oxidized and calcretized brownish to yellowish brown clayey silts. The terrace formed of these sediments is much dissected. The nature of oxidation and calcretization of the sediments together with the dissected nature of the terrace suggests an antiquity of these deposits. A volcanic ash bed underlies the sediments containing the fossil. (It is proposed to report separately the occurrence of the ash bed in detail.) Samples of Quarternary ash beds of comparable stratigraphic positions from the Indian sub-continent compare closely with that of the youngest (74,000 BP) Toba Tuff[3]. Summing up, a late Pleistocene age (less than 74,000 BP) may be suggested for the sediments and the fossils contained in them.

The material has been deposited in the Regional Palaeontological Laboratory, Southern Region, GSI Complex, Hyderabad (GSI Type No. 20454).

1. Pascoe, E. H, *A Manual of The Geology of India and Burma*, 1964, vol. III, p 1810.
2 Ram, L. G., *Geol. Surv India, Spl. Publ*, 1988, II, 207–211
3. Acharyya, S. K. and Basu, P. K., *Quart Res.*, 1993, **39**, 1.
4. Lydekker, R., *Pal. Indi. Ser.*, X, 1866a, III pt. 7, 209–239.

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Occurrence of segmental distortion in larvae and pupae after refrigeration of non-diapause eggs of silkworm *Bombyx mori* L.

The non-hibernating eggs of tropical polyvoltine silkworm races generally complete their embryonic development under ideal incubation conditions by 9th day after oviposition[1]. These eggs can be conveniently preserved in cold storage for a maximum of 20 days, to delay hatching. The effect of prolonged refrigeration of these eggs on hatching and rearing performance has been studied earlier[2–4].

The present study was carried out at the Regional Sericultural Research Station, Majra, Dehradun, to understand the effects of prolonged refrigeration of eggs on rearing performance and on the morphology of larvae and pupae in a popular polyvoltine silkworm race, Nistari. The eggs (two egg layings of about 600 to 650 eggs in each replication in each treatment) of 24 to 30 h age were refrigerated for 30, 40, 50, 60 and 70 days at 2.5°C± 1°C in cold storage. Hatching percentage was recorded and hatched larvae were brushed in three replications (actual hatched larvae of two egg layings in each replication as mentioned in Table 1) and reared till adult stage for recording further observations. Freshly laid eggs of 24 to 30 h age (two egg layings) were kept as control and were released in

Table 1. Rearing performance (mean of 3 replications) of the refrigerated eggs of the Nistari polyvoltine silkworm race

Refrigeration duration (days)	Actual no. of eggs treated in 3 replications	Actual no. of larvae brushed/ reared in 3 replications after hatching	Average hatching percentage	Average cocoon yield/10000 larvae brushed wt. (kg)	Average effective rate of rearing	Percentage of deformed larvae (of total larvae brushed)	Percentage of deformed pupae (of total deformed larvae)
30	1967	1804	91.55 ±0 535	8 319 ±0 038	89 26* ±1.37	Nil	–
40	1794	1365	76 04* ±7.73	6 337 ±1 559	67 11* ±15 66	Nil	–
50	1849	1230	66.68* ±1 413	9 055 ±0 930	78 34* ±8 09	Nil	–
60	1881	934	49 69* ±7 49	6 059 ±1 044	66 27* ±9 92	5 3 ±2.52	100
70	1919	209	43.14* ±11.01	1.897 ±0.221	25 03* ±4 14	8 7 ±2 52	100
Control	1932	1777	92 04 ±1 98	8 673 ±0 074	94 51 2 25	Nil	–

*Significant (0 05) as against control in *t* test.
NS = Non-significant

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.

1. Datta, R. K., *Indian J Seric.*, 1988, **XXVII**, 1–6.
2. Datta, R. K., Sengupta, K. and Biswas, S. N., *Indian J. Seric.*, 1972, **XI**, 22–27.
3. Anonymous, Annual Report, CSRTI, Mysore, 1988–89, pp 71–72.
4. Tayade, D S., Jawale, M. D. and Unchegaonkar, P. K., *Sericologia*, 1987, **27**, 297–299.
5. Hasimoto, H., *Jpn. J. Genet.*, 1956, **31**, 294, cited in *The Silkworm· An Important Laboratory Tool* (ed Tazima, Y), Kodansha Ltd , Tokyo, 1978, pp 24–29.
6. Tamazawa, T., *Rep Res. Grantees Minest. Educ. Agr.* (Japanese), 1972, **41**, 269, cited in *The Silkworm: An Important Laboratory Tool* (ed. Tazima, Y), Kodansha Ltd , Tokyo, 1978, pp. 24–29.
7. Sidhu, N. S., Proceedings of the IV All India Symposium of Environmental Biologists, Dec. 1981 (eds. Datta, A. K. and Maleyvar, R. P.), p. 64.

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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