

*Evolved by VS on The Base Model
of the National Radar Council*

*The Swraj Paul Award
for the Promotion of
Science and Technology Policy 1991/92:*

*Attachment to Official Application Form
submitted by Dr. V. Siddhartha*

**Policy mechanism and research-support
arrangements for the promotion and conduct of
superconductivity research and its applications in India**

1. Background

In early-1987, several research groups round the world began reporting promising results from work on the concoction of a new class of materials that exhibited superconductivity at temperatures higher than that of liquid nitrogen. What was earlier a scientific curiosity was thus suddenly brought into the realm of techno-economically viable application.

In 1987, work on the development and characterisation of these superconducting materials in India was contemporaneous with work elsewhere in the world. Several institutions in the governmental and quasi-governmental sector, (such as the Bhabha Atomic Research Centre and the Tata Institute of Fundamental Research, both in Bombay) and academic institutions (such as the Indian Institute of Science, Bangalore and the Indian Institute of Technology, Madras) were the active centres. But their efforts were isolated from each other and there was little focus on viable applications. The need for enhanced support for basic research and a suitable institutional means for focussing such research on applications was felt in leadership groups within the Indian scientific community. However, it was not clear what precise form and shape such institutional means should take.

The last major and significant novel institutional arrangement for research support and human resource development in Indian science was the setting-up of the Indian Atomic Energy Commission (AEC) shortly after Indian independence, when the harnessing of atomic energy for non-military applications all over the world was still in its infancy. The late Homi Bhabha departed from the then-prevalent Indo-British style civil-service precedent and evolved a self-contained "Commission" structure for governmental support for research in, and civilian applications of, atomic energy.

Two decades after the setting-up of the AEC, a scientocracy had established itself (i.e. leadership groups in the scientific community occupying civil-service positions in, or with influence over, the civil service). This scientocracy got habituated to the 'atomic energy' precedent in its conception of systems of governmental support for science & technology. This scientocracy did not analyse the circumstances (political, economic, institutional, bureaucratic and scientific) that circumscribed the establishment of that precedent. Thus, when the government of India embarked upon major programmes of research support in electronics (1971) and space research (1972), the scientocracy followed the atomic energy precedent and set-up the Electronics and Space Commissions explicitly patterned after the Atomic Energy Commission. But by the mid-80's it had become apparent that while such an institutional design for the promotion of space research and its applications (i.e., the Space Commission) was appropriate to its mission, the institutional design of the Electronics Commission was, at best, very weakly suited to its mission.

Despite this experience, when it became necessary in 1987 to evolve and set-up an institutional arrangement for the support of superconductivity research, a section of the scientocracy, habituated to the atomic energy model, proposed a 'Superconductivity Commission' patterned on the atomic energy and space precedents.

My endeavour was to attempt to break-out of this mind-set.

2. The nature of the research-support activity

One recognised that the research activity in the area of superconductivity that needed to be performed is very much people-dependent (rather than organisation-dependent). The qualified and motivated people are not in industry, but in academia and in publically-funded national laboratories; people who have to travel extensively and easily within India and abroad; people who are young.

One recognised also that the funding required for the first three years was quite modest (Rs.150 million or so); the disbursement being primarily conditioned by the funds-absorption capacity of the institutions and groups performing various research tasks, rather than by allocation amongst competing groups.

Consequent to the above recognitions, the nature of the research-support arrangements for the first few years was primarily facilitation and hassle-removal. It was not so much co-ordination, direction or management of the activity itself.

3. The facilitatory functions

The facilitatory functions in the research-support activity covered:

- * Finance: the principle sought to be enshrined being budget and not expenditure control (This is a departure from both civil-service norms and the 'atomic energy' precedent).
- * Personnel: much greater flexibility being provided to acquire the services of personnel from within and outside the country as consultants, visiting scientists, and to facilitate their operation within the country.
- * Procurement: of goods and services of all types, including by import without extensive paper-work and regulatory drill.
- * Civil-Works: including their attendant specialised architectural design, whenever required.

4. The innovative policy and research-support mechanism

The facilitatory functions required the co-operation and support of a wide array of departments and agencies in government, many of them historically and, by nature of their traditional functions, sceptical (if not antagonistic) to the scientific enterprise in India; jealous of the 'excessive freedom' given to agencies such as the Atomic Energy and Space Commissions, and, of course, very conscious of the need to protect their turf.

One realised also that such co-operation and support would be forthcoming only if one innovated a two-tier policy and research-support mechanism as follows:

Tier One: A cabinet-level Apex Body 'to promote Superconductivity Research and its applications in the country', thereby underlining the political commitment to the research-support activity.

Tier Two: A Programme Management Board presided over by the Chairman of (the then) Science Advisory Council to the Prime Minister with executive and financial powers as necessary for pursuing this area of research, development, and engineering by a number of scientific agencies and engineering institutions in India.

5. Implementation of mechanism

The Government of India accepted the above innovative policy and research-support mechanism. Copies of the published Resolutions of the Government of India incorporating and giving effect to the research-support mechanism are attached.

GOVERNMENT OF INDIA (BHARAT SARKAR)
CABINET SECRETARIAT (MANTRIMANDAL SACHIVALAYA)
RASHTRAPATI BHAVAN

No.84/1/2/87-Cab

New Delhi, the 12th June, 1987
22 Jyaishta, 1909(S).

RESOLUTION

Sub:- Promotion of Superconductivity Research and
its application in the country.

The generation and transmission of electricity in bulk depends wholly on the manufacture and use of conductors. Electronics is wholly dependent on devices which transmit or impede the flow of current. If materials can be found or fabricated which can be made to lose their electrical resistance, a whole new industry with far reaching economic consequences can be visualised. Superconductivity is the physical phenomenon in which materials lose their electrical resistance when they are cooled below a certain temperature, called the superconducting critical temperature (T_c). The development of high T_c oxide materials in India has been made at various places. Ceramics being the main material is being tried out on other similar non-superconducting ceramic materials. However, the following items of work, including continuing high-quality, academic-institution-based, basic research, need to be done:-

- (i) Synthesis of these high-quality ceramic materials in bulk quantities.
- (ii) Making cables, wires and tapes out of these materials using the techniques mentioned above and to develop other techniques.
- (iii) Constructing prototype electro-magnets for use in electrical machines of various types.
- (iv) Making super-conducting devices for a variety of electronic applications.

2. The work that needs to be done is heterogenous. It has, therefore, been decided with the approval of the Prime Minister to constitute an Apex Body to promote superconductivity research and its application in the country thereby underlining the political commitment to this just emerging area of Science and Technology. The terms of reference of the Apex Body would be as under:-

- (i) To make necessary budget provision;
- (ii) To take all steps for acquiring the services of personnel, both from within and outside the country as consultants, visiting scientists and to facilitate their operations within the country;
- (iii) To procure goods and services of all types including import without extensive paper work, permits and licences.

(iv) To have civil works carried out including architectural designs etc.

3. Any of the above functions may be delegated by the Apex Body to the Programme Management Board, which is being constituted separately.

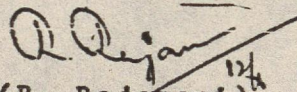
4. The Apex Body will consist of the following:-

- (1) Prime Minister
- (2) Minister of Human Resource Development
- (3) Minister of Finance
- (4) Minister of State (Science & Technology)
- (5) Scientific Adviser to PM
- (6) Chairman, SAC to PM
- (7) Chairman, UGC
- (8) Cabinet Secretary
- (9) Finance Secretary
- (10) Concerned Agency Heads (DAE, Defence Research and Development, Department of Science and Technology, DSIR, DOE)
- (11) Director, BARC
- (12) Two eminent scientists
- (13) Two eminent technologists/industrialists
- (14) Secretary, Department of Member Secretary Science and Technology.

5. The Apex Body shall be serviced by the Department of Science and Technology.

Ordered that a copy of the Resolution be communicated to all the Ministries/Departments of the Government of India and all the State Governments/Union Territories.

Ordered also that the Resolution be published in the Gazette of India for general information.



(R. Rajamani)

Additional Secretary to the Cabinet

To

The Manager,
Government of India Press,
Faridabad.

KKK

110 copies.