

Summary Record of Discussion of the Seventeenth Meeting of Scientific Advisory Committee to the Cabinet (SAC-C) held on 22nd April, 2009, at New Delhi.

The seventeenth meeting of the Scientific Advisory Committee to the Cabinet (SAC-C) was held on 22nd April, 2009, under the Chairmanship of Dr. R. Chidambaram, Principal Scientific Adviser to the Government of India (PSA to GOI) and Chairman, SAC-C.

The agenda of the meeting and the list of participants are at **Annexure-I** and **Annexure-II** respectively.

M17A1 Opening remarks by the Chairman, SAC-C.

After welcoming the participants, Dr. Chidambaram thanked the members for sending their valuable suggestions. He especially thanked Prof. P. Rama Rao, Prof. M.S. Valiathan and Prof. M. Vijayan for sparing time to give presentations to the SAC-C members on the respective agenda items.

Thereafter he briefed the members about the current activities of O/o the PSA. A copy of the Report was also circulated. Dr. Chidambaram further added that the scientific business of the government is allocated among various scientific departments. However, there are certain subjects, which do not quite fall into any department's area and there are subjects which fall into the areas of several departments, and institutions. The "synergy projects" of the O/o PSA focus on such areas. 'Science behind Ayurveda' is one such example; "Collaborative Automotive R&D (CAR)" is another example.

Chairman also informed the Committee about the National Knowledge Network (NKN), which has created a lot of excitement in the scientific community of the country. The project is being implemented by NIC with adequate support from all stakeholders. The first phase of NKN was recently inaugurated by the President of India. Eventually, NKN will connect more than 1000 institutions in the country. One of the priority areas is 'Education'. There is an awesome shortage of faculty in the country and with this kind of connectivity, it is felt that this problem can be partly addressed.

The Chairman then took up the agenda one-by-one.

M17A2 Presentation by Dr. Rama Rao on "Initiatives for Research based Technology Development in Automotive Sector".

Dr. Rama Rao traced the rapid growth of the Component Sector in Automobile Industry, through joint ventures, adoption of known technology and low cost skills for reducing the overall cost of manufacturing. Some Indian entities now figure among the world's largest auto-component suppliers. Then he mentioned the second generation of vehicle development - the Tata Nano and M&M Xylo. They are fuel efficient, comply with international pollution norms and are lower-priced, and benefited from learnings with the Tata Indica and the M&M Scorpio.

However, overall, the Indian vehicle companies still lag behind in manufacturing technology. The price/ cost leadership is critical for Indian automobile companies due to the intense competition. Component costs have to come down since 70% of the vehicle cost is from the components. In addition to commercial price negotiation, a major factor is engineering/ design innovation, for which R&D is a key enabler. So, the industry must transform into an R&D, engineering and manufacturing industry.

CAR is a technology foresight-based research & development programme, and the activities are strongly "oriented" towards technologies suggested by industry, and incorporated in the CAR roadmap. Refining and updating the technology roadmap, based on foresight studies led by TIFAC, is an important function of CAR. Technologies need to be assessed in the Indian context and the technology roadmap for India may be quite different from other nations. Dr. Rama Rao distinguished three types of projects under CAR:

- **Projects aimed at establishing advanced relevant basic research capability.** Example: Combustion Research Institute (Report of Working Group on R&D for Energy Sector for 11th Five Year Plan). Since 92% of our energy use involves combustion, we need to make advances in our understanding of combustion process in a manner so as to achieve maximum efficiency. New automobile engines need sophisticated combustion diagnostic techniques. A Combustion Research Institute in India could study fluid dynamics, combustion modeling and diagnostic techniques for non-intrusive, in-situ, spatial/ temporal, fast, precise measurements.

- **Projects aimed at specific competency development.** Example: CAR Project on light weighting using tailor welded blanks and hydroformed tubes involves three large corporates (Tata Motors, M&M and Tata Steel, national lab (ARCI), academic institution (IITB) and two small private companies (Pro SIM, Electropneumatics).
- **Projects with long-term vision.** Projects on technologies / processes / products which have not been commercialized anywhere in the world (in auto sector). Example: Nanomaterials have burst upon the world S&T scene with unprecedented impact; India needs to enter the auto field purposefully.

He mentioned that, from the country perspective, there are gap areas in our automotive technologies, and illustrated it with the example of electronics that would be required for the “small car”. As per the Automotive Mission Plan (2006-16), India can be a major designer and manufacturer of the “small car” with restricted features, low cost & reliable electronics and networks. In order to build the base for a distinctive small car electronics architecture and help bring together the automotive and IT industries in India, the following gap areas need focused attention: (a) Test lab for electronics and chip functional testing (AEC Q 100 rev G lab) for stress testing for automotive applications, (b) Standard for small car electronics platforms (a la’ AUTOSAR of Europe), and (c) Software verification and validation.

A recent initiative to expand the base of collaboration is the CAR- Fraunhofer Gesellschaft dialog. The India workshop was held on Jan 2009 and the German workshop is scheduled for end of May 2009. A dozen project concepts were developed on the Indian side, for discussions at Dresden, Germany in May 2009. The planned initiatives include the CAR-ACMA task force and the CAR-SIAM interaction.

Discussions on Dr. Rama Rao's presentation

Dr. Sumantran recalled the US CAR was an inspiration during the early days of this activity. CAR has given a major push for Indian industry, and the present set of projects is a balanced portfolio: (a) they cover all important areas & (b) include catching up efforts and novel technology development. He said industry participation tend to be

influenced by business cycles; for example currently the interest will be diminished due to economic downturn. So, CAR may lean to R&D with longer time horizon. On the other hand, near-time, smaller outlay projects have to be promoted with components industry.

Mr. Subodh Bharghava said that CAR could explore a way of upgrading the R&D profile of ARAI, Pune. DRDO could provide some technologies for immediate take up by industry.

Dr. Baldev Raj quoted the example of German institutions with specialized facilities for manufacturing, testing, visualisation etc. and highlighted the need for such centers for world-class work in India. He said the significant latent competency in the country needs to be tapped for automotive R&D.

Dr. Samir Brahmachari mentioned several CSIR projects in automotive sector taken up by NCL, CEERI, NPL etc., and requested CAR to liaise with CSIR institutions for greater synergy.

Dr. Ramasami pointed out that to get more results, we have to increase the investments of financial and human resources and intensify the process. Metaphorically speaking, we need apparel rather than mere cloth, and the following could be envisaged:

➤ Explore technology acquisition from abroad. Industry is reluctant for long term investments and lacks patience for the percolation of homegrown technologies. So, they could form consortium to acquire technology, under the program, in a public funded institution and share it through a payback mode.

Dr. Brahmachari supported this idea and suggested a new institutional structure of an IP driven R&D Company in PPP. Dr. Sumantran quoted examples of Indian companies accessing IPR by acquiring units abroad. But the industry is new to the game and competitive spirit is high. So an industry consortium will not work. It will need a public funded institution to lead or mediate in the PPP arrangements for acquiring IP, commonly.

➤ Source expertise globally to develop foresight for the country, to leapfrog in manufacturing, for example.

Dr. Rama Rao mentioned that automotive industry abroad move with well planned programs, including forecasting. So, CAR has to work actively with the associations, and TIFAC can intensify the technology foresight efforts.

Dr. Ramasami said that CAR will be made an empowered committee. In the short term, TIFAC-CAR secretariat will be strengthened, and arrangements to institutionalise the R&D efforts at ARCI will then be put in place, since it may be easier to convert existing institutions bordering the topic, than set up new institutions.

In his concluding remarks, Dr. Chidambaram pointed out that research is about adding new knowledge, whereas innovation is adding value. In the liberal-trade regime, government intervention in industrial R&D has to orient more to pre-competitive research than proprietary products. The CAR Technology Roadmap was developed with participation of industry and incorporated their desires for the long term. There is also merit in supporting directed basic research during the time of economic slowdown.

M17A3 Science initiative in Ayurveda - presentation by Prof. M.S. Valiathan

In his presentation, Prof. Valiathan said that most of the research in ayurveda is carried out pertaining to Herbal Drugs. Clinical trials for safety /efficacy and basic science applied to Ayurvedic concepts / procedures are not done till date.

He stated that as Ayurveda originated in the eastern part of the world and knowing our strength in the subject, the basic science needed to be explored now. He thanked PSA's Office for timely initiation of 'Science in Ayurveda' programme, focusing basic studies in Ayurveda, involving many institutions from all over India.

He then explained the genesis of this integrated project and said that a brain storming session (February, 2006) followed by a Seminar (May 2006) of scientists, Ayurvedic experts were organized by this office at IISc Bangalore. The five project proposals, involving ayurvedic vaidya and modern scientists, finally actively started in 2007. Every project is monitored by a committee where the stalwarts are providing inputs to fill the gap areas. He then informed in detail about each of the five projects as follows:

- 1) The epigenetic alterations that are responsible for phenotypic differences among three prakritis (Vata, Pitta and Kapha) will be studied. The Genomic basis of Prakriti distribution using high throughput analysis (single nucleotide polymorphisms (SNPs) and copy number variations (CNVs)) may be able to find out the signature of each prakriti and 426 subjects with predominant prakriti are sampled after screening 2191 subjects.
- 2) He also informed that DNA fingerprinting of selected anti-vata, anti-pitta, and anti-kapha plants through RAPD, AFLP and SSR markers are being studied at CIMAP. Initially the research was directed for species-specific markers and matching DNA profiles but after monitoring committee's inputs it was revised and now, Chemical finger-printing of 10 each of anti-dosha groups of plants with blind coded samples from BHU will be analyzed.
- 3) He further stated that immunological parameters are being studied in panchakarma therapy. Subjects (Basti, Virechan, Tamak shwas etc) are screened, panchkarma therapy is given and then blood samples are collected, analysed for selected parameters. Till date **124** subjects are screened.
- 4) He then explained about the elaborate processing of minerals in the ancient protocols and the important physico-chemical changes in ayurvedic bhasma preparations. The Rasasindur Bhasma, prepared by Arya Vaidya Sala (AVS) is being studied at IIT Kharagpur. EDS point analysis reflected the presence of only mercury and sulfur and was also confirmed by HR-XRD analysis. Rasasindur showed distinct tendency to form complex with serum albumin and is clearly revealed by FESEM, EDS, and MALDI-TOF experiments.
- 5) Lastly he explained about Rasayana project and said that they are used for therapy to promote health status of aged individuals. The effect of amalaki

rasayana is being studied on DNA repair response in aged human subjects, drosophila model and rat model. Rasayana may modulate the immune function to promote DNA repair and hence the well being of aged individual and the correlation is studied with functional assay using advanced technologies. In initial experiments, it is observed that rasayana therapy effectively helped to reduce DNA repair (FADU assay). In drosophila flies it was observed that feeding of the larvae with Rasasindur/Amalaki formulations had induced Hsp70 and Hsp90 expression enhancing thermotolerance.

He concluded the presentation with suggestions on a futuristic study approach and expressed that these kinds of basic research study programme should be sustainable.

Discussions on Prof. Valiathan's presentation

All the members appreciated the support of the Office of PSA to GOI to carry out such studies and opined that these efforts should be continued further with a great vigour.

A publication entitled "Whole genome expression and biochemical correlates of extreme constitutional types defined in Ayurveda" was also referred and then it was opined that world wide interest in Ayurveda has increased.

Chairman opined that to sustain this research programme, a suitable mechanism may be worked out with the help of DST and Dr. Ketaki Bapat may further discuss it with Secretary, DST.

It was also felt that Ayurveda may be studied with a Holistic approach and Physiology & Biochemical parameters with allopathic and ayurvedic treatments could be studied in normal / diseased population.

It was also suggested that a short note, informing about these projects may be sent to LANCET/ New England Journal of Medicine (NEJM).

Dr. D. Balasubramanian, Director, L.V. Prasad Eye Institute, Hyderabad, had posted a few points related to “Science in Ayurveda” project. He has suggested that phenotypic biomarkers for prakriti could be explored and pertaining to Bhasma project (Crystal morphology & protein interactions) the expertise of Dr Gautam Desiraju may be availed.

Prof. Vijayan suggested that structural biologists at IIT, Kharagpur may be associated with this project.

M17A4 Discussion on creation of training facilities for Scientists from Developing Countries - introduction by Prof. M. Vijayan

The Chairman requested Prof. M. Vijayan, President, Indian National Science Academy (INSA) to brief SAC-C on the subject. Prof. Vijayan, in his introduction to the subject, referred to the attempts of the international scientific community to support science in the developing countries, particularly those in Africa, with special reference to training of personnel. Several countries, including China and Brazil, are seriously involved in this effort. Many developing countries look up to India for help. Our serious involvement in this effort is important for more than one reason. It is in consonance with our general approach to help our less endowed brethren in the world. Equally importantly, such help constitute a major strategic investment. Professor Vijayan also referred to the efforts in this regard of the Centre for Cooperation Science & Technology among Developing Societies (CCSTDS), which functions under the supervision of INSA. The core funding for the centre is provided by DST, supported by other concerned agencies and organizations. It is successfully operating a few short term training programmes. The effort needs to be substantially enhanced and should aim at more such short-term fellowships in subsequent years.

In the ensuing discussion, the participants, including the Presidents of other two science academies and Secretary, DST, endorsed the comments of Professor Vijayan and opined that INSA is an appropriate organization to take initiatives in this regard. Secretary, DST assured the flow of funds on a sustainable basis not only for term fellowships but to support also senior scientists from developing countries. The latter

may be undertaken by INSA itself while training fellowships are managed by CCSTDS. At the end of the discussion, the Committee endorsed the proposal to substantially strengthen the programme for visits of scientists from developing countries and agreed to support the initiatives of INSA in this regard.

The meeting ended with a vote of thanks to the Chair.

Seventeenth Meeting of the Scientific Advisory Committee to the Cabinet (SAC-C)

Date : 22nd April, 2009.
Time : 1030 hrs.
Venue : Committee Room 'A', Vigyan Bhawan Annexe, New Delhi.

Agenda

- M17A1** Opening remarks by Chairman, SAC-C.
- M17A2** Discussion on Collaborative Automotive R&D (CAR) - starting with a presentation by Dr. P. Rama Rao
- M17A3** Science initiative in Ayurveda - presentation by Prof. M.S. Valiathan
- M17A4** Discussion on creation of training facilities for Scientists from Developing Countries - introduction by Prof. M. Vijayan
- M17A5** Any other item with the permission of the Chair.
- M17A6** Concluding remarks by the Chair

List of participants of the Seventeenth Meeting of Scientific Advisory Committee to the Cabinet (SAC-C)

| S. No. | Name, Designation and Organisation |
|---------------|--|
| 1 | Dr. R. Chidambaram, Principal Scientific Adviser to the Government of India, Vigyan Bhavan Annexe, Maulana Azad Road, New Delhi - 110011. |
| 2 | Dr. (Mrs.) K.A. Dinshaw, Director, Tata Memorial Centre, Dr. E. Borges Road, Parel, Mumbai - 400 012. |
| 3 | Dr. B. K. Gairola, Director General, National Informatics Centre, Department of Information Technology, Ministry of Communications and Information Technology, A-Block, CGO Complex, Lodhi Road, New Delhi - 110003. |
| 4 | Dr. Rohini M. Godbole, Centre for High Energy Physics, Indian Institute of Science, Bangalore - 560 012. |
| 5 | Sh. Subodh Bhargava, Industrialist, A-15/1, DLF City, Phase I, Gurgaon - 122001. |
| 6 | Dr. N.G. Hegde, President, Baif Development Research Foundation, Dr. Manibhai Desai Nagar, Warje, Pune - 411058. |
| 7 | Dr. Deepak Pental, Vice-chancellor, University of Delhi, Delhi - 110007. |
| 8 | Dr. V. Sumantran, Scientific Consultant, Office of the Principal Scientific Adviser to the Government of India, Door 7/1, Valli Ammai Aachi Road, Kotturpuram, Chennai - 600 085. |
| 9 | Dr. Baldev Raj, Distinguished Scientist & Director, Indira Gandhi Centre for Atomic Research, Kalpakkam - 603102, Tamil Nadu. |
| 10 | Dr. Juzer Vasi, Deputy Director, Indian Institute of Technology, Bombay, Powai, Mumbai - 400076. |
| 11 | Prof. Vijayalakshmi Ravindranath, Director, National Brain Research Centre, NH - 8, Nainwal Mode, Manesar, Gurgaon - 122050 (Haryana). |
| 12 | Prof. Pramod Tandon, Vice Chancellor, North-Eastern Hill University, Shillong - 793022. |
| 13 | Dr. T. Ramasami, Secretary, Department of Science & Technology, Technology Bhawan, New Mehrauli Road, New Delhi - 110 016. |
| 14 | Prof. Samir K. Brahmchari, Secretary, DSIR & DG, CSIR, Anusandhan Bhawan, Rafi Marg, New Delhi - 110 001. |

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| 15 | Prof. M. Vijayan, President, Indian National Science Academy, 2, Bahadur Shah Zafar Marg, New Delhi -110 002. |
| 16 | Prof. D. Balasubramanina, President, Indian Academy of Sciences, Director of Research & Director, L.V. Prasad Institute, Hyderabad. |
| 17 | Dr. P. Ramachandran, President, National Academy of Medical Sciences, Ansari Nagar, New Delhi. |
| 18 | Shri T.A. Sarka, Rep. of Secretary, Ministry of Environment & Forest, Government of India. |
| 19 | Dr. S.K. Sikka, Scientific Consultant, Office of the Principal Scientific Adviser to the Government of India, Vigyan Bhawan Annexe, Maulana Azad Road, New Delhi - 110011. |
| 20 | Dr. K.V.S.S. Prasada Rao, Chairman, National Technical Research Organisation, New Delhi. |
| 21 | Prof. Seyed E. Hasnain, Vice Chancellor, University of Hyderabad. |
| 22 | Shri B. Rajendiran, Adviser, Office of the Principal Scientific Adviser to the Government of India, Vigyan Bhawan Annexe, Maulana Azad Road, New Delhi - 110011. |
| 23 | Shri S. Chatterjee, Scientific Consultant, Office of the Principal Scientific Adviser to the Government of India, Vigyan Bhawan Annexe, Maulana Azad Road, New Delhi - 110011. |
| 24 | Dr. R.P. Gupta, Scientist 'E', Office of the Principal Scientific Adviser to the Government of India, Vigyan Bhawan Annexe, Maulana Azad Road, New Delhi - 110011. |
| 25 | Shri Neeraj Sinha, Scientist 'E', Office of the Principal Scientific Adviser to the Government of India, Vigyan Bhawan Annexe, Maulana Azad Road, New Delhi - 110011. |
| 26 | Dr. Ketaki N. Bapat, Scientist 'D', Office of the Principal Scientific Adviser to the Government of India, Vigyan Bhawan Annexe, Maulana Azad Road, New Delhi - 110011. |
| 27 | Dr. G.V. Subramaniam, Advisor, Ministry of Earth Sciences, Government of India, CGO Complex Lodi road, New Delhi. |
| 28 | Smt. Shalini Prasad, Joint Secretary, Department of Medical Sciences. |