CURRENT SCIENCE

Volume 74 Number 2 25 January 1998

CORRESPONDENCE

Creativity in science

Creativity is the trait of inventing, designing, contriving something original and unravelled so far. Such 'finds' stimulate epochal work which has far-reaching implications for humankind and find applications sooner or later. Majority of the human beings remain wonderstruck about how the person conceived the idea and why it did not occur to them. Creativity has correlation with intuitive skills and serendipity. Albert Szent Gyorgi said, 'Discovery consists of *seeing* what everybody has seen but *thinking* what nobody else has thought.' Apples had been seen falling down by people all over the world down the ages but it was Newton only who questioned why it did not go up. Similarly, Einstein has been quoted as saying that when he was 15 years old, he asked himself: 'What would the world look like if he were moving with the velocity of light.' He started thinking about the idea at the age of 15. He was 25 when he formulated the theory of relativity (Garfield, E., *Curr. Contents*, 1989, **34**, 3–7). Knowledge is passed from generation to generation. Each generation not only perceives the previously acquired knowledge to pass it further but increases and multiplies it. We must do something new, something unknown to all previous generations. A good teacher and mentor inspires the craving for knowledge (Peterov, R. V., *Me or Not Me*, Mir Publishers, Moscow, 1987). He teaches his students to choose the untrodden paths. He is not successful if the student has no such craving and only repeats what others say or show him (usually such behaviour gets cultivated in the feudalistic environment, when people higher up in the hierarchy at every step expect and appreciate response as per their preconceived notions and lack objectivity, vision and intellectual strength). Incompetence breeds incompetence.

Creativity can be likened to the cultivation of fruit from seed. Both need proper conditions to germinate, grow, develop, bloom, come to maturity and bear fruit (Garfield, E., *Curr. Contents*, 1989, **43**, 3–9). If conditions are not propitious, then most of the seeds would die and only a few exceptionally hardy ones would germinate. Obviously, the rate of germination is more in the countries where day in and day out newer and newer developments are taking place. Certainly, one factor of fundamental importance for fostering creativity is the 'social environment'. *The worst social trait which stifles creativity is feudalism in the social system.* This is the bane of most of our scientific and educational institutions. Mentor relationship is of utmost importance for fostering creativity. There are umpteen examples of chains of teachers and their students winning Nobel Prizes. Mentor relationship instils in the young minds the trait of 'how to hit the tough and the most challenging problem in the front line areas' (*Curr. Contents*, 1989, **43**, 3–9). The knack of choosing the research problem and tackling it, the right way is conveyed by close association with intellectual giants. 'Beware of the *zamindars* in science'. They are feudalistic, and try to cash in on the latest fads in science for personal glory which feeds ego but harms the intellect. The role of science administrators (at every level in the hierarchy) is the most crucial in fostering creativity. They ought to have a panoramic vision, professional and intellectual strength and solicitude for their research team. A. E. Pannenborg (Research Administrator, Philips) said, 'It is incumbent upon those who are in charge of the research groups to create conditions that would allow the gifted young scientists to adequately follow their creative instincts' (*Eur. Heart J.*, 1988, **8**, 14–16). It is very important and urgent to realize, especially in the Indian context, that no additional financial inputs/funds are required for creating conditions and environment conducive to creativity in science. Right questions must be asked for seeking the right answers. Discussions in the peer groups play a pivotal role in this process. One must listen more attentively to the opinion of young people who are statistically in more creative age group (20–40 years age). Creativity requires intuition, identification and pursuit of anomalies, hot chase of unexpected data, weird thinking and pursuit by umpteen experiments, constant verification of data by the laws known or likely to be known (Watson, J. D., *The Double Helix*, Penguin Books, New York, 1970; Hazen, R. M., *Breakthrough: The Race for Superconductivity*, New York Summit, 1988; Garfield, E., *Curr. Contents*, 1989, **45**, 3–9).

For introspection, let us recall that C. V. Raman is still the only scientist who has won the Nobel Prize so far for work done in India. This is in spite of the fact that our science and technology task force is numerically the third largest in the world. It is germane to get back to the two publications during the recent years which provide very objective insight into the 'health profile' of institutions of scientific research in our country (few islands of excellence and small, isolated motivated research groups must be considered an exception) (Proceedings of the seminar held at INSA, New Delhi on Scientific Values and Excellence in Science; Ahmed, R. and Rakesh, M., *Insights into Scientific Research in Indian Universities and the Institutes of Technology*, CSIR, New Delhi, 1991). The consensus is that there is fast decline and this has been corroborated by the latest analysis (Raghuram, N. and Madhavi, V., *Nature*, 1996, **383**, 572). It is high time to take pragmatic corrective measures, which would attract young minds to scientific research. It is all the more urgent in the changing international scenario for obviating the import of technology. It is important that scientific institutions and universities have their frequent *health check-up*. The early detection of the malady would be a step forward for the cure..

OM P. SHARMA

Biochemistry Laboratory,
Indian Veterinary Research Institute,
Regional Station,
Palampur 176 061, India

Use of lint as soil conditioner

The August issue of the *Scientific American*, which reached me late, has, on page 19, an illustrated news feature on the use of lint from textile factories as soil conditioner, immense benefits in reclaiming degraded soils, increasing yields, etc. flowing from such practice.

It surprised me very much to find the feature presenting the matter as if it were a new discovery. Some years ago (in the early seventies), the authorities of the suburban train services in Mumbai (then 'Bombay') decided to lease out railway lands, wherever free on either side of the tracks, for raising vegetables. As a leading newspaper of Mumbai had the story, the first act of the lessees was to plough in cotton waste, available in plenty from (the then active) textile mills in the city. Thus conditioned, the lands are said to have given excellent yields from whatever was raised. I believe the practice still continues, but the produce is probably exported, mostly to the Gulf countries, now.

On inquiry, I learnt from some farmer acquaintances of mine in Bangalore Rural District that there has long been a practice of mixing cotton waste (that became easily available from some cotton textile mills established in the early part of this century in the Bangalore region) with composted municipal vegetable garbage and ploughing in the mixture.

What has been reported in the *Scientific American* is, therefore, not novel – the 'new' use found for lint has only succeeded in solving the disposal problems of, and enhancing the profits of, some very large textile finishing factories in the El Paso region of Texas which produce several tpd of the material. We may even grant that the statistics on the increases in yield, slow release of nutrients, prevention of fertilizer run-offs into nearby water bodies, etc. are new. But presenting the use of cotton waste/lint as a soil conditioner as a new, probably patentable, 'invention' is certainly not acceptable. The presentation is no different from those ascribed to Soviet writers on the history of science and technology trying to attribute the invention of the steam engine to a Russian-born, 'socialistic' (even in Tsarist times!), tinkerer (presumably, those re-writers of history must have been parochial and born in the Russian region of the erstwhile Soviet 'Union').

I do hope our agricultural scientists would take note of the feature and express their knowledgeable reactions to it.

S. N. BALASUBRAHMANYAM

D.Q. No. 14, IISc campus,
Bangalore 560 012, India

Square-grid patterns in a twist grain boundary phase

I was interested to read the report entitled 'A three dimensionally modulated structure in a chiral smectic-C liquid crystal' by P. A. Pramod, R. Pratibha and N. V. Madhusudana (*Curr. Sci.*, 1997, **73**, 761). The purpose of this note is to present some unpublished work carried out about 5 years ago, when I was a Ph D student at the Raman Research Institute, which broadly confirm the conclusions drawn by these authors.

My studies were carried out on binary mixtures of 4-(2′-methylbutyl)phenyl 4′-*n*-octylbiphenyl-4-carboxylate (CE8) and 4-*n*-dodecycloxybiphenyl-4′-(2′-methylbutyl)benzoate (C12). The phase diagram I reported in my thesis (1992, chapter 5) was obtained before the twist grain boundary phase with smectic-C-like blocks (TGB_C) was established and hence the phase diagram was incomplete. Subsequently I re-examined the textures. A modulated structure was clearly seen at temperatures below the TGB_A phase (phase with smectic-A-like blocks); photographs of the modulated structures are reproduced