world of work and life;
* Vocationalization of secondary education;
* The strengthening of centres of advanced study and the setting up of a small number of major universities which would aim to achieve highest international standards;
* Special emphasis on the training and quality of teachers for schools;
* Education for agriculture, and research in agriculture and allied science should be given a high priority in the scheme of educational reconstruction. Energetic and imaginative steps are required to draw a reasonable proportion of talent to go in for advanced study and research in agricultural sciences; and
* Development of quality or pace-setting institutions at all stages and in all sectors.

Education should be used as a deliberate and powerful instrument for social transformation and to increase productivity.

Rich Countries and Poor Countries

In a historic sense one of the most significant things of our time is that the world, for the first time, has got divided into a poor part and a rich part. The economy in the rich part is highly prosperous and dynamic, whereas in the poor part it is at a bare level of subsistence and is static. In the industrialized countries the average span of human life is about twice that in the underdeveloped world.

The economic gap between the rich and the poor countries is not only dismally large, but is growing wider with the passage of time. This has, of course, its effect on what a country can spend on education. Education is both a seed and a fruit of industrialisation: it is the foundation as also the consequence of rapid economic growth.

Japan, during the post-second-world-war period, has achieved an extremely high rate of economic growth of nearly 10 per cent yearly rise in its GNP—this is regarded as almost a miracle. Within a generation Japan has transformed its economy from an "under-developed" to a "developed" level—it has increased its per capita GNP from less than $ 100 to above $ 600, a sixfold increase in 15 years. Many think that the special attention paid to technical and general education has been a very important factor in this transformation. G. Uchida (Scientific American, November 1966) has observed that China with its stress on technology and industrialisation, and with luck, may in 10 to 15 years attain a per capita income equal

to Japan's present figure ($ 620). The lesson and significance of all this for the developing world is apparent.

As an instance of the frightening gap between the rich and the poor countries, we may notice that in India today the expenditure on all levels of education and research is about two dollars per capita per year. The corresponding figure for the U.S.A. is $300. By the end of the century the Indian figure may go up to $ 20 per person per year. The U.S.A. figure will certainly rise to $ 1,000 per person per year. The frightening gap would be wider still.

In thinking of the ever-widening economic gap and how to meet it one is forcefully reminded of the terrific expenditure which the world is incurring on national defence and the arms race. It is now well recognised that in the case of superpowers, and it may equally be true of the lesser powers, in the context of our times an increasing military expenditure only leads to decreasing national security.

It is a grim fact that as a consequence of the arms race the increasing sophistication and amplification of nuclear weapons has resulted only in a steadily diminishing security for the big power blocs. A nuclear attack and the inescapable counter attack in the early 1950s could have inflicted casualities numbering into millions on the two sides; in the late 1950s numbers could have been in tens of million, whereas today the number of casualties could be of the order of hundreds of millions. As Wiesner and York state: "*It is our considered professional judgment that this dilemma* (increasing military power and decreasing national security) *has no technical solution,*" (J.B. Wiesner, now Dean of Science at the M.I.T., has been the Chairman of the U.S. President's Advisory Committee and Special Assistant to Prasident Kennedy; H. York has been Chief Scientist of the Advanced Research Project Agency of the U.S. Department of Defence). The arms race between the super-powers may enter a new and even more dangerous phase because of recent developments in the field of *anti-ballistic missiles.* By comparison the dangers of nuclear proliferation are some times over-estimated; and the discussion of the problem often tends to be dominated by the short-term interest of the big nuclear powers. A nonproliferation treaty, as under current discussion could raise more issues than it resolves; and could conceivably postpone indefinitely a lasting solution to the terrible problem of nuclear peril. An 'arms race' between the two Blocs, can in the end lead only and inexorably to universal doom—a complete collapse of human civilization. The solution to the great nuclear challenge of our times can be found only on the basis of hope and faith, trust and confidence, and courage and wisdom. The only possible goal—to be attained by stages—can and ought to be comprehensive and complete disarmament.

The defence expenditure in the case of most countries ranges from 5 to 10 per cent of their GNP. Against this the aid which the rich part of the world gives currently to the developing world is of about one per-cent of the GNP of the rich countries. What is urgently necessary for the development of the under-developed world is as Professor P.M.S. Blackett has so vigorously and cogently argued in his recent address to the American Association for the Advancement of Science, that the aid be raised to about twice its present level. The difficulties that stand in the way are largely political rather than technical. In a sense it is linked also with the problem of nuclear and general disarmament. It is to be hoped that cooperation which has been a feature of the

post-war world will be further strengthened and the flow of aid over the next decade may increase from its current level of one per cent to about two per cent of the GNP of the rich countries. Though its effect on the development of the underdeveloped world will be of crucial significance, it will not seriously affect the growth rate of the dynamic economy of the developed countries. Its effect on them will be not more serious than about a year's 'holiday' in growth.

It is even more important that the receiving countries recognise that, paradoxically, only those countries deserve aid which are prepared to do without it. In other words, they must be so determined to maintain internal stability and to pursue the path of development and social welfare, and so committed to their programmes of improvement of agriculture and productivity, and education that even if there were no external aid, they would move forward with zest and dedication. In such circumstances aid would help to accelerate the process of development and would therefore prove most useful.

To face successfully the unprecedented problems and challenges of our times we need a symbiotic combination of knowledge and commitment; we need education and science, and co-operation within the country and between countries.

To quote the prophetic words of a great thinker of our times, H. Bergson:

> "Mankind lies groaning, half-crushed beneath the weight of its own progress. Men do not sufficiently realise that their future lies in their own hands. Theirs is the task of determining first of all whether they want to go on living or not. Theirs is the responsibility then, for deciding if they want merely to live, or intend to make just the extra effort required for fulfilling, even on their refractory planet, the essential function of the universe which is a mechanism for the making of gods".

APPENDIX

GNP PER CAPITA, SCIENTISTS AND ENGINEERS, HOUSING STATISTICS, CONSUMPTION OF ELECTRICITY TV SETS AND RADIO RECEIVERS

Sl. No.	Country	G.N.P. per capita in dollars 1963	R/D expenditure-percentage of GNP (1960)	Net consumption of Electric energy per head, per year KWH		Scientists and Engineers (per cent of total working population) 1959	Housing standard Average No. of rooms per person around 1960	No. of T.V. Sets and Radio Receivers per 1000 inhabitants 1963	
				1963	1964			T.V. Sets	Radio Receivers
1	2	3	4	5	6	7	8	9	10
1.	Argentina	563*	—	—	—	0.2**	0.71	55	253
2.	Brazil	282	—	—	—	0.1**	0.77	0	—
3.	Canada	1871	1.2	—	6280	1.3	1.43	246	—
4.	China (Taiwan)	146	—	—	—	0.1	—	1	95
5.	Columbia	301*	—	—	—	—	0.53	14	—
6.	France	1406	2.1	1692	1830	0.8	1.00	92	304
7.	Greece	440	—	323	380	0.4	0.67	—	—
8.	Guinea	86*	—	—	—	0.002**	—	0	—
9.	India	76	0.1	48.3	—	0.05	0.38	0	7***
10.	Iran	169*	—	—	—	0.16	—	5	68
11.	Italy	776	0.3	1211	1290	0.9	0.91	85	190
12.	Japan	589	1.6	—	1630	—	0.83	158	201
13.	Mexico	390	—	—	—	—	0.34	27	169
14.	Nigeria	89	—	—	—	0.01	0.33	0.3	11
15.	Pakistan	77	0.1	—	—	0.05	0.32	0	4
16.	Peru	247	—	—	—	—	0.45	13	169
17.	Philippines	191*	0.1	—	—	0.24	—	2	40
18.	Spain	401	—	675	720	0.3	0.91	27	129
19.	Thailand	101	—	—	—	0.01	—	4	—
20.	Turkey	230	—	117	120	0.2	—	—	54
21.	United Kingdom	1361	2.7†	2784	2900	1.0	1.43	238	296
22.	United States	2790	2.8	4870	5180	1.7	1.43	327	1000
23.	U.S.S.R.	835	2.3	1710	—	1.2	0.67	44	310
24.	Yugoslavia	293	0.7	584	—	0.5	0.63	11	120

*Figures relate to 1958
**Engineers only
—Not available
***Figure relates to 1962
†Figure relates to 1961

Sources: *Col.* 3:(1) United Nations: Yearbook of National Accounts 1964; (2) Education Commission (India) Statistics of comparative Education in Selected Countries 1965 (for Brazil, U.S.S.R. and Yugoslavia).
Col. 4: (3) *Underdeveloped Science in Underdeveloped Countries*, Stevan Dadijar, *Minerva*, Autumn, 1963.
*Col.*5: (4) United Nations; Annual Bulletin of Electric Energy Statistics for Europe 1963;
(5) Central Statistical Organisation (India): Statistical Pocket Book of Indian Union 1964 (for India only).
Col. 6: (6) OEC Observer, February 1966.
Col. 7: (7) OEC Observer, June 1966.
Col. 8: (8) United Nations : Statistical Yearbook, 1965.
Col. 9 *and* 10 (9) UNESCO: Statistical Yearbook, 1964.

SCIENCE ADMINISTRATION

DR. J. LEE WESTRATE*

I am a student of Political Science particularly public administration and management. I have served in the office of President Eisenhower and President Kennedy's Science Adviser in the unit dealing with the science management. Of late I am associated with Federal Bureau of Budget in the Office of Management and Organisation which is a part of the Executive Office of the President. I came to India as management consultant to Indian Institute of Public Administration. The Institute was engaged in studying in depth the Science Policy and Organisation of the country on behalf of the Administrative Reforms Commission.

While in the States, I had studied the problems of Science Administration from very close angles, but I had not much knowledge of Science in India and its administration. I had heard the names of a few top Indian scientists like Prof. Thacker, Dr. Bhabha and Dr. Sarabhai. I was therefore very eager to come and study science administration in India. During my stay here I have had the privilege of discussing these issues with the administrators of science at various levels and also have gone round and visited many research establishments and institutes in the country. I had talks with the directors of these laboratories and their senior colleagues. Today I would talk about the Science Administration at the laboratory level and at the Headquarters level like C.S.I.R. I would mainly concern myself with the role of the Director of a laboratory and Central Administrative Office in the research management. I must say, here that, I am using the word management of research as contrasted with administration, because the term management is more comprehensive and all-inclusive of various functions involved in successfully running a research enterprise. I feel that the administrative machinery should be geared to the purpose of supporting the objectives of the research institute rather than for the purposes of controlling it. It has been experienced that when administration tries to control the research enterprise, it is capable of creating obstacles in the way of smooth functioning of the Organisation. It can strangulate the creativity and kill the initiative with detrimental impact on scientific research effort. Secondly, the diarchy in the research administrative machinery should be done away with. For, it violates the fundamental principles of sound scientific management.

If, I were to be a director of the research organisation I must have the following:

(i) Responsibility;

(ii) Autonomy; and

(iii) Accountability.

I would wish to be made responsible for delivering the goods. Since I am the man on the spot, in the research enterprise, I should have full autonomy in the use of the resources allocated to me. Modification of research programmes seeking collaboration with industries, evaluating the performance

*Dr. Westrate is a Consultant, Institute of Public Administration. The above is an extract from his talk at CSIR on 25.5.1967.

of my team, and effectiveness of a research programme and its time scheduling should be my responsibility. If at a particular point of time, I want to reorganise functional units, I should be free to do so. Since I am the leader of my research team at the institutional level, I should have the full autonomy to reorganise my research teams and to select personnel for my organisation. My right to hire should also, under the existing laws of service security, include right to fire. The accountability for the public funds put under my charge should rest on me. My administrative staff should be under my control. Their punishments and rewards should rest with me. It shall reduce my effectiveness as director of the institute, if my administrative officer, derives his power from someone beyond me. This would bring in the diarchy in the administrative system, which as stated earlier is not desirable. I should be free to spend within the budget allocated to me. Administrative procedures should be flexible enough, with minimum rigidities, to facilitate me to bring about the necessary changes in the laboratories and to make laboratory more effective. It should help to create the climate necessary for more productive work.

It has been experienced that the most productive period of scientists is between 20-35 years of age. This can also be inferred, if we were to analyse the most productive ages of Nobel Laureats. I should be free to promote people with greater initiative and capabilities. We should not allow brilliant youngmen to be held down in the most productive period at the lower position, because of administrative structures. I should even be free to do away with all the structures to have organised research energy capable of doing more work.

Coming to the role of the Headquarters (e.g. CSIR Headquarters), I would suggest that it should concern itself with the following activities:

(1) Broad planning of science effort in the constituent units.

(2) Suggesting newer fields of activities, as desired by national objectives;

(3) Evaluation of research output from the point of view of the mission of the central agencies;

(4) Coordination of various disciplines and fields; and

(5) To allocate priorities to the broad fields and national problems.

The headquarters organisation should abjure its routine activities of administrative nature by transferring these powers to the constituent units. The headquarters should evaluate the total research effort of its constituent units and see how far they have been successful in meeting the aims and objectives of the agency. In matter of planning of resources for research, the central office should be the defender of the laboratory and should particularly serve this function with Ministry of Finance. The main functions of the central office should be that of laying down priorities. Since the funds made available to each organisation or agency are limited, they must be allocated in a rational manner between various laboratories and fields. For this the headquarters should assign priorities to the various fields which are in keeping with the national objectives. After making the allocation and the basis of the priorities decided by the central office, it should leave the matter with each individual laboratory director to spend them. But the director must be accountable for his actions.

To be able to discharge these functions rationally, the central office would require a very refined and sophisticated system of collecting the required information for it to evolve the desired priorities and to be able to allocate the resources to various institutes.

The Ministry of Technology in U. K.

(Based on a communication from Shri K.N. Johry, Scientific Officer, High Commission of India, London

—Editor)

The Ministry of Technology was set up to help and to enable the British industry to make maximum use of advances in technology, of new processes and new thinking and thus meet the challenge of other advanced countries. It has had to set about its work by using new methods, or by organising and applying established methods in new ways. All this, plus the exceptionally wide range and diversity of matters it deals with, makes its purposes and its operation quite hard to grasp and to explain. The exercise of organising the Ministry to deliver the goods it has been made responsible for has now been going on for more than two years and cannot be said as yet to have been finalised. With the additional burden of Ministry of Aviation, the Ministry of Technology now have a staff of 36,500 and annual gross expenditure of £750 million. A few people are doubtful whether so far the Ministry has not made things worse and work more complicated. Everyone realises this but it is an effort worth trying and worth watching for as the results might after all tone up the British industry and save it.

The Ministry is now organised into three main groups; Engineering, Research and Aviation, together with the Common Services which deals with establishment, finance and contracts for the whole Ministry.

1. Engineering Group

This group is charged with carrying the responsibility of the Ministry towards the engineering industry generally. This is the channel for contact between the Government and Engineering industry and for furthering the economic and technological development of these industries. It is headed by an Administrator and an Engineer and is sub-organised into ten divisions each with a Head—who may be an Administrator, Scientist or Engineer of the rank of an Under Secretary (equivalent to a Joint Secretary in India). Five industrial divisions deal with specific items as follows:

(a) Electronics, telecommunication and instruments,

(b) Computers,

(c) Machine tools and manufacturing machinery,

(d) Vehicles and mechanical engineering products,

(e) Ship building, electrical and chemical plants.

The categorisation of these divisions shows the importance this Ministry has attached to computer industry, electronics and machine tool industry—whose efforts are being concentrated to improve their performance.

In dealing with these industries there is no universal pattern of action adopted by the Ministry, because the problems vary from one industry/firm to another. Usually, however, it starts with a survey of an industrial sector, bringing out their economic performance,

their structure, the industry's technological standard and studies of the relevant technologies. The increase in the investment of these industries and improvement in the quality of investment, the development and study of effective inter-firms comparisons of productivity and performance usually form part of the exercise, based on this suitable action by the Ministry follows. The views of the industry, the research associations and research laboratories, university research groups and other concerned technical organisations are brought together to get as broad basis of advice as possible. More often it has been found that there is a need to provide incentives for use of advance equipment. A scheme has recently been launched, for example, to provide numerically controlled machine tools (which are considered most advanced of automatic machines) for a trial period. Survey is being carried out to find out reasons of breakdown, machining requirements of industry and of the machinability of various materials. Contracts for purchase of preproduction models of advanced equipment are placed to help in their production as well as their adoption by industry. To help buyers of engineering items, an expert service is set up to guide users for buying better products. Another technique being employed is to bring together assemblers and sub-contractors to induce more coherent production planning. A large number of such small projects are in hand for various engineering industries.

The reviews and study of the industry are likely to reveal the need for action to consolidate their technical, managerial and financial resources. In the aircraft and ship building industry these changes are already being thought of. Changes in the procurement policy are being considered for those industries which are mainly selling their products to the public sector, to induce them to improve their products.

Because of the special significance of computers this relatively small industry has a separate division which is striving to rapidly increase the use of computers and computer techniques in this country. Apart from giving all support to British Computer industry, a National Computing Centre has been set up and a Computer Advisory Service is run by the Ministry. The N.C. Centre renders technical advice, arranges seminars for management executives to explain potential of computers in their organisation. It provides training to their personnel and also undertakes research on programming and operating methods.

Similarly the Ministry has set up Production Engineering Advisory Service recently. Under this scheme seven mobile demonstration units have been launched to bring advice on production engineering to firms all over the country. This on-the-spot technical advice and training for engineering personnel is of particular use to small firms who can be visited by the mobile van at their own works at no cost to them. Managers, designers, foremen and other production staff can discuss best production engineering practices with experienced advisers of the service. The van is equipped with films slides suitable for 29 different topics, models, tools, equipment and other display material which supplement the discussions and lecture programmes. This service is operated by Production Engineering Research Association as agents of the Ministry and is run in cooperation with the Ministry's nine regional offices all over the country.

The Ministry has also set up a National Calibration Service for maintaining standards and calibration of scientific instruments and industrial measuring equipment.

The other five divisions in the Engineering Group deal with general questions and covers the working of all industry.

They are :

(f) Standards

(g) Information and intelligence

(h) Economics and statistics

(j) Industrial problems e.g. prices, mergers

(k) International technological collaboration.

2. Research Group

The Research Group is headed by a scientist and covers—

(i) ten research stations—formerly D.S.I.R. laboratories which are as follows:

Building Research Station
Forest Products Research Laboratory
Hydraulics Research Station
Fire Research Organisation
Laboratories of Government Chemists
National Engineering Laboratory
National Physical Laboratory
Torrey Research Station (fish processing and technology)
Warren Spring Laboratory (air pollution and mineral processing)
Water Pollution Research Laboratory

(ii) *Research Associations*
There are 47 cooperative research associations obtaining grants from the Ministry at present.

(iii) *National Research Development Corporation*

(iv) Seven of the ex-Ministry of Aviation research and development establishment:

Royal Aircraft Establishment
Explosive Research & Development Establishment
National Gas Turbine Establishment
Rocket Propulsion Establishment
Royal Radar Establishment
Signals Research & Development Establishment
Inspection Division which includes—
Aeronautical Inspection Directorate, and Electrical Inspection Directorate, and between them they are responsible for quality control of all aircraft, missiles, engines, electrical and electronic components, and radar equipments.

There are separate units in this group which deal with relations with universities and other Government department's technological work and another to deal with subjects like materials technology, tribology etc., which extend across a number of establishments and industry.

A joint department of technology and Atomic Energy Authority unit has been set up at Harwell to develop techniques for apprising the value to industry and the national economy of research and development projects and programmes and choosing the most profitable ones.

The seven ex-Ministry of Aviation research and development establishments given above are administratively the responsibility of Aviation Group which are described in the following paragraphs:

3. Aviation Group

The Aviation Group is largest of the three. It organises the development and procurement of aircraft and other defence equipment; does the same for some civil aircraft (of which the most significant is the Concord*); and handles the Government's relationship with the aircraft industry, and in particular the reorganisation of the industry now under negotiation.

* This is supersonic plane being developed with French collaboration.

This group under Sir Ronald Melville, who is referred to as Secretary (Aviation) is organised substantially on the same lines as before. The intensive examination carried out last year showed that aviation supply is an entity which cannot be split up without great inefficiency. It is brought into the Ministry of Technology with little change.

The organisation (formerly on its own and brigaded with civil aviation) will be working closely with the Research and Engineering Groups. They will bring the aviation research-development-production process into a clearer relationship with the economic and technological development of industry (and particularly the engineering industry). The Department must do this without weakening its links with the Defence Department, which are crucial to defence supply.

Regional Offices

There are nine regional offices of the Ministry of Technology as indicated in the preceding paragraph in various regions of the country.

Through its Regional Offices the Ministry of Technology participates in the work of the regional economic planning boards and councils, advising particularly on the scientific and technological aspects of economic development. They are responsible for encouraging technical development in the industries in their areas, and for promoting effective cooperation between industry and Government, and academic and independent establishments concerned with research and development.

An important function of the Regional offices is to help industry to make full and proper use of the advisory and research facilities of the Ministry and the research associations. They serve also to coordinate the work of the Industrial Liaison Centre.

Industrial Liaison Centres

62 Industrial Liaison Centres have already been established and five more are to be set up shortly by the Ministry of Technology for bringing closer coordination and liaison between the industry and academic research institutions.

Industrial Liaison Centres are normally based on Colleges of Advanced Technology and regional and area technical colleges. A few are based on universities, and three of the Scottish Centres are based on Cenral Institutions. The Ministry bears the greater part of the cost of operating these Centres, and is responsible for staff training and technical support.

Each Centre has one or more Industrial Liaison Officers who are on the rolls of the college staff. They are responsible for maintaining contact with local firms, particularly the smaller ones, and encouraging them to make greater use of existing scientific and technical knowledge —personal contact being essential to the successful working of the scheme. The advisory facilities of the college, including those relating to research, development, production and design, are an important element in the service.

Simultaneously with the setting up of the Ministry of Technology, the Department of Education & Science had also set up a number of research councils like Science Research Council and Natural Environment Research Council, for support of research in universities. They have also some research establishments mostly concerned with pure sciences like nuclear physics and radio research under their control.

ASWI Activities

MYSORE BRANCH

Note on

"Evolving a rational system of recruitment and promotion for scientific personnel"

The need for replacing the existing recruitment and promotion system in scientific institutions in India with a more objective one has been widely felt for a long time. The case for this and the principles that should govern a revised system have been brought out in detail in an article ("The Recruitment Quagmire in India's Science") published in the *Vijnan Karmee* of September 1966.

The Mysore Branch of the ASWI set up a study group to go into this problem further and propose a workable alternative system. As a first step, the group has identified and listed the different questions of operational details that have to be answered before such a system can be formulated.

While continuing its study, the group has felt that getting the views of distinguished scientists and science administrators all over India on these questions, would be of great help in its task. With this idea, a questionnaire has been prepared for circulation which asks for concrete suggestions on the different operational aspects of an alternative system.

A copy of the questionnaire is enclosed (page 21). A statement of background propositions, summarizing the principles governing the approach to the problem, has been included below as an introduction; this is followed by the questionnaire proper.

I earnestly seek your help in this important task and request you to give us the benefit of your expert suggestions on these aspects at your earliest convenience. I need hardly assure you that your views will receive our more sincere consideration, and that by helping us in this matter, you will be helping the healthy development of science in India.

Sri Baldev Singh
C.S.I.R.
New Delhi.

K.R. Bhattacharya
Secretary

Recruitment and Promotion of Scientific Personnel

Background Propositions

1. The exsisting system of effecting new recruitment as well as promotion only through advertisement and interview* is highly idealistic and impractical. It breaks down completely in the case of promotion of personnel already in employment (which is necessitated by the existence of a multiplicity of grades), for which purpose it can be applied only with considerable manipulation and prevarication. The reasons are as follows:

   (a) The crux of promotion of personnel in employment is their assessment to select the outstanding among them irrespective of their field of work.

* This situation has been slightly altered in the CSIR since the recent introduction of the five-year assessment for promotion rule. However, even here, this rule is treated only as a minor auxiliary route and so does not substantially effect the discussion.

But an advertisement, being specific, automatically restricts the field and so prevents a free and fair assessment of *all* in their *own* fields. Hence if the scope of the advertisement is chosen at random, promotion will depend more on luck than on eligibility: e.g., an oilman, even if brilliant, cannot even compete if the advertisement is for sugar, but even a mediocre person in the sugar department is favoured. Therefore the only way to ensure that promotion will not become a matter of chance, but will go to the really deserving, is to choose the deserving ones first and then to allocate the posts and advertise accordingly. That is, in effecting promotion through advertisement, if it is to be fair, the *true selection must precede the advertisement*. This type of manipulation does ensure a modicum of fairness, but inevitably leads to scepticism and demoralization.

(b) In addition, the stated requirements in such advertisements being manifestly false (for instance, when an oil chemist is advertised for, and the intention is not to get an extra oilman but only to reward a deserving employee), the whole process is rendered unethical.

(c) Tagging promotion to advertisement also seriously hampers the efficiency of the interview: In absence of any other route of promotion, there is always a continuous stream of advertisements and a huge number of applicants, which severely restricts the time of interview that can be devoted to each candidate. Again, many deserving people having been earmarked for promotion earlier, their selection becomes a formality. Naturally, the whole process is viewed with mistrust.

2. The crux of a sound alternative method of recruitment and promotion, therefore, is that the process of promotion of employed personnel must not be mixed up with that of recruitment of additional hands. New recruitment and promotion would then be roughly on the following lines:

(a) Advertisement should be issued only when *additional* personnel are required to be recruited. Quantitative need should be met by university freshers, qualitative need by specialized persons. Provision should perhaps also be kept for direct absorption of Pool Officers etc. already working in and integrated into the institution.

(b) Promotion of employed personnel within a cadre should be determined solely by a system of rigorous assessment. Such assessment should be periodical and at certain predetermined intervals. Promotion should also be unconnected to any sectional distribution of the number and grades of posts within the laboratory.

QUESTIONNAIRE*

(Please answer on a plain sheet of paper quoting appropriate question number. As far as possible, kindly indicate the reasons for your choice.)

PART ONE: PRINCIPLES

Do you agree, atleast broadly, with the thesis

*The following arbitrary nomenclature has been used:

Cadre=A class of employees with more or less uniform function (e.g. research personnel, laboratory assistants, etc.)

Grade=A sub-class in a cadre generally determined by a time-scale of pay (e.g. SLA, SSA SSO II, etc.)

Research personnel=Research workers, scientists technologists, etc. engaged in research or developmental work.

Laboratory assistants=Persons engaged in assisting research or developmental work.

Information scientists=Personnel engaged in extension, library, documentation etc.

Auxiliary personnel=Personnel engaged in maintenance of instruments.

presented in the Background Propositions? If not, please explain why.

PART TWO : OPERATIONAL

I. PERSONS IN EMPLOYMENT

(It is envisaged that once a person is recruited into an institution, his further advancement or promotion within the cadre within that institution will be effected directly without any recourse to advertisement. This will need laying down of clear-cut procedures for assessment and promotion, whether there are several grades as at present or there is only a single continuous scale of pay with several 'merit bars'. However, alternatively, if all appointments are made contractual, need of promotion as such will be eliminated.)

A. Procedure involving assessment and promotion

1. Assessment:

   (i) What should be the periodicity of assessment and whether the periodicity will be institute-wise or person-wise.

   (ii) What should be the means of assessment (e.g. by oral interview, by examination of written record of attainments, by annual assessment reports prepared by senior officers, etc.) Please give details of procedure and criteria.

   (iii) Who should assess.

2. After assessment:

   (i) Those whose performance hsbeen definitely below standard—should be dismissed? demoted? warned? nothing?

   (ii) Those whose performance is found good but not such as to make them eligible for promotion—Should they wait for the next routine assessment or be specially assessed after a shorter period?

   (iii) Those who have shown a certain definite standard of performance, deserving promotion—

   (a) Should they all be statutorily promoted to the next higher grade?

   (b) If all eligible persons cannot be promoted because of financial limitations, how to pick out the requisite number?—by grading them according to merit? age? years of service? etc.

   (c) If all eligible persons cannot be promoted (as in b.) what happens to those who were declared eligible, but could not be promoted in the first instance?—To be treated like those who were found in-eligible, or to get preference later (and how)?

   (iv) For special outstanding work (as revealed during the *routine* assessment)—Special extra promotion? special prizes? special increments? nothing?

B. Procedure not involving promotion per se

1. Do you consider that all or certain categories of scientific appointments should be on contract basis for a specified period? If yes, please specify which categories and for how many years?
2. If so, at the end of the contract period, what will be the criteria and procedure of deciding whether the contract shoud be renewed? Please give details.
3. The administrative process in India being inordinately slow, and jobs being scarce, it takes a long time to land a suitable job. In this background, if you visualise all or certain jobs to be contractual, what machinery can you suggest to ensure that people will not periodically have to go without jobs for considerable times?

II. NEW RECRUITMENT (RESEARCH PERSONNEL)

[This refers to the first recruitment of a research worker into the institution. It is

envisaged that the bulk of these recruits, representing the quantitative need of the institution, will come from among university freshers without any previous experience. A small number of specialized personnel, according to qualitative need, will also have to be recruited (always from outside the institution). In addition, certain Pool officers etc. may have to be recruited directly. All such recruitments will be through an interview, but not necessarily through an advertisement.]

A. University freshers (without any previous experience

1. What minimum qualification (fixed and non-relaxable) do you recommend? (See also IV A 1 ii b).
2. What should be the method and criteria of selection.
3. Do you prefer direct recruitment or through a fellowship? (For example, an M.Sc. can either be directly recruited in an appropriate regular grade or may be required to serve as a Research Fellow for a certain prescribed number of years before being absorbed as a regular employee.)
4. If direct recruitment, into what grade
5. If fellowship :
   - (i) Fellowship for how many years:
   - (ii) One type of Fellowship or more (e.g. JRF, SRF)
   - (iii) What should be the procedure and criteria for judging successful completion of fellowship?
   - (iv) After the successful completion of the fellowship, should he be absorbed through advertisement or directly?
   - (v) What procedure do you suggest, in the background of (iv) above (i.e., if without advertisement), to allow a successful Fellow from one institution to be absorbed into another institution if he so desires?
   - (vi) What is the grade (fixed) in which the successful Fellow should be absorbed?

B. Experienced persons needed by the institute (to be recruited through advertisement and selection, always from outside).

Should the grade be specified in the advertisement or left to be decided according to the qualification of the person selected?

C. Pool Officers

Provision should be made that Pool Officers and similar personnel already working and integrated into the institution might be directly absorbed into it through an interview, but without an advertisement. However, while fixing their grade and pay, it must be ensured that neither they nor those already in employment are at a disadvantage—Please comment.

III. NEW RECRUITMENT

(Non-Research Personnel)

What criteria and procedures do you suggest for the recruitment of :

1. Laboratory assistants
2. Information scientists.
3. Other auxiliary personnel

IV. OTHER RELATED PROBLEMS

A. Cadre structure

What, in your opinion should be the cadre structure in a research institution? More specifically:

- (i) At present, the cadres of research personnel and of laboratory assistants are not clearly demarcated. Do you think that these two cadres should be kept distinct?
- (ii) If two distinct cadres are desired:
  - (a) What should be the two cadres? (Total salary range of each cadre break-up, if any, into grades and and its designations may be suggested.)
  - (b) What should be the minimum qualification for entry into each of these two cadres (see II A 1).

Please list equivalent qualifications, if any, for the two suggested qualifications.

(c) What, in your opinion, are the criteria that an assistant must fulfil after which he can be eligible for entry into the research cadre? Also, on eligibility what should be his entry point? Please give details.

2. Do you consider that there should be a distinct cadre of research management? If so, what should be the point of demarcation between this cadre and the cadre of research personnel?

3. Do you consider that there should be a separate cadre or cadres of information scientists and maintenance and other auxiliary personnel distinct from the cadre of research personnel ? If so, please suggest the cadre(s) (salary range, designations etc.) and the minimum qualification (s) required for entry.

B. Post distribution

For the pattern of promotion suggested in I A, it will be necessary that the break-up of the total number of posts of a given cadre in a laboratory into grades and into its different departments should be left flexible. Do you consider this feasible?

C. Promotion of non-research personnel (within their cadre)

Do you think that the pattern of promotion, formulated under I (which applies specially for research personnel), will also apply to non-research personnel (assistants, auxiliary personnel)? If not, in what essential points must it be modified and how? Please give details.

D. Initial difficulties

1. In the background of the existing situation do you visualise any serious difficulty in introducing the revised system, specially during the initial phase? If so, please give details and suggest remedy.

2. When the revised system is put into effect, do you think the personnel now existing should be fitted into it? If so, to what extent and how?

E. Mobility of scientists

1. In the suggested revised system, number of advertisements for experienced personnel will be greatly reduced (except as under II B and possibly II C), which could reduce the mobility of scientists. Do you think this might have any adverse effect?

2. If you consider such mobility to be of special value, can you suggest a scheme or system by which this could be deliberately encouraged?

F. Other prevailing systems

If the system of recruitment and promotion followed in your laboratory happens to be different from the one followed by CSIR and other similar organizations, or if you are conversant with any such other system, we shall be obliged if you give a brief outline of this system and its advantages and disadvantages.

G. Any other comments

Please send your answers, quoting No. H_{20}

To

Dr. K.R. Bhattacharya
Secretary, ASWI,
Mysore Branch
Central Food Technological
Research Institute,
Mysore-2

EMPLOYMENT ASSISTANCE

Any scientist who may be seeking employment can insert an information column giving his qualifications and his job selection requirements, free of charge, in the Vijnan Karmee. All scientific workers who may like to avail of this facility are welcome to write to the Editor.

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HIROSHIMA DAY—AUGUST 6, 1945

This is the August issue of Vijnan Karmee and this month reminds us, year after year, of the human crime against thousands of innocent men, women and children by the dropping of atom bombs on Hiroshima and Nagasaki. This date, the 6th August 1945, is a reminder to humanity that the cultural heritage of generations could be in danger by the abuse of scientific knowledge. Science has given humanity wonderful means and opportunities to build a happier and healthier life on this globe and aspire to establish contact with the entire system of planets around us. We the scientific workers of India along with our fellow scientists the world over and men and women of goodwill pledge to devote our best energies to see that the discoveries of science and accummulated knowledge of generations is not used to destroy human-beings.

—Editor

Editorial

CSIR CONTROVERSY: ENDS AND MEANS

ONE of the tenets of Gandhiji's teachings was that he insisted on the purity of 'means' as a must, in addition to the correctness of 'ends'. Even a noble 'end' may be defeated by the questionable 'means' employed to attain it. At times the 'ends' are not visible with absolute clarity, then the need for clean methods and means becomes all the more important. The distressing situation in CSIR could still have a happy ending if the contestants of differing viewpoints adopted democratic norms and scientific attitude in advocating their case. In the absence of availability of authentic versions of Nihar Ranjan Ray and Atma Ram Committees' Reports, one is obliged to accepting the arguments for or against their proposals from reports in the daily press.

It is stated that Nihar Ranjan Ray Report advocates merger of Indian National Scientific Documentation Centre and the Publications and Information Directorate and absorption of some of the functions of Research, Survey & Planning Organisation; Research Coordination & Industrial Liaison Directorate into a new Central Institute for Scientific & Technical Information. It is also said to advocate the handing over of Directorate of Scientific & Technical Manpower to the Institute of Applied Manpower Research of the Ministry of Home Affairs. The arguments advanced in favour are unitary control of information agencies and better efficiency and economy. From a contending standpoint, questions have been raised about the desirability and propriety of the setting up a Committee on an issue on which the CSIR had taken a decision hardly a year and half ago. That none of the members of Nihar Ranjan Ray Committee is expert in information science, documentation, publications or scientific data surveys or planning methods. It is stated that the Committee met for a single day and pronounced upon such diverse issues as scientific documentation to technical manpower. Even the charge of 'casualness in scientific matters' is held against the Committee.

It would be inappropriate to add to the heat of the controversy by offering support at this stage to either viewpoint. However, such recommendations which affect the working of laboratories or autonomous bodies of the CSIR should in the first instance be referred to their executive councils and scientific advisory committees of these organisations as also to the Board of Scientific and Industrial Research, the principal adviser of CSIR on scientific and technical matters. Short-circuiting of these organs may have the effect of antagonising an otherwise commendable proposition; and in any case depriving these scientific organs of their share of responsibility in ushering in a change.

Atma Ram Committee's Report has the stamp of authority of a galaxy of eminent scientists. The Prime Minister as President and the Governing Body set them the task of reallocating priorities in research projects and programmes during the Fourth Five Year Plan and suggesting optimum utilisation of the reduced allocation of funds. The press reports indicate that the Committee have made serious strictures on "disproportionate

expenditure on salaries", "Imbalance in staff pattern", and "high proportion of non-research activity" in CSIR. They are reported to have advocated the functional reorganisation of CSIR Headquarters by abolition of the technical directorates. They appear to have also recommended handing over of some laboratories to Research Associations of Industry. The critics claim that the Committee's recommendations are beside their terms of reference and conflict with the recommendations of the Third Reviewing Committee of the CSIR. They also allege that the data on which the Committee has based its strictures is neither correct nor authentic and that the Committee has not fulfilled its task of allotting priorities to research projects. It is also alleged that conclusions of the Atma Ram Committee have been arrived at without discussion with or participation of Directors and other scientists directly concerned.

These proposals have thrown the entire CSIR set-up in an agonising convulsion. While on the one hand it would be hard to lightly dismiss the criticism of such a group of eminent scientists, it would be a most serious matter if the data on which the conclusions are based was unauthenticated. Eminent scientists can contribute their maximum in matters of policy and decision making. If the purpose was to go into details of research programmes and projects and fit priorities to resources, then the choice of membership of the Committee was unfair to itself and the task before it. They could hardly be expected to go into technical and economic details of projects and identify those of primary relevance to the industrial and economic planning. It is not surprising that the Committee's proposals have been widely characterised in the press as for "reorganisation" than for allotment of priorities in keeping with CSIR allocations during the Fourth Five Year Plan.

Whatever may have been the terms of reference of the Committee, the charges of "disproportionate expenditure on salaries", "imbalance in staffing pattern", and "non-scientific activities" have been seized upon by the press and made the subject of front-page headlines and newspaper editorials. The public and the press have come to believe that there is something intrinsically wrong with the entire organisation and a searching enquiry is called for. In the present context it appears immaterial whether there is substance in the charges or these are without foundation. The fact remains that the public image of the CSIR, a premier organisation for scientific and industrial research, has been clouded. Elements opposed to science and its role in national development are casting aspersions on the policies of support to scientific research enunciated by Jawaharlal Nehru. This itself will hamper the effectiveness of science and technology as means to industrial and economic development and erect hurdles in the path to progress and prosperity.

It is a matter of gratification that the Prime Minister has decided to refer matters to an *ad hoc* group of scientists. We venture to suggest that this group should be of persons who are able to spare the time for a detailed study of the position and offer constructive suggestions for future research programmes for the national laboratories and indicate absolute priorities in the context of plans of industrial development. They should also indicate the minimum allocation of financial resources to CSIR during the Fourth Plan which will enable this important organisation to play an effective role in economic growth. This group would greatly benefit with the association of a few public men in the field of industry who may have a positive approach to scientific research. Since Reports of these Committees have been extensively quoted and

(Continued on page 19)

The Application of Scientific Discoveries

PROFESSOR J. D. BERNAL, U.K.

It has been felt for many years that the applications of science, numerous as they are, do not take place sufficiently rapidly, and that much of the effort of the scientist in the laboratory either gets held up or never sees the light at all. I have been asked why this is so, with the implication that all that the scientist needs to do when he makes a new discovery is to go out at once and apply to the making of a profit or to the benefit of humanity, according to the social or economic system in which he happens to be living. This is, in general, an impossibility. The transition from the laboratory to industry is both long and complicated, and quite beyond the powers of the individual isolated scientist. It implies the co-operation of large numbers of engineers and technicians in a social organization to ensure that they work harmoniously and rapidly.

It is usual these days to refer to the whole problem as one of research and development and not to distinguish between them, though in fact they are radically different processes. Both take men, money and time, but the cost of development is usually ten times, at least, that of research. In the past, the time taken by development has been generally of the order of decades. For instance, there was a gap of fifty years between Faraday's discovery of the generation of electricity by moving magnets in 1831 and the first practical use of large-scale electricity in electric lighting in 1881. Recently the period has shortened, especially for the lighter uses of science; for instance the principle based on solid-state physics, of the transistor made it a practical and very widespread instrument within a decade. With large problems, however, application involves the reconstruction of whole industries, great obsolescence losses, and usually the need to retrain or train new types of workers also. The computer industry, for instance, is now becoming a major one, employing thousands of men and women at tasks that did not exist twenty years ago. Most of these are not employed in creating new scientific applications but in carrying out what have already become routine production methods.

At the moment, the speed of application of scientific research has become a new factor in its own right. Scientific research applicable in industry is being carried on actively in the whole of the older industrial world. There is a high premium attached to those teams in which results of practical utility are first attained because the use of these ideas subsequently depends on patents and licences, usually obtained at an economically unjustified cost, and when obtained rendering the whole expenditure on research and development of the slower teams a dead loss. Even without this, it is clearly impossible for a relatively weakly economically developed country to be in the lead in all fields at any one time. In this respect for instance, England will rank as a poorer country. It is necessary, therefore, to plan the fields in which it is viable for any

country to concentrate its research effort, with the corollary of the abandonment of any claim to priority in other fields. The strength of any country in science depends on the availability of adequately trained and adequately motivated scientific workers. It also depends, at the next stage, on an organization of science which makes it possible for the men with ideas to get their work accepted and put into action in the minimum time. This is a particularly difficult requirement, for organization implies a certain degree of hierarchical centralization, and it is more than likely that the higher echelons of the hierarchy will not be scientifically or technically minded and they are liable to act on traditional, Civil Service bureaucratic principle.

The need for a scientific policy

What is clearly needed is the setting up in every country of a scientific policy based on knowledge of scientific progress and on national economic needs at the same time. Such a formulation of scientific policy is still not available anywhere in the world, though a few such principles have been enunciated by individual scientists and administrators and the subject is being discussed in many parts of the world.

Scientific research planning is intrinsically a most difficult part of planning. Not only are the principles not clear, but the facts to which they must be applied are not known; and this is for the obvious reason that science itself is the exploration of the unknown. Its planning, therefore, must necessarily involve what are intrinsically guesses but all the guesses are not equally chancy. It is a matter of selecting those that seem most likely to be fruitful, on the basis not only of the technical aspects of science itself, but also of a number of economic and political factors, and, perhaps most of all, of the proved quality of the applied and scientific research workers and the provision of a continuing stream of successors for them. To determine policy, it is, in a sporting phrase necessary to back winners and to back them with high stakes.

The electronic computer

It is already apparent that certain fields of modern research are particularly fruitful, and engender new and unexpected results that are immediately applicable. For instance, the development of the laser, or coherent light beams, was in itself unpredictable; but it would not have been made, as it was almost simultaneously in the U.S.A. and the U.S.S.R., if fields of high-frequency radiation and of solid state physics had not been pursued rigorously. I would contrast this device with one of much less ingenuity, but incomparably, wider application, the electronic digital computer, which in itself is bound to produce a greater change, not only in industry but in administration, than all the inventions of the first Industrial Revolution put together. The electronic computer itself derives from acute military needs, as do many of the applications of science in the twentieth century. But once devised, even in a very imperfect form, it was evident that it had almost unlimited possibilities of further development.

Thus, it can be seen that important practical applications are not so much the result of an individual scientist trying to solve a particular problem, but of groups of workers in combination adding improvements to an original idea. A sideline of the production of computers is that of their components, involving operating circuits which can act in an incredibly short period of time. This is a process of miniaturization, a general method of manufacture which can work right down to almost atomic dimensions. We can even

say now that anything that can be seen in microscopes using electrons can be made. The computer is an example of the use of science working in a field not of gross action but only of communication, and memory, which can now easily be transmuted into large-scale applications, in flight control machine tools, and even drilling and earth moving. Indeed this has happened in the last century, when electric light itself and the use of electricity for power were, in fact, by-products of the development of the telegraph.

So far, I have chosen only applications in the field of physics. Even more important are likely to be those in the field of chemistry, particularly in the new branches of petrochemicals, catalysts and artificial polymers. The deeper understanding of chemistry produced by the quantum theory has enabled that science to move from the empirical methods which were really varieties of cookery, working by trial and error, to a science susceptible to actual computation. Another field for the utilization of chemistry is that of drugs and other biological applications. Here, owing to the new understanding of genetic process in chemical terms in the field of molecular biology, there are unlimited possibilities for rapid growth in the service of medicine and agriculture.

Convergent and divergent research

Out of the multiplicity of scientific developments of the last decade certain principles of application are becoming evident. It is possible to proceed in either of two ways. Either a definite problem is set and the scientists using all the armoury set about to solve it. This is what may be called convergent or problem-oriented research, which has been very evident in the realms of planes of and rockets and is the basis of space studies. Great as these successes have been, an alternative method has yielded even greater ones. This method is to start with a new principle discovered in the laboratory and to look round to find applications for it in the fields of industry, agriculture or medicine. This may be called divergent research, but it equally involves the use for final applications of numbers of workers with wide technological experience. Both these types of useful research need to be cultivated to the utmost, and both require the setting up of highly integrated scientific organization which must be linked with the general direction of the economy.

It can be seen that there are many (even embarrassingly so) possibilities of expansion in the use of science. There are always more problems to be solved than trained men to solve them. The field can be divided roughly into that of the science-based industries such as those of electricity and chemistry, where the knowledge of science is an absolute necessity, and the traditional industries, which only use it incidentally. The latter, however, include most of the basic heavy industries—power, textiles and building. If science is not at the foundation of these, its use even when it yields only a small improvement, will produce a greater effect on the economy. The new method, for instance, of the spray formation of steel promises enormous economies. So does the use of reinforced material in plastics and metallurgy, especially by the application of the principles of pre-stressing.

Science has by now proved itself to be a real productive force. Yet, this force is not only science, but more the men and women themselves, who are making science and leading to its application. This implies not merely their work as individuals, but also a political and economic organization directed to the best use of this new resource.

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SCIENTISTS' APPEAL FOR VIETNAM

From

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c/o W.F.S.W.,
40 GOODGE STREET,
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27th June 1967

Dear Colleague,

In spite of the wide opposition of a very large section of world public opinion, the war in Vietnam continues to escalate. The advanced technology of a great industrial nation is being employed in the systematic destruction of the meagre resources of a poor developing country.

In reponse to an enquiry concerning the most effective way in which scientists outside Vietnam could help scientific laboratories in universities, institutions and schools to continue to function, the Association for the Dissemination of Science and Technology of the Democratic Republic of Vietnam recently sent the World Federation of Scientific Workers a list of scientific apparatus urgently needed. This list contains a large number of items of obvious importance for the continued functioning of their laboratories.

In addition, an appeal has been launched by a group of French colleagues for money to buy books for the library of the University of Hanoi.

In order to help our Vietnamese colleagues and to demonstrate our feeling about the continued American bombing of North Vietnam, we have decided to donate *one day's salary* to a fund in support of these two appeals.

We are inviting scientists all over the world to join us in this action. The money thus donated should be sent to : Dr. W. A. Wooster, Treasurer, at the above address. Cheques should be endoresed "Vietnam Appeal Account".

The intention is that of the money received half should be used to purchase the equipment requested by our Vietnamese colleagues. We are assured that such equipment can be transported to Hanoi without difficulty. The other half will be transmitted to the appeal fund of our French colleagues to provide books for the library of the University of Hanoi.

In view of the urgency of the need, we ask you to respond quickly to this appeal.

Yours sincerely,

J.D. BERNAL
BOYD-ORR
H. GRUNDFEST
D.M. CROWFOOT HODGKIN
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A Rational Approach to Research Investment

G. S. CHOWDHURY

The Council of Scientific and Industrial Research during the past two decades had set up several Laboratories spread all over the country with the specific object of promoting scientific and developmental research utilising the natural resources of our country.

The construction and development of a Research Laboratory over a period of years involves considerable financial outlay by way of buildings, equipment, workshop, library, auxiliary and other technical services, residential colony, pilot plants, etc. In addition to the above capital expenditure, a recurring expenditure to the extent of several lakhs of rupees is required annually to support the activities of the scientific personnel. This expenditure mainly relates to technical and administrative staff, their salaries, allowances, contingent expenditure for the office, books and journals, electricity and water charges, maintenance, research chemicals and apparatus, etc. A further annual capital expenditure is also continuously required to supplement the research efforts by way of capital equipment, minor constructions and services, miscellaneous stores and raw materials, etc. for Pilot Plants. Recently the CSIR had carried out an intensive survey on research expenditure in the various National Laboratories and full detailed information is available in Report No.2 published by the Survey and Planning of Scientific Research Unit of the CSIR.

In the statement (on pages 10 & 11) the cost per working scientist in each Laboratory under the various heads has been indicated for the year 1961-62. Below the above figures under each head, is given the average of 3 years per working scientist for the period 1959-62 for each laboratory. In the last column i.e. 24, the averages for the whole of the CSIR laboratories have been worked out.

The working cost per Scientist may thus be summarised as follows:—

	Average cost per Scientist Rs. in thousands	*Extra for devaluation* Rs. in thousands
1. Pay & Allowances for supporting staff:	8.543	
2. Chemicals and Apparatus	4.928	+ 1.5
3. Library and Books	.765	+ 0.380
4. Equipment	5.638	+ 2.5
5. Pilot Plants	2.822	
6. Contingencies	.233	
7. Maintenance	.030	
8. Towards CPF	.550	
	23.506	4.380
	4.380	
9. Total	27.886	

* Director, Regional Research Laboratory, Bhuvaneswar.

10. Capital expenditure per working scientist is computed on the following basis :

Average Laboratory working space per scientist :	250 sq. ft. (Plinth area)
Additional space for administration block, Library, Canteen, Lecture Hall and other Services, Workshops, Pilot Plants etc.	350 sq. ft. (Plinth area)
Total :	600 sq. ft. (Plinth area)
@ Rs. 40 per sq. ft. for 600 sq. ft.	Rs. 24,000
Cost of quarters per working scientist (cost of quarters per working scientist for supporting personnel including administrative staff is charged per scientist)	Rs. 50,000
	Rs. 74,000

11. Equipment @ Rs. 22,000-Rs. 25,000 per working scientist including pilot plants, instrumentation and other services : Rs. 25,000

12. Interest @ 6%, depreciation and maintenance etc. @ 4% on item 10. Rs. 7,400

13. Interest, depreciation charges, etc. on item 11 Rs. 2,500

14. Grand total Items 9+12+13 Rs. 36,786

It may therefore be seen that the above figure of Rs. 37,786 is on the basis that the full strength of a Laboratory is always present. In reality a certain number of personnel are always continuously on the move. As such the expenditure per working scientist excluding his salary and allowances may work out to approximately Rs. 40,000 or more in almost all the laboratories of the CSIR on an average.

The figure is likely to fluctuate very widely depending upon whether the laboratory is fully developed or still in the process of growth.

Thus the expenditure on the several items listed above, per working Scientist is about Rs. 40,000 per annum on an average in the CSIR. In comparison, the pay and allowances of the various categories of Scientists is insignificantly low as can be seen from the following figures :—

		Percentage of expenditure per Scientist
1. S.S. As : Rs. (325+110)×12 :	Rs. 5,220	13.05
2. Scientists-B Rs. (400+120)×12 :	Rs. 6,240	15.60
3. Scientists-C : Rs. (700+120)×12 :	Rs. 9,840	24.60
4. Scientists-E :Rs. (1300+100)×12 :	Rs. 16,800	42.00

It is only possible to recruit fresh students from the Universities with practically very limited experience as Scientific Assistants. The salary difference between the Scientists-B and the Scientific Assistants is insignificantly low as compared to the research effort likely to be contributed by a Scientist-B who has generally more experience, initiative and ability to carry out research programmes independently. The recruitment policy therefore should be oriented to recruit fewer Scientific Assistants in

relation to Scientists-B. Further, there should also be adequate openings for promotion of deserving Assistants after an initial period of training for a few years within the Research Institute.

The ability to tackle problems independently with the least possible delay, thereby contributing significantly to the reduction in the overall research expenditure can only be expected from senior scientists with experience. Consequently *the number of Working Scientists* should be governed on the basis of the research programmes at a particular Institution in order to bring down the high overhead costs rather than resort to curtail the number of Working Scientists to attain nominal economy in expenditure.

A radical approach to the problem is to plan the optimum level of working scientists in relation to the investment already made by way of buildings, equipment and other supporting personnel and further investments by way of fixed assets should be subjected to utmost scrutiny to avoid further wasteful expenditure. Having determined the optimum number of working scientists in a Laboratory the distribution of the staff pattern for each Laboratory should be left to the discretion of the Director on whom lies the *main responsibility to deliver the goods* in time. This procedure will obviously help to boost the morale of the working scientists who can look forward to get due recognition for their research efforts. Periodical assessment of the individual scientists and their output could be made by a Committee constituted specially for this purpose.

In view of the limited available resources for research and its management, it is essential that optimum utilisation of the monies already invested by the Government in the various national laboratories of the CSIR should be achieved by co-ordinating the efforts of the various organizations, the research personnel and the equipment in relation to the research problems at a Laboratory.

In order to curtail wasteful expenditure and achieve economies, it is more relevant to scrutinize the research problems and allocate priorities in relation to the investment already made in an Institute. This can be best done and should be done by the Director and his senior Scientific Staff in consultation and close collaboration of the scientific sub-committees. Since the overall expenditure per working scientist is very high in relation to the pay and allowances, a serious attempt should be made to equip the laboratories fully and expeditiously both with qualified personnel and modern scientific equipment.

The real economy therefore in 'Scientific Research' lies in reducing the total cost of research in relation to its scientific effort. The economies obtained by restricting the recruitment of scientists and the necessary supporting personnel after having invested huge amounts in our National Laboratories only aggravate the problems. Further, as a consequence of the above policy, the research effort of the country is bound to suffer and slide down rather than contribute effectively to the solution of the urgent technological problems of the day.

ANALYSIS OF THE EXPENDITURE PER SCIENTIST UNDER DIFFERENT HEADS IN 1961-62

(*Rupees in thousand*)

Sl. No.	*Laboratory*	*Pay & Allowances*		*Chem & Apprts.*	*Library Books*	*Equip-ment*	*Pilot Plants*	*Item 3 to 8*	*Contin-gencies*	*Main-tenance*	*Other heads**	*Total of Rec. & Cap. Exp.*
		Sci. & Tech.	*Support-ing staff*									
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.	NPL	4.471	6.732	3.844	0.305	2.265	0.381	17.996	0.827	0.030	7.913	26.766
		4.325	5.204	3.684	0.333	1.843	0.537	15.929			8.719	24.648**
2.	NCL	6.724	5.256	4.529	0.164	0.874	1.904	19.454	0.272	0.054	4.999	24.779
		6.496	4.979	4.665	0.181	0.909	2.822	20.054			4.150	24.024**
3.	NML	6.306	6.385	7.925	0.106	5.085	36.437	62.244	0.370	0.045	12.387	75.046
		6.228	5.297	6.696	0.001	3.233	13.316	34.672			18.814	53.485**
4.	CFRI	4.483	4.769	1.727	0.072	0.567	4.903	16.495	0.527	0.032	3.350	20.404
		4.569	3.744	1.759	0.001	0.555	4.712	15.405			3.569	18.973**
5.	CGCRI	7.386	11.251	6.078	0.362	3.860	7.297	36.234	0.243	0.018	9.219	45.714
		7.333	8.922	5.498	0.221	3.581	5.566	31.121			11.459	42.580**
6.	CFTRI	4.376	3.435	2.988	0.068	0.975	1.295	13.101	0.284	0.089	3.810	17.284
		4.143	3.110	3.072	0.015	0.067	1.273	12.418			4.021	16.438**
7.	CDRI	7.797	5.793	4.584	0.140	1.028	4.310	23.652	0.274	0.100	9.974	34.001
		7.689	5.807	4.251	0.051	0.586	3.364	21.749			7.773	29.523**
8.	CRRI	7.103	9.443	3.691	0.273	2.330	0.946	23.785	0.248	0.029	5.667	29.730
		7.739	8.413	3.487	0.374	3.253	1.051	24.316			7.525	31.842**
9.	CLRI	4.836	5.409	3.088	0.185	0.319	1.198	15.033	0.219	0.010	3.114	18.376
		5.557	5.038	3.488	0.237	0.201	1.138	15.653			3.577	19.231**
10.	CECRI	6.059	7.658	5.404	0.521	4.912	0.419	24.972	0.113	0.014	4.796	29.895
		6.954	6.709	5.250	0.460	3.985	0.845	24.203			5.381	29.584**
11.	CBRI	7.318	6.709	3.757	0.284	2.905	0.000	20.973	0.297	0.010	7.869	29.149
		6.431	6.336	3.829	0.275	3.241	—	20.100			19.507	39.606**
12.	CEERI	6.954	10.200	6.700	0.704	5.600	0.000	30.158	0.124	0.019	41.586	71.887
		7.914	12.075	7.073	1.104	7.731	—	35.896			16.180	52.076**

13.	CSMCRI	7.322	10.161	5.183	6.094	6.556	3.739	39.056	0.056	0.015	11.056	50.183
		6.226	9.602	4.442	4.364	6.896	3.260	34.790			8.244	43.034**
14.	NBG	4.803	8.084	2.470	1.078	2.205	0.000	18.640	0.393	0.005	10.496	29.534
		4.631	7.286	2.525	1.023	2.024	—	17.489			10.931	28.420**
15.	CMRS	5.234	4.340	1.801	0.152	0.000	0.000	11.522	0.114	0.007	17.554	21.198
		6.386	5.872	3.635	0.019	1.633	—	17.112			20.792	37.904**
16.	IIBEM	4.972	7.536	3.181	1.664	3.386	0.000	20.739	0.140	0.014	29.682	50.575
		4.730	6.827	3.377	2.590	3.969	—	21.494			26.614	48.108**
17.	RRL (H)	6.881	5.653	3.119	0.478	5.149	1.475	22.752	0.165	0.006	8.155	31.079
		6.558	5.093	2.918	0.511	5.847	1.696	22.624			7.458	30.082**
18.	RRL(J)	5.703	4.603	2.166	0.806	4.003	0.050	17.300	0.119	0.008	20.279	37.706
		5.562	3.789	2.045	0.750	5.527	0.436	18.113			23.875	41.988**
19.	CMERI	8.200	17.370	16.011	0.656	4.378	0.000	46.817	0.125	0.014	76.050	122.800
		9.871	17.490	12.785	1.710	18.081	—	59.938			131.633	191.571**
20.	CPHERI	6.188	6.015	6.010	0.333	2.697	0.558	21.802	0.163	0.051	27.349	49.365
		6.103	5.326	9.043	0.784	5.098	1.017	25.371			21.888	47.259**
21.	NAL	10.000	24.348	12.543	1.643	57.178	0.000	105.813	0.221	0.040	52.996	159.070
		15.104	27.739	17.804	3.914	66.650	—	131.211			64.979	196.189***
22.	RRL(A)	12.413	12.938	0.000	0.800	2.738	0.000	28.788	0.048	—	31.190	60.025
		17.290	17.940	—	1.440	8.230	—	44.900			33.960	78.860**
23.	IIP	21.180	12.400	6.513	0.720	10.676	0.000	51.567	0.119	—	93.848	145.533
		22.500	11.211	5.733	1.250	9.483	—	9.032			15.031	24.063**
		190.438	196.488	113.282	17.605	1296.86	64.912		5.461	0.610	499.410	
24.	Average for CSIR Lab. per Scientist	8.279	8.543	4.925	0.765	5.638	2.822		0.233	0.026	21.713	

*Works, Buildings, Services, furniture and staff quarters.

**Basis Expenditure three years average 1959-62

***Average based on 1960-61 and 1961-62.

Reports About CSIR in Newspapers

SCIENTISTS ABROAD

The Statesman (10.2.67)

Dr. Atma Ram, DGSIR said in an interview today (9.2.67) I am giving serious thought to evolving a new policy on the subject (scientists abroad) after which only those Indian scientists who are needed here may be requested to give up their jobs in foreign countries and return home.

Amrit Bazar Patrika (11.2.67)

Dr. Atma Ram's foremost point is that it is not necessary to recall all Indian scientists working in foreign countries for the simple reason that all of them will not have any scope to serve India.

Indian Express (29.7.67)

The DGSIR—Dr. Atma Ram has often expressed himself in favour of restricting the entry to the Pool. But although the statements have been given wide publicity, it appears that the question of restricting entry has never been raised at joint committee meetings either by the CSIR or the Education Ministry representatives.

The Manpower Wing of the Home Ministry has decided not to impose any restrictions on the entry of foreign trained Indian scientists into the Scientists' Pool of the CSIR. This decision is binding on both the CSIR and the Education Ministry, for while the Education Ministry finances the scientists Pool and the CSIR operates it, it is the Manpower Wing of Home Ministry which is responsible for policy matters.

4TH PLAN PROPOSAL ETC. ATMA RAM AND NIHAR RANJAN RAY COMMITTEES

The Hindu (14.7.67)

The Committee headed by Dr. Atma Ram is yet to complete its work but is understood to have presented an interim report. Governing Body at its last meeting had set up a Committee to scrutinise 4th Plan proposals of the CSIR and fix the guidelines for the Research Projects to be undertaken by the National laboratories.

Official sources say that these proposals are aimed at avoiding unnecessary dupli-

The Hindu (14.7.67)

The interim report, it is learnt, deals not so much with research projects, but about the organisational structure of the Council. According to informed sources — the Committee's suggestion will make some of the technical *units* at Headquarters of CSIR lose their separate existence.

The proposals run counter to the recommendations of the 3rd Reviewing Committee which has already been appro-

cation of work by different units and ensuring that the *limited resources* (Rs. 153 crores slashed down to Rs. 46 crores by Planning Commission) available with the Council are put to the best use.

Nihar Ranjan Committee has suggested the bringing together of all Units engaged in collection, dissemination of scientific data and information. If this proposal is approved, the INSDOC, PID, RSPO which are now separate units may be merged into one.

The Economic Times (16.7.67)

Although the Atma Ram Committee was set up to examine Plan proposals, the Committee felt that economy could not be achieved without some organisational changes. The Committee had to suggest reduction in various spheres.

Patriot (23.7.67)

Nihar Ranjan Ray Committee was appointed on 16th March to look into the possibility of integration of INSDOC with PID. It has recommended the establishment of CISIP, report PTI, as total budget for INSDOC, PID, Languages Unit & Science Reporter during 1967-68 was Rs.40 lakhs which is what a bigger laboratory of CSIR costs. This is a large sum & should be husbanded properly.

The Times of India (24.7.67)

Atma Ram Committee's conclusions stresses : that the existing laboratories and institutions should be the first charge on the 4th Plan provision.

The Times of India (24.7.67)

CSIR advised not to open new institutes unless there are compelling reasons.

Hindustan Times (24.7.67)

No new laboratories should be set up ved by the Governing Body at an earlier meeting. According to them, the 3rd Reviewing Committee had commended the useful role that could be played by these technical units in the planning of scientific research and formaulation of scientific policy and had suggested strengthening of these Units with full fledged Directorates; The Scientists are reported to have met the Education Minister and told that by scrapping these units, the headquarters would be made more an administrative Centre than a technical and policy making agency; the measures of economy effected by DG had the effect of tightening control over the powers of Directors. One of the Director is reported to have sent a letter to DGSIR, copies to all others and Education Minister demanding a halt to these measures as they constituted a reversal of the trend towards decentralisation of authority which was set in motion after the 3rd Reviewing Committee report.

The Economic Times (15.7.67)

Prime Minister presiding over the Governing Body said, that activities of the Council should not be measured in terms of money only, but the dedicated work of scientists. Important research projects should be studied and that the findings discussed informally with her and Education Minister.

The Statesman (16.7.67)

Prime Minister stressed the need for a Plan that would unfold a national science strategy. It should be a programme of action to meet the national needs in development & defence. She wondered whether there was adequate research planning and whether it was linked with specific development objectives.

The Times of India, Bombay (16.7.67)

Prime Minister in her address hoped,

until there was full utilisation of existing ones.

Hindustan Times (24.7.67)

In an interview DGSIR surprised 'onlooker' by saying that he was keen on cutting out 'the frills' from the CSIR, an overstaffed body, much of whose work should probably be handled by the Planning Commission.

'that scientists would not live in a compartment and would take the national needs into consideration.

The Hindu (16.7.67)

Some members of the Governing Body, it is learnt, felt that the proposed change in the organisational structure at headquarters as recommended by the 4th Plan Committee and Nihar Ranjan Ray Committee was drastic. They are reported to have vigorously opposed the move to merge INSDOC with PID, and the RSPO which is now a separate Unit at headquarters.

DATA ON RESEARCH

Indian Express (27.7.67)

Lion's share of Rs. 18 crores spent on Research by CSIR labs. now goes in the form of salaries. Unplanned growth of staff has resulted in an expenditure of 65 *to* 85% of the budget of the labs. on salaries alone. Even in India, private sector research labs. do not spend more than 30% on salaries. Apart, much money is spent on seminars, tours, to satisfy the whims of a few scientists.

Some influential Directors of laboratories refuse to budge from their wrong policies and uncontrolled recruitment in the name of several unproductive and wasteful research projects.

Atma Ram Committee notes that there are scores of non-scientific persons in CSIR who have been given scientific posts in the last 4 or 5 years. Surprisingly, there are many senior scientists who never had even elementary science education. DG has strictly stopped new recruitment—Result—ratio of research staff has gone up by 5%, technical staff by 2%, and administrative staff declined by 7%.

(also **Patriot** 27.7.67) Ancillary staff accounts for a major part of this expenditure out of 15000 employees, 7000 belong

Patriot (28.7.67)

Campaign on behalf of Dr. Atma Ram has now taken open shape of a personal attack on Dr. S.H. Zaheer. Some of the facts reported highly questionable and some others misleading. 65 to 85% of CSIR funds spent on salaries cannot be corroborated with observed expenditure reports of CSIR. Res/Adm ratio in 1966-67 is in fact the fruit of Dr. Zaheer's policy which showed positive results as Dr. Atma Ram took charge only on 22.8.66. Class IV high proportion gives an impression of peons and chaprasis hovering round. Many labs. employ labour force through class IV staff. For preparing raw materials specimens, maintaining plant and animal house employees are usually looked as 'class IV' (technical) but this fact has not been revealed.

Economics Times (29.7.67)

Chaos in CSIR—Govt. to remove lot of deadwood and forge a meaningful look between Science & Industry; should speak out clearly what CSIR can do by way of cost reduction, import substitution, improvement in productivity and so on. Without unassigned definition of its capabi-

to Class IV and administrative cadres. Research scientists less than 4000.

The Hindu (31.7.67)

DG said: his experience in CGCRI which he headed indicates, out of research problems referred to the laboratory 'not even 5% are real research problems' when we analyse them.

Patriot (31.7.67)

DG said 'Process of reorganisation already begun.' He proposed to do the reorganization 'without retrenchment or demotion' but by regrouping of existing staff in labs for various priority projects. He expects to complete the reorganisation shortly.

The Hindu (1.8.67)

The Atma Ram Committee is against their continuance as separate Directorates. At the recent Governing Body meeting these proposals were considered but briefly, but no decision was taken. Dr. V.K.R.V. Rao who is the Chairman of the Executive Council of RSPO while stoutly defending the work of the organization shed no tears for the other units.

Hindustan Times (2.8.67)

Main controversy—is the fate of 4 technical directorates— governed by separate executive councils. Atma Ram report proposes the abolition of these Councils which will terminate the Directorate independent existence; bring them under the DGSIR, reducing them to the status of other CSIR units.

The Statesman (14.7.67)

Several Directorates of the CSIR are to be wound up. BSIR is to be abolished and replaced by an Advisory Committee of not more than 10 members. Governing Body to be re-constituted with a compact body of 18 to 20 members with a standing committee of 7 to meet every month.

lities, its inner imbalances between productive and new production staff, fundamental & applied research, duplication and coordination, can hardly be redressed.

The Hindu (1.8.67)

It cannot be denied that some of the contemplated measures have the effect of ending everything that his predecessor did.

In last 4 years, a number of technical units have been established at the headquarters which function as separate directorates. These are INSDOC, PID, Industrial Liaison, Directorate of Scientific and Technical Manpower, RSPO, Indian Languages unit, CDEO. Proposal under consideration is to entrust the work of Industrial Liaison and preparation of Designs to the laboratories concerned; to transfer Directorate of Scientific & Technical Manpower to Applied Manpower Research, to hand over Indian Languages Unit to Ministry of Education, merge INSDOC and PID into CISIP and to make RSPO—a technical wing of the CSIR Secretariat.

Committee has gone beyond its terms of reference in making these recommendations as its task was only to prune 4th Plan projects and not the existing ones.

The Statesman (2.8.67)

Some Members of Scientific Advisory Committee of the Cabinet had reservations about the Atma Ram Committee Report, demanded more data before coming to a decision on such an important issue.

Hindustan Times (2.8.67)

Atma Ram Committees' recommendations are understood to have been opposed by several of CSIR Directorates.

W.F.S.W.—A PROPOSED INTERNATIONAL SYMPOSIUM

Science and technology are developing rapidly in many countries of the world. There were serious problems concerning the effects of science and technology on one another even before the present period of rapid growth. But now, the problems are more evident and demand solution more urgently. The discovery of the New World by Columbus marked the beginning of a great period of expansion of colonization and development generally. In a similar way the flights of astronauts round the Earth mark the beginning of a new period in the extension of the influence and discoveries of mankind. It is to be expected that when science and technology have such a great success it will have a profound influence on the life of mankind in general. Another problem for the whole world is the population explosion. If disasters are to be avoided, science must be applied rapidly to secure the needs of the populations. The world is still witnessing the spectacle of a war in progress. Bearing in mind the immense potentialities for destruction on a world-wide scale, which modern science and technology have introduced, all people anxious for the preservation not only of their own nation but also of all the people of the world, must regard the application of technical and scientific knowledge to the conduct of war as demanding the most urgent and searching examination.

Apart from exerting a powerful influence on the lives of people everywhere, science and technology have an important influence on one another. Science is sometimes seen as a help to technology and the reverse is also true. However, there is often competition for limited funds and society is obliged to decide between the rival claims of "fundamental" and "applied" science. There is also the problem of the speedy and effective utilization of technological discoveries.

Underlying many of the problems mentioned above are the social structures of the countries of the world and the external pressures which are put on them. By far the most important hindrances to the application of science to the welfare of mankind arise from some social and political institutions. These institutions may be beneficial to mankind but sometimes they are harmful and may be opposed to the application of those methods and machines which would greatly improve the material and spiritual life of man. It is therefore necessary to study not only natural sciences, both fundamental and applied, but also social sciences. Economic domination and pressure by foreign countries must also be included among the influences retarding the progress of science and technology in many countries.

For these reasons, the W.F.S.W. has decided to organize a Symposium in 1968 to gather contributions on the subject briefly outlined above. It is hoped that the Symposium will have a worldwide appeal and that those coming from developing as well as those from developed countries will find much of interest. The W.F.S.W. is well

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placed to organize such a Symposium. It has affiliated organizations in twenty-six countries and Corresponding Members in twenty-five others and it has already held a number of international symposia, the last one in Budapest being attended by people from forty-six countries. The W.F. S.W. has close connections with Unesco and enjoys the help of that body in organizing symposia of this kind. It is hoped by the organizers of this Symposium that there will be representatives from many countries in different stages of scientific and technical development so that a thorough and unbiased presentation of allthe aspects of the problem may be obtained. Some notes on the proposed detailed sections follow.

General Organization of the 1968 Symposium

It is proposed that the Symposium will include:

An opening Plenary Session

Several Sections dealing with specific topics

A Final Plenary Session

PLENARY SESSIONS

(a) *Opening*—One speech covering the following:

The role of science in the development of contemporary society and industry and the position of the scientist in this system: the influence of fundamental sciences in the growth of industry and technology: the relation between the fundamental and applied sciences;

the possible contribution of the W.F. S.W. to the study of problems concerning the developing countries.

(b) *Final*—The Chairmen of the Sections will make reports on the work of their respective Sections.

SECTIONS

It is proposed to have three Sections. As far as possible it will be arranged that these do not occur at the same time so that delegates may participate in the work of more than one Section.

The title of each Section and a provisional subdivision of the general themes are suggested below. The final programme will depend on the result of consultations among scientists from many countries and will be circulated later.

To assure the success of the Symposium the contributors will be urged to submit their contributions well in advance to enable the organizers to issue copies beforehand. A great effort will be made to achieve this pre-conference circulation of the material and all participants at the Symposium will be asked to co-operate.

SECTION 1

The impact of science on technology and production

1.1 The role of science in the development of society and industry and the position of the scientist.

1.2 The influence of fundamental and applied sciences in technology.

1.3 The relation between the development of technology and production.

SECTION 2

Obstacles to the development of Science and Technology

2.1 Political, social and economic factors hindering the development of science and technology (imperialism, lack of finances, the 'brain drain'' to richer countries, the effect of big monopolies on scientific research).

2.2 Defects in the education of scientists (unfavourable public attitude towards science in education, lack of adequate

teaching in primary and secondary schools).

2.3 The relations between scientists and administrators.

SECTION 3

Assistance to developing countries

3.1 Bilateral and international assistance.

3.2 Agricultural and food research, expanding populations.

3.3 Studies on natural resources.

3.4 Educational exchanges at undergraduate, graduate and professional levels.

3.5 Scientific research in town and regional planning for the use of developing countries.

Further information can be obtained from the following offices of the W.F.S.W. :

W.F.S.W. 40 Goodge Street, London, W.1., U.K., (Tel: 01-580 8688).

W.F.S.W. Prague Regional Centre, Parizska 11, Prague 1, Czechoslovakia. (Tel: 663-43.)

W.F.S.W. Indian Regional Centre, Association of Scientific Workers of India, Post Box No. 137, New Delhi, India.

W.F.S.W. Regional Centre for Arab Countries and the Middle East, 33 Abdul Khalek Tharwat, Cairo, Egypt, U.A.R.

(*Continued from page 2*)

commented upon in the press, they should now be made freely available. The *ad hoc* group should arrive at their conclusions through detailed discussions with Directors and scientists in the national laboratories and others charged with collection of scientific data and planning of scientific research. The group should also go into the strictures passed by the Committee and determine if they were based on authentic data and facts. The proposals for reorganisation should also come up for examination on merits and their implications carefully gone through.

We are believers in the democratic process in the functioning of scientific organisations. Even if this process is slow, it has the advantage of carrying the willing cooperation of the largest number. Scientists are a creative and sensitive lot. They cannot be governed by administrative edicts and office orders. The widest possible discussion and participation by scientists must precede adoption of any changes in the organisational pattern.

N. P. Gupta
President, ASWI.

ASWI ACTIVITIES

Karaikudi Branch

The branch adopted the following resolutions at the meeting of the Executive Committee held on 21.6.67 :—

1. Resolved to request CSIR to grant loan scholarships to its employees to proceed for higher studies and also study leave.
2. Resolved to request the SAEST to institute a research diploma in Electrochemical Technology.
3. To co-opt Sarvashri M. Sundaram, Scientist and P.V.S. Subramanian, SSA as members of the Executive Committee.

A three members delegation headed by Shri B.A. Shenoi visited Madurai and waited on Shri T.P. Meenakshisundran, Vice-Chancellor, Madurai University by prior appointment. A representation was made on the following points :—

1. The possibility of awarding M.Sc. degree by research to the B.Sc. degree holders working in CECRI (Research staff).
2. Permitting degree holders of other Universities (other than Madurai) to register for higher degrees by research.
3. If M.Sc. by research could not be awarded, the possibility of permitting the research staff to appear privately for the M.Sc. degree examinations.
4. The possibilities of permitting Bachelor degree holders in Science subjects with more than a stipulated period of research experience to register directly for Ph. D. on lines similar to the one adopted by I.I.T. (Madras) with suitable modifications.
5. The possibility of permitting the Bachelor degree holders in Engineering and Technology to register for Ph. D. or M.E. by research.
6. The possibility of AIC equivalent diploma holders by examination, to rigister for Ph.D.
7. The possibility of opening a Department of Electrochemical Technology similar to leather technology department run by CLRI for Madars University.
8. Admitting in Second M.Sc. class the research staff with stipulated experience, as is being done for demonstrators.
9. The possibility of starting part-time B.E. Course in A.C. College of Engg. and Technology, Karaikudi.

The Vice-Chancellor gave a sympathetic hearing though no immediate steps towards meeting the requests were promised. The Vice-Chancellor advised the branch to submit concrete proposals covering all the points represented, which he said, would be placed before the Syndicate for consideration.

Mysore Branch

Formulation of an alternative system of recruitment and promotion

Readers are aware that this question has been engaging the serious attention of the

Branch lately, An informal study group after a detailed study, has identified and listed different operational problems requiring careful consideration before a revised system could be formulated. This was done to facilitate the work of the group itself in examining the issue systematically and framing concrete proposals.

Since concrete questions had been listed, the study group felt it would be useful to seek the suggestions and views of others as well. A detailed questionnaire was therefore drawn up and circulated during the third week of May to more than 350 scientists and science administrators in the country. They included the Directors of all known research laboratories and institutions, other well-known scientists (except those in the Universities) in the country, administrators employed in scientific institutions, the different Branches of the ASWI and about 70 persons in CFTRI, Mysore. The questionnaire has also been published in the June-July'67 issue of Vijnan Karmee.

Answers to the questionnaire have already started coming in (about 20 so far). Very thoughtful and elaborate answers have come from Dr. P.C. Meeha, Director, ATIRA, Ahmedabad. Constructive answers have also been received from Dr. C.R. Krishnamurthi (CDRI, Lucknow), Dr. Vikram A. Sarabhai (AEC, Bombay), Dr. M.U. Pai (NCL, Poona), Dr. K.K. Iya (ICAR, New Delhi), Dr. Rama (TIFR, Bombay), and a few others. According to communications received by us, replies from many more are expected shortly.

The study group will soon take up detailed consideration of all aspects of the questionnaire in the light of the suggestions received to formulate a concrete proposal.

ASWI, Ordnance Establishments, Kirkee

Bihar Relief Fund: The response that Association received to its appeal for contributions in aid of Bihar Relief Fund was spontaneous and encouraging. Every one has risen to the occasion and acted in full realisation of the gravity of the issue. By our excellent performance we displayed our traditional generosity and goodwill at this juncture also. Association extends its heartfelt and sincere thanks to all those who so readily responded to its appeal and contributed to the fund. The sub-committee formed for this purpose deserves our full throated congratulations. The sum so collected amounting to Rs. one thousand one (1001) was sent to Chief Minister of Bihar.

Executive Committee Meetings:—The Executive Committee of the association had six meetings so far to conduct routine business.

Editor of Bulletin:—Shri A.V. Thomas was unanimously elected the Editor for the bulletin for the year ending December 1967.

Rotation of shifts & day work for the staff: The General Manager, H.E.F. was approached by the association to make suggestions regarding rotation of shifts and day-work for the staff. A good number of staff, ever since their appointments are placed in day work. A reply from the General Manager is awaited.

Improvement of H.E.F. canteen: The Association noted with deep concern the sad state of affairs in the canteen and has submitted a memorandum to General Manager. This memorandum contains, inter-alia, some practical and pragmatic suggestions for the improvement of the administration, service etc. It is suggested that the items in menu can be increased considerably to have more appeal to all persons with varying tastes. A reply is awaited.

Promotion of Ex-apprentices: There is a good number of Ex-apprentices who, having undergone the prescribed terms of appren-

ticeship & completed more than two years of service as supervisors A grade, are denied promotion. This problems is to be viewed in the light of recent direct recruitment of supervisors 'A' The D.G.O.F. has been requested to consider this. No reply has yet been received.

Opening of Post Office in H.E. factory:— This issue had been taken up 4 years back with General Manager of H.E.F. Association approached him to inquire about progress made in this direction. He, in his reply has said that this question is being considered earnestly.

Punching clocks in Ammunition Factory: A number of members of staff from Ammunition Factory have complained to this association that the existing punching clocks in A.F.K. are either keeping incorrect time or not working satisfactorily. As a result of this many staff members are given 'notes' for coming late. Association approached G.M./A.F.K. & requested him to provide new clocks or get the existing ones repaired to obviate the inconveniences caused to staff.

Recruitment of Chief Glass Blower: Association enquired from the Director, Solid State Lab. in New Delhi whether the appointment to the post of Chief Glass Blower in their department had been advertised in any newspapers. Reply is awaited.

Lunch Room in C.I.M.E.: The Association brought to the attention of C.I.M.E. authorities the need for a suitable Lunch Room in C.I.M.E. for its staff. We look forward to the granting of this facility to C.I.M.E. staff.

Irregular disbursement of salaries and supplimentary payments: The Association has represented to G.M./H.E.F. this case and pointed out the inadequacy of the existing procedure of payments to staff especially those in night shift. It is also suggested to him that the same method as adopted in AFK and CIA etc., i.e. issuing payslips to staff with all details of information regarding credits/debits etc. could be followed here also. The G.M. replied that the existing procedure was working satisfactorily and hence there was no need for any change at present.

Drying of DNT/TNT bags in front of shift rooms: The practice of drying of DNT/TNT bags in front of shift room needs to be avoided because it causes inconvenience to staff entering the shift-rooms. General Manager is requested to look into this matter.

Regd. No. D-1650

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