Science, society and media: some perspectives

I read with interest the correspondence by Tripathi and Singh[1], which lamented lack of media focus on science and specifically on the conferring of the Bharat Ratna to C. N. R. Rao. I would like to offer a few comments.

While it is true that the media has focused primarily on the award to cricketer Sachin Tendulkar, the statement made by Tripathi and Singh, that 'not a single media channel elaborated on the immeasurable contributions of Rao in science' is factually incorrect. Few channels have focused on Rao and his scientific achievements, not only after but even before the award of the Bharat Ratna, and that stands true for many other illustrious scientists of India. Yes, there has been a major focus on Tendulkar and that is understandable because Rao[2] in an article in *Current Science* has himself stated that 'a good scientist does get respect where he belongs, by the international and national scientific community'. It would be illogical to expect that the entire country has more interest in science than in sports. Further, if hardcore science in Rao's own research area, i.e. solid state chemistry is explained, it would be incomprehensible to scientists of other research areas, let alone the common public.

Having said that, I must also state that I strongly feel that it is necessary for the citizens of a country to develop a 'scientific temper' (a term coined possibly by Jawaharlal Nehru), not only to encourage young people to science but also to remove superstitions and many social evils. Rao himself grieved the fact ISRO scientists seek Lord Balaji's blessings before space missions[3]. Media cannot and should not be expected to instill scientific outlook among common citizens, if scientists themselves are superstitious. If a basic level of science is to be communicated to the citizens, scientists need to come out of their ivory towers and interact with the public more often through popular articles, lectures and so on.

Therefore, as a scientific community, what we require to do with regards to public interaction and communication of science is introspection instead of blaming the media.

1. Tripathi, N. and Singh, R. S., *Curr. Sci.*, 2013, **105**, 1654.
2. Rao, C. N. R., *Curr. Sci.*, 1993, **64**, 288–293.
3. Press Trust of India, 23 November 2013 (adapted from NDTV, http://www.ndtv.com/article/india/isro-seeking-lord-balaji-s-blessings-before-space-missions-is-superstition-cnr-rao-450055; accessed on 27 December 2013).

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Participatory water management

India faces a major water crisis as we move into the 21st century. This threatens the basic right to drinking water of our citizens; it also puts the livelihood of millions at risk. The demands of a rapidly industrializing economy and urbanizing society come at a time when the potential for augmenting supply is limited, water tables are falling and water quality issues have increasingly come to the fore. Rivers and groundwater are polluted by untreated effluents and sewage that continue to be dumped into them. Climate change poses fresh challenges with its impacts on the hydrologic cycle[1].

The only way to manage water is by involving stakeholders/people. Until people understand the importance of environmental protection and participate in conservation campaigns, the scenario cannot be changed. Making people aware about the environmental impacts of their activities will indirectly help in improving environmental quality[2]. Participatory water management by involving the stakeholders is the need of the hour. The best example of participatory groundwater management in India is the Andhra Pradesh Farmers Ground Water Management System (APFAMGS). The core concept of APFAMGS is that sustainable management of groundwater is feasible only if users understand its occurrence, cycle and limited availability, and they accept that groundwater conservation through collective decisions is ultimately a safeguard of their own interest. In participatory groundwater management people shall collect water level and rainfall data of their area. After preparation of crop water budget, people can decide which crop has to be taken up. They should know the basics of the project and its benefits. The corollary was that, once concepts of hydrogeology and groundwater management, which had hitherto remained in the domain of scientific communities were translated and mastered by poorly literate farmers through what was called the 'demystifying science' approach, groundwater users would agree to take appropriate action for its sustainable management. It is clear that the implementation of such a complex concept implied a strong 'piloting and testing' element. The project has been successful in meeting its challenges and expected results were largely achieved. Farmers understand the seasonal occurrence and distribution of groundwater in their habitations and in 'hydrological units' as a whole and are able to estimate seasonal recharge, draft and balance.

Individuals like Anna Hazare in 1975 and Rajendra Singh in 1985 have been the pioneers in promoting participatory approach in water management. Ralegan Siddhi village in Ahmadnagar district, Maharashtra was a degraded village before 1975. Anna Hazare implemented different water-harvesting structures to catch every drop of rain by developing drainage system, trenches, check dams, drainage plugs, percolation tank, etc. by

developing and designing micro-watershed-specific schemes[3]. After implementation of the project, the crop production of the village increased and ultimately the livelihood of its people.

Rajendra Singh, a water conservationist also popularly known as the 'water man of India', has transformed the water-starved and dwindling water table of Alwar region in Rajasthan to one of the best surface and groundwater potential zones. The Tarun Bharat Sangh helped build 9000 johads and other water-conservation structures to collect rainwater from few high-intensity rainfall events during monsoon months, and this has brought water back to over 1000 villages and revived five rivers of the state, namely Arwari, Ruparel, Sarsa, Bhagani and Jahajuali. Rajendra Singh's ideas, opinions and leadership with dedication are the driving force behind community-based efforts in water harvesting and water management of Alwar region. Rajendra Singh has proved that dedicated, selfless thinking and strong leadership can change the attitude of the people[4]. Once the attitude of the people changes, the movement gains momentum.

Consensus-based decision-making should be the goal of local Water Users Associations (WUA). Social audits should be in-built in the participatory groundwater management. Presently the water-use efficiency in agriculture is low which can be enhanced by the participation of stakeholders. Participatory water management can promote water conservation and minimize the impact of climate change in rural areas.

1. Shah, M., *Econ. Polit. Wkly*, 2013.
2. Sharma, S. K., *Curr. Sci.*, 2013, **105**(9), 1203–1204.
3. http://www.annahazare.org/watershed-development.html
4. Evaluation of FAO Cooperation with India, Report, Andhra Pradesh Farmers Managed Groundwater Systems (APFAMGS-GCP/IND/175/NET), November 2008.

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Food colourants and health issues: are we aware?

Colour is an imperative component of food or any edible stuff as it can enhance its appearance[1]. Food colours are being used in beverages, desserts, jams, jellies, sauces, pickles, cosmetics, toothpaste, etc. In addition, medicines, including tablets, capsules and syrups are dyed with food colours. Many of the food industries and other related companies as well as restaurants have relied on colourants in order to sell their products. However, there is a question on the safety and nature of colourants which have been used for these purposes?

Numerous studies have demonstrated the dangers of artificial colourants in food, which include the possibility of onset of attention deficit disorder (ADD), inhibition of the immune system, hyperactivity and allergic reactions[2]. In addition, the use of non-permitted colours or overindulgence of permitted colours may also cause thyroid tumours, urticaria (hives) dermatitis, asthma, nasal congestion, abdominal pain, nausea, eczema, liver and kidney damage and cancer.

In view of the above, several food colourants have been banned in developed countries due to their toxicity observations on experimental animals. According to the Centre for Science in the Public Interest (CSPI) (USA and Canada), several synthetic food colourants can cause several problems and should be prohibited from use in food. Table 1 shows some of the widely used synthetic colourants and their toxic effects.

Food safety and quality are important parameters in supporting both national and international trade. Unlike other food additives, dyes are not permitted to be used unless it has been tested and certified that each batch meets the legal specifications. The number of synthetic colours permitted varies in each country depending upon the recommendation of the respective Food and Drug Authority Regulations. For instance, FAO/WHO Codex Alimentarius permits 14 artificial colours, European Union (EU) 15 colours, Japan 12 colours, USA 9 colours, Korea 9 colours and 8 in India.

There have been tremendous advances in promoting food safety and security in developing nations than in developing countries. Food systems in developing countries are not always as well-organized and developed. Due to overpopulation, urbanization and lack of resources, food systems in developing countries continue to be stressed and adversely affect quality and safety. The public health sector in many developing countries is not well resourced, and has limited infrastructure that lacks the capacity to address issues associated with the safety, efficacy, labelling, and marketing control of novel food colourants. As a result, people in developing countries are exposed to a wide range of safety risks[3,4].

The demand and supply of street food is being appreciated in developing countries for its unique flavours and colour.

Table 1. Some of the routinely using food colourants and their effects

Synthetic food colourant	ADI* (mg/kg)	Uses in	Possible effects
Quinoline yellow	10	Sweets, pickles	Asthma, hyperactivity, rashes
Ponceau 4R	4	Biscuits, drinks	Allergy, intolerance
Allura red	7	Soft drinks	Hypersensitivity
Azorubine	4	Sweets	Allergy, hyperactivity
Tartrazine	7.5	Sweets, biscuits	Asthma, hyperactivity, rashes
Sunset yellow	2.5	Ice creams, biscuits, sweets	Gastric problem, allergy
Erythrosine	0.1	Toothpaste, cough syrup	Hyperactivity, allergy

*ADI, Acceptable daily intake.