ning or (ii) larvae of *S. epius* simulate mealybugs in their early instars and subsequent mature larvae withstand ant attack by hard, thick dorsal cuticle.

The primary association of *S. epius* with non-hostile ants like *A. gracilipes* at the feeding site of mealybugs probably had made them discontinue secretion of honeydew and their relation with hostile ants later might be secondary association (Figure 1). Or else, as *S. epius* larvae of early instars simulate mealybugs, it is difficult for the hostile ants to recognize these camouflaged predacious guests amidst host population and later instars (Figure 2), which are larger than mealybugs and withstand the attack of hostile ants by their thick dorsal cuticle, as reported in different species of *Spalgis*[1,14,15]. Because of any one of the above developments in *S. epius*, it perhaps opted to save valuable energy (honeydew), which is no longer required to appease ants as predators of mealybugs and sequester them for defence. Moreover, no larval parasitoids/predators of *S. epius* have been reported so far. Hence, it may not be necessary for *S. epius* to sequester ants for defence. Even if early larval enemies of *S. epius* exist, ants tackle them at the cost of homopterans' nectar.

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Sethusamudram shipping canal project and the eternal silence of the Indian earth scientists

The controversial Sethusamudram project – excavating the 56-km-long shallow sea between the Palk Bay and Gulf of Mannar and creating a narrow shipping passage linking the east and west coasts of India – received a formal go-ahead signal from the Union Cabinet recently, according to press reports. This project (estimated to cost currently Rs 2233 crores) has been under fire for being unmindful of possible environmental impact. A note, critical of this project, by Ramesh (incidentally a medical practitioner, not a geologist or oceanographer) was published in *Current Science*[1]. The major scientific objections raised by him regarding this project are: (a) The National Environmental Engineering Research Institute, Nagpur, which had been entrusted with the environmental impact assessment (EIA), has not taken recent studies on the sedimentation dynamics of the project area into consideration; therefore their conclusions are questionable. (b) The impact assessment studies have neglected the role of cyclones (not to speak of the rare incidences of tsunamis) in dispersing the dredged material, a major risk factor of the region. (c) The EIA has only looked at the sedimentation dynamics of a small area, but ignored the adjacent portions, including the Palk Bay strait – an area noted for unusually high sedimentation rate. (d) The nature of the substratum of the region is not known: is it soft or hard? This information is important to decide on whether to dredge or blast the sea bottom and to plan for safe disposal of the dredged material. (e) The EIA study is ambivalent in identifying sites for safe disposal of dredged material, without creating an environmental mess for the organisms living in the sea (Sri Lanka has a major stake here). (f) The impact of changed bottom topography as a result of dredging or blasting on the movement of currents is not known. Ironically, the medical practitioner who is affiliated to an NGO has registered all the aforementioned objections (see his full report in http://www.geocities.com/sethuship canal), and I am yet to see any geologist or oceanographer raising any concern on this project.

Personally, I believe all the objections raised remain valid unless and until these issues are resolved by an independent group of experts. Have we considered other dangers, for example, the prospect of grounding or straying, from the canal alignment, of a rogue ship containing coal or oil or even a collision of such ships, and the ensuing ecological disaster? On the other hand, if ships are going to be guided by tugs, there will certainly be a huge toll that would work out to be more expensive than sailing around Sri Lanka (see Ramakrishnan, K. S., *The Hindu*, 21 December 2004). Finally, only the Indian Navy will essentially use this route! Another issue is whether we have worked out a realistic cost-benefit analysis of this project? In a recent statement, the Union Minister for Shipping, Ports and Highways mentions that this canal will have a 'dissipating effect' on tsunamis, if they strike the east coast (*The Hindu*, 6 June 2005). He further states that the Ministry is now ready with scientific data to answer any questions on this project (including a tsunami model of deep sea-

wave propagation in a post-project scenario).

I am curious to know how our scientists (not the ones who are doing EIA for the sponsors) respond to such projects, which obviously require an interdisciplinary approach. What is appalling is the complete silence from the earth sciences community of the country. I think here we have an excellent geological problem and an area where we can effectively intervene. Are we to leave all these important decisions to some influential bureaucrats and politicians who are clever enough to hide under some technicalities and poorly whetted reports? What about the national academies and other professional bodies of Indian scientists? Are they not supposed to take their positions on such important issues based on considered opinions of independent experts; in this case, particularly from the earth scientists? Sethusamudram, as the name suggests, is part of an ocean that is being constantly bridged by natural sedimentation processes, and nature has been at this work for hundreds of thousands of years. I am sure, going by the rates of sediment build-up, in hundred of years there would be a land bridge connecting Rameswaram with Sri Lanka. Why disturb this process for questionable purposes? The technical, scientific and economic credibility of this project must be convincing and it should not be another disaster in the making. The concerned Ministry and institutes must present their results in an open forum consisting of both national and international experts on such matters as well as other concerned persons and stakeholders.

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Note: The views expressed here are my own and not necessarily of the institute that I am affiliated to.

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NEWS

Cholera: The scourge of India and Bangladesh

Cholera has been endemic in the Ganges and Brahmaputra belt of eastern India and Bangladesh from very early times. This Asian pestilence 'Cholera asiatica' moved out of its homeland in 1817 and spread to Europe and America in a pandemic form causing widespread death and devastation. Due to partial improvement of quality of water supply and sanitation, the incidence of cholera has declined steadily and by the 1960s, many scientists in the field had hoped that cholera would die a natural death. In 1961, however, a new strain of cholera vibrio, haemolytic ElTor, had started its march heading towards Philippines, Hongkong in 1962, Burma and Bangladesh in 1963, India in 1964, Pakistan, Afghanistan, Iran, Iraq, South of USSR in 1965–66 and finally to Europe and Africa in 1970.

Till 1991, scientists thought that only one family of *V. cholerae* (Called O1) and its variants caused epidemic cholera. But in 1992, large parts of Bangladesh and India, particularly coastal areas of Tamil Nadu and West Bengal were ravaged by a previously unrecognized strain, which was subsequently designated as O139. Since then, this strain has been isolated from 12 other Asian countries. The resurgence of O139 serogroup in September 1996 in Kolkata and the coexistence of both the O1 and O139 serogroups in much of the cholera-prone areas of India and elsewhere, suggested that the O139 serogroup had come to stay and would be an entity to contend with in the coming years.

Cholera, a severe diarrhoeal disease leading to acidosis and death, is caused by *Vibrio cholerae*. The bug colonizes in the small intestine and its pathogenicity is due to the production of enterotoxin that binds to an epithelial ganglioside receptor. India has a long tradition of cholera research and several pioneering works led to early breakthroughs in the field of diarrhoeal research. 75 years after Koch had postulated the existence of a cholera poison, S. N. De from Kolkata discovered the cholera toxin in 1959. At about the same time, N. K. Dutta, a pharmacologist at the Haffkine Institute of Mumbai along with his colleagues reported the production of fatal choleraic diarrhoea in infant rabbits fed with multiple doses of sterile lysates of dense suspensions of *V. cholerae* strain.

Molecular characterization of *Vibrio cholerae* rough strains are found to contain O1 serotype-specific (*wbe*) genes and all currently known genes responsible for its virulence. 'Cholera toxin production ability of the rough strains was found to be higher (three- to five-fold) as compared to the smooth counterparts and this is regulated transcriptionally', says T. Ramamurthy, National Institute of Cholera and Enteric Diseases (NICED), Kolkata[1].

According to Rupak Bhadra, Indian Institute of Chemical Biology (IICB), Kolkata, who has been working on *V. cholerae* for the past few years, epidemic *V. cholerae* O1E1Tor and O139 strains are prone to rearrangements leading to emergence of their variants within a very short time[2]. According to Rita Colwell, Dept of Microbiology, US-based University of Maryland, the discovery of O139 is a turning point in cholera research because researchers realized that new strains could arise from genetic recombination and gene transfer[3].

Rukshana Chaudhuri of IICB, Kolkata is of the view that the environmental parameters impose a spatio-temporal control on the expression of virulence factors allowing the bacteria to colonize in the intestine before production of cholera toxin. Since cholera toxin causes massive fluid loss from the intestine, production of toxin prior to colonization washes away the uncolonized bacteria, limiting the infection[4].

NICED proudly announces the two recent discoveries originated from studies conducted by scientists of recent years. A new oral cholera vaccine has been developed as a collaborative effort with scientists from two other institutes, Institute of Microbial Technology (IMT), Chandigarh and IICB, Kolkata. This new recombinant vaccine strain, designated as VA1.3 is derived from a parental strain VA1 which is