standing physicists who had started as part-time researchers. It would probably not be difficult to motivate bright students to become ARPs.

During the initial years, a young ARP would need to be trained in doing research and would aim to meet norms for a Ph D (albeit on a somewhat longer time scale). We have to evolve a procedure by which potential ARPs can be selected and then supported by helping them find a guide. For this student–guide interaction, e-mails would be the normal mode of interaction. Scholarships would not be involved because an ARP would be doing research as a hobby and not as a part-time job. Nevertheless, some minimal logistics support must be offered.

The ARP can be expected to spend ten to twenty hours per week (the kind of time that some would spend on a hobby) and this should be used by the ARP to do recommended reading, work out problems, and do some literature survey. For this, the ARP needs to be registered with a research institute so that he (or she) can have access to its library, and electronic access to the journals subscribed to by that institute. This support must be provided gratis to selected ARPs.

We can expect an ARP to spend two to four weeks each year doing full-time research. Theorists would be interacting productively through regular e-mails and the internet, and this period of intense interaction would ensure completion of work on a problem. Even for experimentalists, this time period equals a few instalments of beam-time on a major experimental facility and this period of dedicated work could lead to one good publication per year. I believe that such short visits to small laboratory facilities can be equally productive, as appears to be happening at IUC-DAEF, Indore. Funding agencies would need to explicitly provide support to this activity of ARPs in terms of travel costs and contingency lab expenditures.

The third support required is from academic peer groups which must help by regularly identifying outstanding problems whose solutions are likely to leave an impact. This could be done, say once a year, through workshops and newsletters that would correspond to less-ambitious versions of V. L. Ginzburg's 'Key problems of physics and astrophysics'. Arranging such overviews from active and outstanding physicists will require some effort.

Finally, I feel that 'physics research as an avocation' can be promoted with minimal but focused support. It would allow bright minds to pursue viable research while pursuing their chosen career. Besides inducting bright minds into the research stream, it would allow some of these ARPs to smoothly switch to full-time research later in life.

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Amte's silent revolution: A possible anchor for the bewildered R&D in agriculture

A sobering three-day trip to Anandwan and a few other projects of Amte, exposed me to the environment-friendly agriculture-based integrated commune development experiment that was initiated by Baba Amte, more than four decades ago. I was only a passive listener when the genius of Vikas Amte, a medical doctor, a seismologist, an architect, an agriculturist, a hydrologist, a biogas expert and, above all, a very sensitive environmentalist, all packed in one, enthusiastically described the projects, as he drove us haltingly along the edge of numerous ponds and fields in a jeep. We were a team of four scientists from the Bhabha Atomic Research Centre (BARC), Mumbai who thought it was worthwhile to explore the possibility of giving the benefits of our R&D to such a noble organization.

A number of cured leprosy patients, with their limited resources, run the village and the numerous farms, fisheries and industries in various projects of Amte with exemplary efficiency. But the taboo outside forces them to burden the organization, as they age and gradually become nonproductive. The private donations coming from philanthropists of the West for this effort indicate that they are more sensitive than the Indians. It is in this context that inputs from our R&D laboratories directly to support such sincere efforts, make sense.

I wish to raise several questions against this background. I want to ask the agricultural scientists who claim to do applied research in agriculture and related fields, what is it that did not allow the permeation of the fruits of their research activities to Anandwan that was developed from a piece of arid land into a lush green farm by the efforts of cured leprosy patients under the direction of Baba Amte, using the traditional crops and agronomic practices for more than four decades now? Who are being benefited, if at all, by these researches?

I also want to ask why Indian scientists are always found napping when the rest of the world moves ahead and claims patents for basmati, neem and haldi? Why is it that we cannot think of research to develop the likes of terminator technology to compete with MNCs' effort, or match by devising still newer technologies, and stop crying helplessly when GMOs are introduced in our fields? And why do our scientists and technologists feel elated simply by winning legal battles whose codes are decided elsewhere, instead of winning them in laboratories and experimental fields? Where is all the creativity and spirit of innovation that would be expected of the world's third largest scientist community, which exports perhaps the largest volume of intellectual property in the form of trained personnel, just because we do not know how to employ

them for our own benefit, while the rural development lies in shambles? It is difficult to imagine that our planners are deliberately planning such exports.

As an insider I certainly can claim, after nearly four decades of a research career in basic science related to biology, that we scientists like sharp boundaries of our jurisdictions and protect them zealously, almost instinctively. We lack foresight about what is strategically important to protect us from dominance of the advanced nations in our own soil. We have missed the industrial revolution, the genetic revolution and now with obstructive administration and government controls are sure to miss the BT revolution. Having not developed the sensibility to interact intimately with scientists of different disciplines in the past, agriculturist have to depend on classical techniques or learn the new basics from scratch to protect their domain. We neither inspire team-spirit in the labs, nor do we draw inspiration from the sincere efforts in the rural settings, epitomized in Baba Amte's experiment of turning an arid land into a green land. This happened long before our professional scientists learnt about water management from the Israelis.

We are euphoric about green revolution. We had then imported strains from outside and the farmers used them to bring about a change. Now, in a similar move, we have to import the GE products and adapt these to our land conditions because before we can device them in our labs, these would be ready on the shelves of MNCs in as finely tuned a manner as we would have liked to develop ourselves using the new technologies. But we simply lag behind, though the expertise in all fronts to make such an enterprise successful is available. At least that is what we claim publicly. By blocking the introduction of GMOs from outside, we can only deprive our farmers from exercising their choice to increase productivity with lesser inputs and better adapted to the environment.

How do we charge ourselves with the spirit that will encourage a more enlightened outlook? Perhaps, we should get back to the integrated rural community development based on agriculture, that has been accomplished by the silent work of Amte. You will smell the soil of the country, see the needy people, and probably find the missing anchor of R&D efforts not only in agriculture, but in most of the relevant agro-industries. This will generate a genuine urge to come together, ignoring the rigid barriers we have been maintaining in R&D, to serve ends other than the real needs.

It is gratifying to mention that our visit resulted in identifying several areas where BARC could provide expertise and technologies useful to the activities of Amte in the rural development programmes. The visit resulted in initiating a process of transfer of our existing applied research outputs and expertise with an objective to enhance their productivity and technological competence in related fields. Hopefully, such interactions will encourage our R&D efforts to address a variety of relevant high-tech applied research problems to generate new and useful technologies. It is also not unlikely that even the quality of basic research in relevant fields might improve in the process.

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Surface changes after the 2001 Gujarat earthquake

R. P. Singh *et al.* (*Curr. Sci.*, 2001, **81**, 164–166) have highlighted some interesting and useful information on the physical changes seen around Bhuj as revealed from the IRS-ID LISS-III remote sensing data. In this connection I wish to supplement the following for better perception of the subject.

According to Wadia[1], 'The 1819 earthquake in the Cutch resulted in the subsidence of the western border of the Rann of Cutch under the sea, accompanied with the elevation of a large tract of land. Here some 2000 sq miles of area was suddenly depressed to a depth of 12–15 feet and the whole tract was converted into an inland sea. As an accompaniment of the same movements, another area of 600 sq miles was simultaneously elevated several feet above the plains into a mound, which was appropriately designated by the local people as "Allah Bund" (built by God)'. Wadia further informs that within historic times, the Rann of Cutch was a gulf of the sea, with surrounding coastal towns. The gulf was gradually silted up due to elevation of its floor and eventually converted into a dry saline desert for a part of the year and a shallow swamp for the remaining part.

Similar to the 1819 earthquake, the 2001 earthquake, according to Singh *et al.*, has also brought out changes in the surface features like appearance of palaeo-channels and water bodies in the Rann of Cutch. In my opinion, the palaeo-channels shown in the figure 1 *b* at Kulvida and Khadi by Singh *et al.*, may represent the course of the Neru and other rivers (distributors of the Indus river – now in Pakistan) which were draining into the Rann of Cutch during the geological past. Because of the 2001 earthquake, the floor of the Rann of Cutch suffered upliftment, resulting in the exposure of the palaeo-channels and water bodies. Perhaps, if this region suffers one more upliftment, then the Rann of Cutch may be emptied of its saline waters and the area may again become a fertile land. We can then expect some potable water in this region.

Normally, the salinity of the sea water is uniform at any depth in the sea due to currents, which keep the sea water in a state of agitation. However in the Rann of Cutch, the higher concentration of chlorides (> 13.35 g/l) and