incubation temperature (24°C± 1°C) without cold storing them for hatching and rearing observations.

Hatching percentage did not differ significantly between eggs refrigerated for 30 days and control. Per cent hatching reduced in all other treatments and was lowest (43.14 ± 11.01%) in eggs refrigerated for 70 days. The hatching in 60 and 70 days' refrigerated eggs was severely affected and a number of eggs died after pin head or blue egg stage. The rearing performance (Table 1) of eggs refrigerated for 30 days was on par with control especially the cocoon yield/10000 larvae brushed by weight. In 40 to 70 days' refrigerated eggs, the effective rate of rearing was adversely affected. Larvae reared for 30 to 50 days' refrigerated eggs did not show any morphological deformity. However, a few full grown larvae (5.3 and 8.7% of total brushed larvae) from 60 and 70 days' refrigerated eggs exhibited morphological abnormality. In these larvae, the 8th and 9th segments were fused. The 3rd and 4th abdominal segments were also fused in nearly 50% of such larvae. The prolegs of 8th and 9th segments were closer compared to those of normal larvae. The pupae of these deformed larvae were also deformed and their lower segments were found fused in most of these pupae. Middle segment of these pupae was also seen deformed.

Though there have been no reports on the effects of prolonged refrigeration on either rearing performance or occurrence of abnormal larvae, Hasimoto[5] and Tamazawa[6] have recorded abnormal development and production of gynandromorphs when freshly laid eggs were kept at – 10°C for 24 h. Abnormal larvae may also occur in certain races due to E gene mutants[7].

The present study on the prolonged refrigeration of eggs up to 70 days and its effect on hatching and rearing of larvae envisaged that the eggs of Nistari polyvoltine race can be conveniently cold stored at low temperature (2.5°C + 1.0°C) for 30 days without affecting the hatching and rearing performance of the larvae. The preservation duration of more than 30 days affected the hatching as well as rearing of these batches. Hence, the present study does not suggest for prolonged refrigeration of eggs for more than 30 days.

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COMMENTARY

India and the new global balance

Rustum Roy

As someone who has reconnected with the journal after 30 years, I was very pleasantly surprised by the recent issues of *Current Science*. The quality of the papers, the range of topics, even the colour printing bespoke a new level of sophistication for science in India. My commentary concerns the range of topics and of viewpoints in a couple of recent issues. Of course the scientific bandwidth of topics is large: from geology to physics to molecular biology – as it should be. But as a professor both of the Solid State, and of Science, Technology and Society, I was much more impressed by the range of *viewpoints*. The historical treatment of Harish Chandra's work was truly impressive. I certainly hope that the younger generations can tear themselves away from the microradian focus of their computer sciences to look at the 'big picture' of the work of some great scientists who happened to be Indians. Yet the range within *Current Science* that interested me most was with regard to science policy, represented by the papers by Sumit Bhaduri (1994, **66**, 14) and S. C. Tiwari (1994, **66**, 10). These papers on science and technology policy presented viewpoints which are almost certainly against the prevailing national paradigm. The reason for my enthusiasm is that it is probably true that there is more such counter-cyclical thinking about the role of S & T and R & D in the economy, now in the West than in 'third world' countries, and that the danger from following the wrong models to India, Latin America, Africa, is much, much greater, than it is to the West, where many of these errors originate. I present in this article the position that the swing towards more globalization, more international trade, etc., has reached the end of its rapid growth. The new factors of job famine, nationalism, ethnic loyalties, etc., together with new technologies, will fan the flames of 'localization': The revival of local manufacturing and distribution albeit influenced by outside developments. This view, I recognize, is countercyclical but very dangerous to neglect without careful observation of little signs.

For a period of eight years I was the single prominent scientist in the West who systematically and organizationally worked for truly balanced basic science by trying to kill public funding of the Superconducting Super Collider. Phil Anderson of Princeton was an outspoken critic in various fora including the Congress and Arno Penzias and Nicolas Bloembergen vigorously challenged various specific exaggerations by SSC supporters. The victory however, belonged to the budget realists, and the realization that not only is angular momentum conserved but so – in the long run, as the US has discovered – is a national budget. The president of the University of Melbourne Graduate Council put it pithily on his retirement. The first of four axiomatic truths he had learned (he claimed) was 'science never made any country rich; rich countries do science'. It is an excellent axiom for science policy makers in India to bear in mind.

As the only active scientist who is also an analyst of (national) science and technology policy I have become the spokesman for the 'contrarian' view, as *Newsweek* put it. India appears to be running on a derivative of a totally erroneous post WW II theory of S & T policy. The local theory never spelled out, could be called the Blackett–Haldane–Nehru theory. 'Do excellent Cantabrigian science and prosperity will follow'. It is a derivative of the more formal version in the US, which started with Vannevar Bush's seminal report to President Roosevelt, *Science, The Endless Frontier*. This became both Bible and blueprint from 1945 to 1993 for US science policy. It was used – when it suited them – for prooftexting and fundamentalist Bible-thumping by the most sophisticated scientists as I have shown, in detail, in my book (co-authored with Deborah Shapley), *Lost at the Endless Frontier*. In the early nineties the financial game was already up, but the scientific community didn't want to change. In September 1992 the US House of Representatives issued a major policy document essentially replacing Bush's *Endless Frontier* as the new blueprint for S & T policy. In effect it sets the simple-minded nonsense, 'Do science and prosperity will follow,' on its head and claims the opposite. 'Do not worry about science, it'll get done, it always has. Focus, instead, on technology policy.' This Congressional document also states about our book:

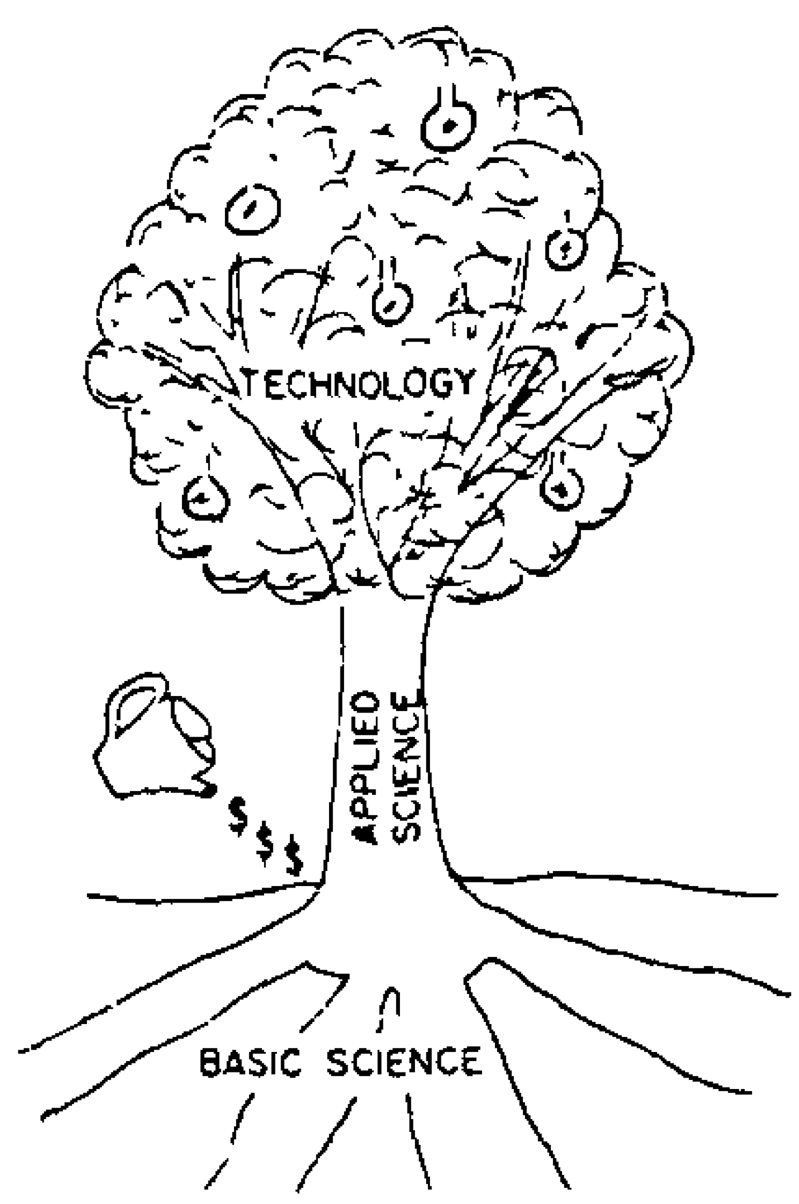

Figure 1. The conventional wisdom about the relationship between science and technology is represented as a single tree. If its roots, which are basic science, are watered, then the fruits, which are technology, will grow automatically. This widespread belief is disproved by the post war experience of Great Britain (which has watered its basic science roots but has difficulty growing technology) and Japan (which has little basic science but grows technological fruits).

> Perhaps the most comprehensive (and controversial) revisionist view of science policy presented to date is Deborah Shapley and Rustum Roy's *Lost at the Frontier*.

That is exactly what we had in mind while writing it.

What is the alternative view? The new paradigm?

To summarize the different views of S & T reality, many, all over the world are using modifications of the One Tree and Two Tree metaphors which appear in my book. These are reproduced here.

The new paradigm is best expressed in the expression of Professor Derek de Solla Price, the great historian of science at Yale who said that we must clearly understand that 'thermodynamics owes more to the steam engine than vice-versa'. Exactly opposite to what most US scientists believe, 'Science *is* applied technology' in most cases as historians keep showing us. I do not follow the details of India's R & D policy but I could imagine what acceptance of this new paradigm might mean for S & T policy for India.

'Identifying' naked emperors

The world of S & T policy is one of the most arcane subfields because most

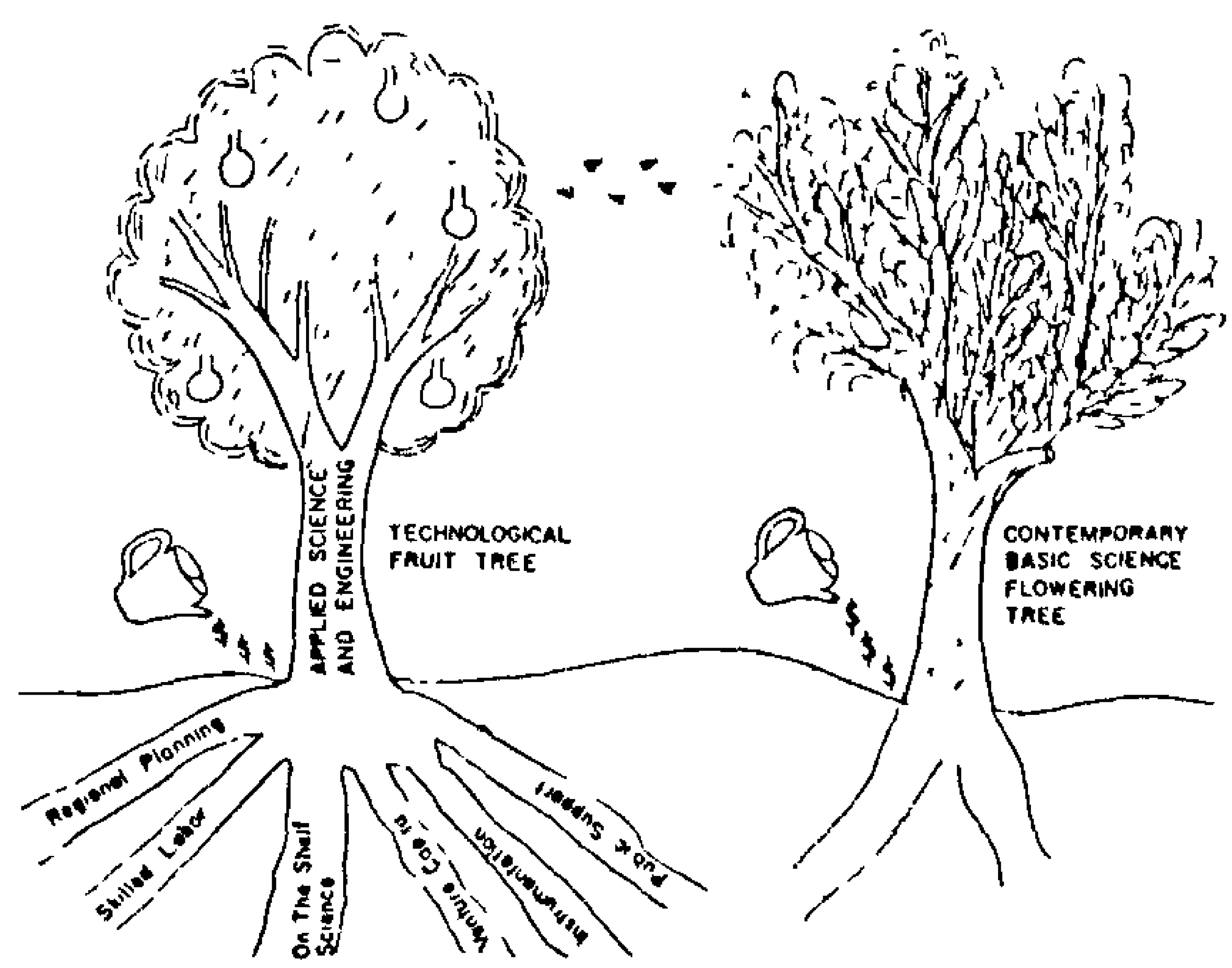

Figure 2. A more accurate metaphor is two trees, one for basic science and one for technology. This recognizes their distinct intrinsic character and the fact that they are nurtured separately by separate policies. Each tree, properly nourished, produces its own fruit; the basic science tree grows Nobel Prizes, and the more complex applied science-engineering-and-technology tree grows technology. Since the trees depend on each other as well, through bees that cross-fertilize, the model emphasizes the importance of establishing policies that nurture not only the technology tree in its own right, but the linkages between the two.

modern scientists do not have a clue about even technology leave alone politics, but in country after country especially under Euro-American influence, we have particle physicists and theoretical chemists advising Presidents and Prime Ministers about technology. How could anyone make such a mistake? Why not persons who built industries or organized scientist labour? Why? Because in the academic hierarchy, theoretical physics is somehow at the top! Because of that, totally empty policy 'pronouncements' about S & T, by persons innocent of any experience in technology, often become adopted as new 'designer clothes' for the local emperor. Reality of course does not change. And yet no one dares point out that the Emperor has no clothes at all. Let me list a few of these pronouncements or shibboleths and then select one or two to treat in more detail.

There are too few scientists or engineers: The nation needs more!

This may be true in specific countries or in specific fields, but overall *every single* consensual study *in the* US has concluded exactly the opposite. We have too many scientists with increasingly high levels of unemployment among them and a huge university machine spewing out more every year. Is this possibly also true in India? Wouldn't technician training be vastly more important instead of more universities?

Science and technology are the route to economic health

This is, of course, transparent nonsense. There is a complex interacting set of factors that lead to national wealth. Are the Arab Emirates rich because of excellent S & T? Did Japan build its magnificent technology on its own basic research? No to both! Did the US build its postwar dominance of world markets in technology on science? Also no! Japan built its success on a long tradition of excellent workmanship not on some will-o-the-wisp of 'basic science'. The US built it on the leftover *productive* capacity from World War II when, by history's fluke, they had absolutely no competition. US science was the *result* of being rich, not its *cause*. US companies built huge fancy research labs. Did they make them rich? No, they largely were a cost center. It is reported that in one of the world's greatest research labs (certainly in my field of materials) the GE Central R & D Center in Schenectady, NY, only 17 products actually started on those benches and made it all the way to production. In 100 years in a billion $/yr (1992 $) research center.

So what am I saying? Abandon all research? Give up on S & T? No! But I am saying: Look at the facts. Study the data, not the old mantras and shibboleths of science policy. What you will find is that basic atelestic (= without a societally desired goal) research does not and can never pay off. It is a 'consumption good' (in economist's language), like art and music; and every country can afford some. Science will be done anyway by all sorts of people all over the world and *all* of it will end up 'on the shelf' – of libraries or, now, magnetic tapes for databases – available very cheaply to all. Ninety-nine percent of such is quite useless, and maybe in rich countries that doesn't matter because it didn't cost much anyway and the 1% *may* make up for it. But you do not have to *do* such research; you must merely learn to *use* it.

Do you think this statement is crazy? There is no economic value at all – indeed negative value – for all atelestic basic research. Let me prove that these claims of mine of the last two decades have been fully justified by the events of the last two or three years. US industry, followed by the UK, and slowly all over Europe, has simply decided to abandon the old idea of wonderful basic research labs perched on hills isolated from dirty factories, etc. They are *all* gone. Dupont, GE, Exxon, BP, IBM have all, in effect, shut down their 'corporate' basic research labs, even though such research was completely under the control of a central authority and directly linked to the research and production of a single company. Edward David, former Bell Labs executive, former Science Advisor to President Nixon, put it thus, bluntly, in *Prism* (July 1993, p. 23).

- In the next 10 years, the total national investment in R & D will shrink by 20 to 30 per cent.
- Corporate central research laboratories will be eliminated.
- The federal laboratory system will be reduced to about 30 per cent of its present size.
- There will be an increasing oversupply of scientists and engineers in the US resulting in downsizing of academic departments and schools.
- Federal research grants will be replaced by contracts with specific deliverables.

The proof of my assertion that even relatively closely linked, carefully chosen and monitored, 'basic research' cannot pay off for the funder is, this fact, that hundreds of the world's largest R & D supporters (many individually much bigger than the G.O.I.) have withdrawn from it. Let those who believe in 'free markets' ponder those data. This does *not* mean that we should not do *any* totally undirected research: it simply *proves* that one cannot get any 'economic benefits' from it. We can get other benefits. Much of it should be, as indeed it was, till 1950 done as the by-product of university graduate training and scholarly thinking at universities. After all, 95% of significant physics was discovered that way, it has been the details which have been expensive. There were no agency proposals for support of atomic structure or quantum mechanics or much that came out of the Cavendish Laboratory in Cambridge till 1950. Of course as Professor John Thomas, Director of the Royal Institution, has described in his biography of Michael Faraday, even he was forever scrounging money from every quarter for his work.

What kind of R & D should then be supported?

What the above paragraphs have referred to is that it is now beyond doubt that 'science-push' in R & D simply doesn't exist. It was a 50-year fantasy. Pure 'market-pull' on the other hand usually does not utilize the full power of R & D. Companies find other ways to respond: imports, advertising, cosmetic changes, etc. In my recent *empirical* analysis of US and Japanese industry, I have labeled the actual processes which I have seen working as 'technology traction'. In Figure 3, I sketch the relationships which exist in these real world successful R & D situations. The key is the *existence* of a technology making products and earning money. 'Technology traction' is the process of utilizing all kinds of real science, serendipitous discovery, on the

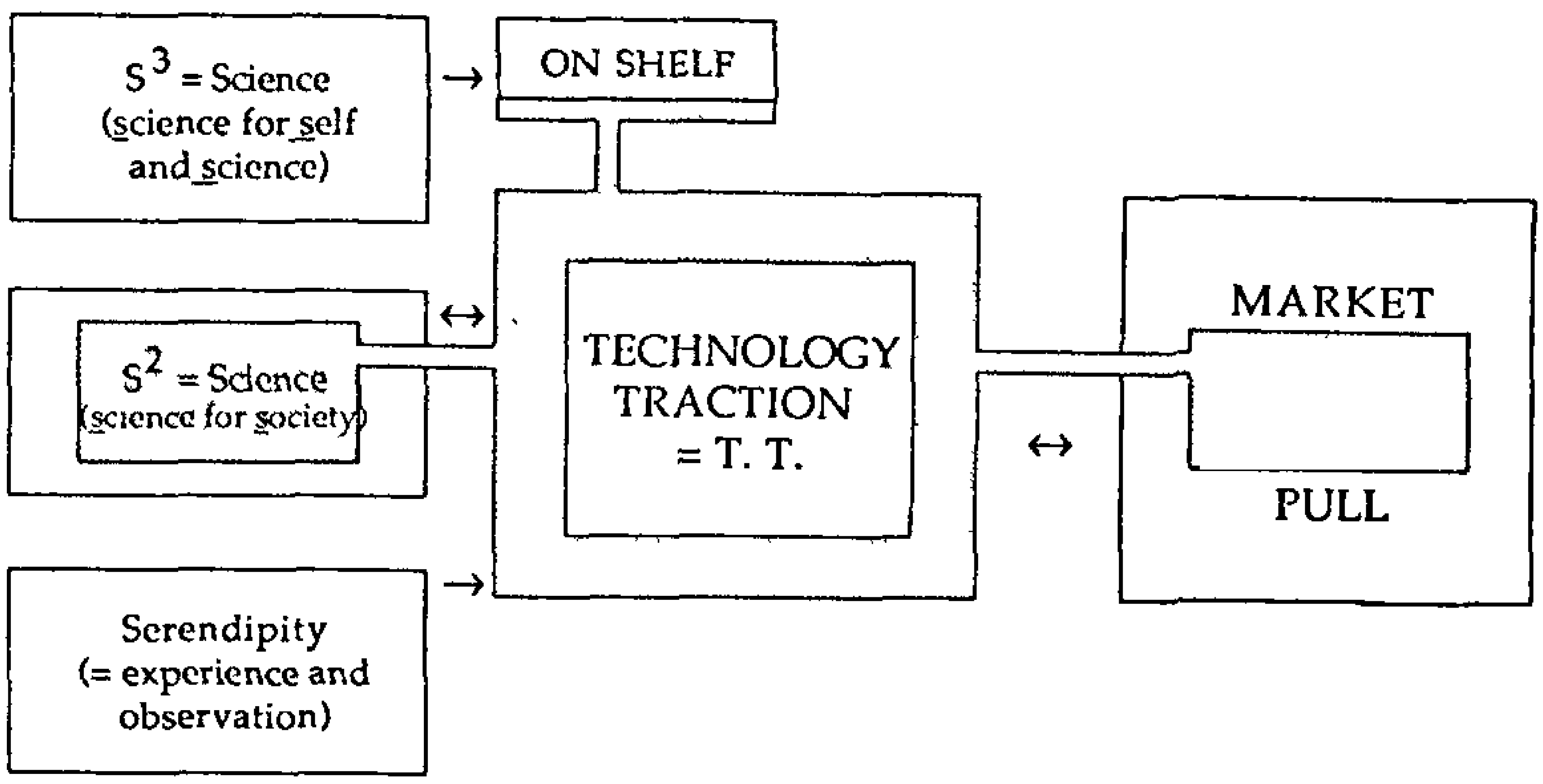

Figure 3. This figure shows the relationship which modern industry and some governments are adopting towards three different kinds of science. Most academic science and some which used to be done in industry is S^3 science. This science creates an 'on-the-shelf' paper archive, accessible worldwide via the literature. The concept of technology 'traction', is that existing production technology in industry (or societal need in the public sector) clearly *pulled* by the market requires mainly S^2 science (which can be very long term but has a clear goal). Of course S^1 and S^3 science will be used insofar as they are relevant to the S^2 mission. This is the nature of the science which looms larger on the horizon of science paid for by the public.

shelf basic science and targeted real product-defined science, even long-term (5–10 year) 'basic studies' in the context of a productive industry. New knowledge to be useful, builds on, and must be based or nested in an existing network. It has become prohibitively difficult and expensive to bring a radically new material or process or product to market. GaAs's battle against silicon is an example. The failure of structural ceramics to dent the automobile markets significantly, after $ 500 M/yr of worldwide research for 20 years is another. Understanding and utility are not strongly coupled.

Particle physics, astronomy and other religious pursuits

One must take very seriously the public policy question. Why should the poor in our cities pay for the very wealthy to indulge in such 'hobbies' as 'basic science' which result at the very, very best only in the aesthetic pleasure for at most a few thousand citizens. *No* one ever suggests that such work should be prohibited or cut off. What is at issue is only *WHY the public*, the government, should pay for such work. Why should Delhi's poor pay for particle physics instead of health care for urban poor in the West or say pure water for tens of millions in developing countries. The answer, I have concluded, is that 'science' is modern secular human being's theological quest for the Holy Grail. Since technology is the religion of most humans in 1st, 2nd and 3rd worlds, the intelligentsia cast about for a theoretical (i.e., theological), base for it, mistakenly assuming a cause–effect relation between science and technology. The public is totally taken in, as are most scientists. Hence the incredible attitudes to present-day cosmology. Stories about the 'first' 10^{-12} second of the Universe, etc., pictures of galaxies, binary, neutron stars, pulsars, etc., all long since disappeared and of zero relevance or understanding to the masses. These are all justifications by our wealthy scientist-classes to have the masses pay for our very high level fun. Another justification is that this is building modern humanity's cathedrals. But that is naive, and betrays a deep ignorance of the role of cathedrals or temples in culture. Cathedrals and temples were nurturing vehicles for the masses, where body, mind and spirit were elevated. The bodily act of pilgrimage to Chartres or Khajuraho was available to everyone and anyone (with no requirement for an MS in physics). The entire structure, the architecture, the windows, carvings, layout, all told stories both at the naive and deeply metaphorical levels which connected again to the mental and spiritual levels of *the masses*. If thousands want to stand in awe of human ingenuity they should go to Florence to see what Brunelleschi managed – to build a cathedral which could put the US Capitol inside it – without a crane or a computer. But Brunelleschi created something which tens of millions can 'connect' with at several levels. Now, try to convey that sense of awe to any average 1000 citizens by explaining the wonders of string-theory to them. No! modern physics demanding of depth and excellence, and revealing of deep truths though it may be, 'cathedral building' for our culture it is not. On the other hand, modern science is indeed a demanding religion for many practitioners. Non-believers only ask, as they do of all militant religions, please don't force us all into your belief system.

Third millennia S & T policies for all countries

In my recent work I have developed the highly unpopular thesis that 'basic' science itself is rapidly approaching an asymptote. I know all about Rutherford, Kelvin *et al.* who had also proclaimed that all of physics was wound up 100 years ago. They were wrong because they had not thought about it. Today many believe that because such luminaries were wrong *then*, the obverse of this position that new equally important discoveries will continue at the same rate must be true. What a vacuous hypothesis. Such simple-minded reactors are wrong for the same reason – they haven't thought about it. My posture is that the very success of science has rendered its demise certain. Of the sensible world – around us that which can be touched and seen and heard – human beings know just about everything that the vast majority need to understand, manipulate and to a large extent control (except of course for large-scale events in nature). That was not true by miles in Rutherford's day. We cannot conceive of repealing Newton's laws, Maxwell's laws and all of E & M theory, the periodic table, quantum mechanics upon which modern science and technology rest. The building blocks of our Universe are now known and known to be fixed (perhaps we'll make a few milligrams of a superheavy element someday and an improved antibiotic, but that will prove the point, science is now *only* about the details, the trimmings, the esoterica, not the exoterical). New discoveries are necessarily minor, incremental. In my annual graduate STS seminar 20 or 30 students and faculty cannot in a serious exercise even conceive of any imaginary new technology or function that they want, which they could sell to large numbers of citizens – except teleportation! Try it yourself. Read all the science fiction you want, and make a list of what Western humans need. In a very real sense, science's 'jig is up'. We can today transmit an image from New Delhi to New York in color and 3D at the speed of light. I trust we can all agree that it will never go faster, nor convey any information it cannot do today. The explosive power of bombs went up from 1 to 10^6 tons TNT in a decade (1945–1955) but has not changed in 40 years. Of course there are infinite possibilities for optimizing improvements in every technology. Lighter or stronger materials; smaller computers; lighter cars; slightly faster trains; slightly safer planes; and so on – not to mention another dozen choices in tooth paste or soft drinks.

In a sentence, my analysis leads me to the prediction that 'basic science' as we know it in the last third of the 20th century, will have all but disappeared in a very few decades, for two reasons: the public will not pay for it, and there is not much interesting new stuff to find anyway, and most honest, brilliant scientists will move on to less abstract problems. We will return to a period of quiescence in this one area of human creativity.

Some hints for Indian policies

Handling new discoveries; vying for No. 2 position

Policy lesson for India #1

Science policy is a luxury for later; India must focus on technology policy, especially local manufacturing of high quality products, in demand by large sectors of the population.

Just as stepwise technological improvements are an infinite source of employment, so also are serendipitous discoveries. Of course these serendipitous discoveries impact our world exactly the way meteorites do – large numbers of small ones, modest numbers of modest sizes, and a very few earth-shaking ones. A major aspect of modern R & D policy for a nation or a company is how to handle a real serendipitous discovery which is broadcast simultaneously worldwide. Having studied, in detail, the ceramic superconductor discovery – as an insider (since we had made the first oxide superconductor thin films of BaBiPbO ten years before the analogous YBC film) – I believe we have an excellent model of how *not* to react. The US led worldwide over-investment in scientific trivia, jumping from one to the next. Quasi crystals, superconductors, bucky balls, is a perfect example that we have run out of things to do. Think of all the scientists who dropped whatever they were doing to become amateurs in this area of materials synthesis.

My considered view for such situations for a strategy from a nation's or corporation's view should be 'Plan to be #2'. Let those who will, jump on any bandwagons and spend their money to get there *first*. Only if such a utilizable discovery is confirmed, initiate a minimum 'watching brief' effort of 2 or 3 people duplicating other work, keeping on top of all literature and meetings and doing their own modest work. When and if the science and applied science show any progress towards real applications, the latter should be making strategic plans to enter into production of the most likely devices or products to enter the market. The tasks of this group is to be knowledge evaluators, concentrators and distributors to the appropriate set of internal receivers.

Among scientists and national policy makers, the cost-effective response to a new discovery would be to abjure – absolutely – encouraging a large spectrum of newcomers to enter fields totally unfamiliar to them. This is a double loss to the nation. It takes them away from something they know about and could contribute to. And one can safely assume that 95+% will waste the money and time applying their specialities in an irrelevant manner to generate a few more papers to muddy the picture. Clearly a national policy should fund a *very* few of the groups *most experienced* in the field, to follow the field for say 5 years. Only if there are significant further developments will there be any need for expanding the number and range of those involved in follow-up research.

Response to globalization: delink from the system

The rhetorical excesses and absurdities on behalf of the market economy and free trade are beginning to sound as extreme as those on behalf of the planned state economies of the thirties and sixties. We ignore such silliness. All over Eastern Europe the euphoria/propaganda on behalf of the market-economy is history: one country after another is electing the old-time managerial class Every economy is a mixed economy. Free trade is a label, not a policy. For evidence look only at the spectacle of the US labouring for 10 years to *manage* its trade with Japan to lower the imbalance using quotas, tariffs, *government* programs to buy American goods, etc. Is this the model for 'free' trade? It is a fact that, the percentage of the total world product which was traded went from about a stable 3% from 1960–75 to what *may* be equally stable 18–20% in 1990. (This could go *up* or *down*, but probably not by more than 5%.) The rhetoric and the planning however often sound as though globalization of trade is headed for 100%! Indeed it would now appear to be a sound guess that we are entering into the reverse swing of the pendulum towards *more local production, more self reliance*, for social, political, and cultural reasons. It is certain that in globalization even if there is a claimed win-win situation, at first, it is certain that the stronger partner will *always* get more than a 'fair share'. The third law of Science, Technology and Society (STS) states that the 'benefits of any (new) technology will be unequally distributed among populations in space (within a country the rich always gain) and between countries (the stronger always gain), and in time (earlier generations always benefit)'.

Thus third world countries instead of maximizing linkage to the global *system*, should vigorously start to **de-link** *wherever possible*. (Obviously this is less possible in certain areas than in others.) The STS research groups at Penn State under Professors Ivan Illich and Wolfgang Sachs have championed this cause of de-linking and the reader is referred to their work. But in case they are thought of as romantic sociologists, I reproduce the viewpoint of Lord Maynard Keynes as a healthy guideline for India's policies, and point to the fact that Lester Thurow, just-retired Dean of MIT's Sloan School of Business, has also talked of de-linking in the last year or two.

> I sympathize therefore, with those who would minimize, rather than those who would maximize, economic entanglement between nations. Ideas, knowledge, art, hospitality, travel – these are the things which should of their nature be international. But let goods be homespun whenever it is reasonably and conveniently possible; and, above all, let finance be primarily national.
>
> – *The Collected Writings of John Maynard Keynes*, 1993, vol. 21, edited by Donald.

Shades of Gandhiji.

Efficiency and enoughness

I believe it is essential now to start a major educational effort to introduce the concept of a society's values as key actors in national policies. We all, for example, agree that *energy efficiency* has proved its worth as a technological principle pulling on science. US utilities literally give away the new expensive fluorescent bulbs to city dwellers, so that they will *not* have to build new plants. But this cannot be a substitute for national policy. Of course in an era of dwindling access to non-renewable resources, every possible energy *savings* must be encouraged by technological innovation. But if social pressures continue to push for growth for thoughtless increase in use of energy, they can wipe out all the gains from increased efficiency. The larger policy issue is how much 'consumption' is possible and how much is enough. My paraphrase of what Gandhiji said is 'Earth has enough for everyone's needs but not for a large number's greed.' How much is 'enough', is a key national, religious and ethical value which must be the overriding principle guiding all technological and science policies. A technology policy maker's oath, analogous to the Hippocratic oath, should be, 'First, fulfill everyone's basic needs. . .'

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The new mineral policy

B. P. Radhakrishna and L. C. Curtis

There is much talk about the liberalization policy leading to vast developments in the mineral industry. The futility of monopolistic control over mineral assets seems to have been realized belatedly and the exploitation of minerals and metals has now been thrown open to private investment. We propose examining some of the issues involved. In our opinion the policy, to become really effective requires action on several other related fronts.

The main thrust appears to be to provide incentives to foreign investment in the mining industry in India. Encouraging local enterprise appears to be only incidental. Mineral development and agriculture, offer the greatest potential for creating additional wealth and employment. More urgent than attracting foreign money are measures and action to develop our land and water resources, and creation of a self-reliant and self-sustaining economy with a strong industrial and agricultural base. The former requires a well-developed and vibrant mineral industry.

The main benefit anticipated is the induction of capital for investment in prospecting, development and exploitation of minerals through private sector companies. Participation by foreign companies is expected to provide access to up-to-date mining methods and metal recovery processes and a significant increase in production.

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Essential further steps required

Initial response to the new policy is one of very considerable interest by international mining enterprises having extensive world-wide operations. To sustain this interest and yield results further steps have to be taken. These are:

1. Geological and mineralogical information to become freely available.
2. Tax incentives to be provided to attract capital.
3. Mineral concession rules to be further amended, present ineffective procedures to be replaced to speed up grant of concessions.
4. Labour productivity to improve through inculcation of work ethic with effective incentives to higher production.
5. Availability of reliable electric power at reasonable rates to be ensured.
6. Unnecessarily restrictive mining regulations to be amended.

Non-availability of basic geological data

The Geological Survey of India and the Indian Bureau of Mines, instead of providing information necessary for exploration, are catering only to the requirement of Government. The needs of the industry are ignored, through reluctance in parting with geological maps. The policy of labelling quite a few of even the limited number of published maps as 'restricted' and denying them to the interested public is one cause of under-development of the mineral industry. A reorientation of outlook is essential as no progress will be possible without easy dissemination of basic geological data. We have repeatedly stressed this point but thus far to no effect.

Paucity of production data

Information on mineral statistics is largely historic, data being several months old.