(b) Metabolism of substances from the environment for the maintenance of the internal equilibrium, namely homeostasis.
(c) An ability to reproduce and to pass on genetic material to offspring.
(d) A possibility to evolve through random changes of the genetic material.

Cognition, he states, 'when examined closely, corresponds exactly to that quality which did not come into the world *until and as a direct result* of the emergence of living systems' (the emphasis is mine). Stated so, the proposition $L = C$ is seemingly tautological.

Meandering through some fifteen-odd chapters, Heschl takes the reader on a series of discursive excursions, through Darwin and Dawkins, Kuhn, Piaget, Popper, Chomsky, (Jared) Diamond, and quotes extensively from the molecular biology literature to make his point, which in elaboration, is this. Everything is there in the DNA, not just the genetic information that controls metabolism, but also the genetic information that decides intelligence. 'The total information', he says, 'about how an organism can meet the challenges of the environment can only be found in the system itself and that the environment in this respect can contribute not a lot, not half, but nothing whatsoever'.

Some may find these arguments in turn simplistic, circuitous and needlessly anthropomorphized (should there be such a word!). I have no doubt that any serious philosopher with any knowledge of modern molecular biology will recognize that the mind – body problem meets a new challenge when faced with the reality of DNA and the transmission of genetic information from generation to generation. However, none will seriously quibble with the idea of genetic determinism, that the basic information is there in the genes. The problem is that we do not always know what precise (usually environmental) factors trigger what actions. Even at the genetic level, this can be a problem. There are numerous examples of genes that get switched on by physical (heat shock) or chemical stress, for instance.

Enough has been said and something has been learned about the profound implications of small changes in the DNA: the intraspecies difference in genomic information is negligible, yet the intraspecies variation in any particular trait is enormous. The interspecies differences, again, can be rather small, but these have no bearing on interspecies similarity in any particular feature, including intelligence and cognition. At the DNA level, God is very much in the details: single nucleotide differences can spell the differences between health and disease, and there are numerous examples of this. There is, to the best of what one can see, no guiding hand, no overarching principle that has directed the course of biological evolution – much of it is entirely chance, however unpalatable it may be to accept.

But does that give enough support to Heschl's argument that the environment can provide no feedback to the DNA? The world around us does guide evolution in a particular manner, though. Selection works so as to amplify genes from those individuals in a species (in terms of number of descendants) that cope best with their surroundings. So is there something about the physical world that we inhabit that, so to speak, teaches us through selection? Namely, is there something about the planet earth that has conferred an evolutionary advantage on our type of intelligence? I cannot imagine any serious disagreement on this point of view, but the absence of a control experiment in this and in most other cases where the long process of evolution is responsible, makes it impossible to give a definitive answer.

And in the end, this is the most serious comment on *The Intelligent Genome*. There are no definitive answers but several provocative arguments, not all (any?) of which are truly substantiated, either through the apposite biological experimental example, or through a deep philosophical underpinning. There are straw men everywhere, and many windmills at which the author has tilted. It does not suffice to say that any book on a matter so important has to be so tentative and so speculative, but I suspect that this is ultimately the only defence that is on offer.

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Chemical and Biological Warfare – A Comprehensive Survey for the Concerned Citizen. Eric Croddy. An imprint of Springer-Verlag, Copernicus Books, 37 East 7th Street, NY 10003, USA. 2002. 306 pp. Price: US$ 27.50.

After the all-too-well-known terrorist attack in the US on 11 September 2001, there have also been a spate of biological attacks with anthrax spores. This perhaps promoted Eric Croddy to write a new book. The author has extensive experience on the disarmament aspects of chemical and biological warfare. The book is meant to explain to the common citizen – what bugs and gases are, how they can be used to kill people and the way they cause death. There had been obviously innate fear that chemical and biological weapons (CBW) are the most gruesome, effective and abominable. It is the purpose of the book to give a correct picture about these weapons and clear the myths that surround the terms.

Each war always bring in an element of surprise. Chemical warfare was one such surprise encountered in World War I, though the decisive victory did not go to the Germans at the end. Biological warfare had never been used openly in any war, though clandestine use cannot be ruled out. Though in the context of modern time war, nuclear threat is much more feared than chemical and biological weapons, as long as these weapons are possessed by belligerent or rogue nations, the chances of their use cannot be ruled out. Moreover, because of less complexity of production and dispersion of these agents, CBWs have passed onto terrorists' hands and therefore the common man must be aware of the consequences of such attacks.

This book is divided into three major parts. Part I describes 'Gas, bugs and common sense' in which the method of proliferation by States and terrorist organizations is brought out. Intelligent guess by the nations that have CBW capabilities and the threat perception of CBWs are also given in detail.

Part II describes chemical weapons in detail. The chemicals that qualify to be chemical weapons, history of chemical warfare and the Chemical Weapon Convention (CWC), from its inception to the present status, are described.

Part III gives a detailed account of biological weapons. The treatment is very similar to that on chemical weapons. Here, a whole chapter is devoted to the issue of vaccinations with reference to biological warfare.

The book is essentially meant to ward-off the fears of the common man about chemical and biological warfare, it is certainly not meant for political analysts and scientists. For them, there are many books which treat the subject in greater depth. This book gives factual information on chemical and biological agents for a general reader who is assumed to have no prior knowledge on the subject. Especially chapters on basic classes of CW and BW agents have been written well. Also, the history and success of CWC and in comparison, the problems with BTWC have been lucidly brought out.

I found very few factual errors except one on p. 6, where precursors are confused with chemical warfare agents and another on p. 176, where destruction of chemical agents are expected to be completed by 2020. The second statement is contrary to the requirement of the Convention. Though Russia and South Korea are dragging their feet to destroy the weapons, to make a statement that they will take another 18 years is obviously misleading.

American authors are generally biased towards the US government and NATO's views in their critical appraisal. This book is no exception. The end result of the well-crafted seven-year protocol for BTWC became null and void, because the US did not support the protocol at the last moment. After supporting the protocol for long years, it is not clear why the US developed cold feet. It is certainly not due to pressure from the biotechnology industry. It is just a ruse. It is a pity that the author did not address this problem properly.

In spite of such criticism, this book provides interesting reading. Both in terms of organization of material and the facts presented, I consider the author has succeeded in presenting an excellent up-to-date cogent review. In summary, I recommend the book to those who would like to have some understanding of chemical and biological warfare, the US bias notwithstanding.

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PERSONAL NEWS

Suresh Kumar Sinha

Suresh Kumar Sinha (1934–2002) was born in Bulandshahar District, Uttar Pradesh on 18 July 1934. He lost his mother at a very young age and was educated in a residential school at Anoopshehar. He received his B Sc degree from Agra University in 1955 and M Sc degree in botany with specialization in 'Cytogenetics and Plant Breeding', also from Agra University in 1957, securing a first class. He was appointed as lecturer in DAV College, Kanpur immediately after obtaining his Master's degree (1957–62), wherein he completed his Ph D working on mineral nutrition aspects of linseed. The desire to learn about plant biochemistry took him to the University of Alberta, Edmonton, Canada, where he finished his second Ph D in 1964 in a record time of eighteen months. His outstanding work on glycine–serine conversion in plants was published in international journals of repute and became part of textbooks in plant biochemistry. He continued as a post-doctoral fellow at the same university before returning to India in 1965, where he was appointed as Pool Officer, CSIR at the Indian Agricultural Research Institute (IARI), New Delhi. He joined as a plant physiologist at the Central Tuber Crop Research Institute (CTCRI),

Trivandrum in 1966 and worked on tuber crops till 1969. He joined IARI once again in 1969 as senior plant physiologist at the Division of Plant Physiology, eventually becoming Director, IARI (1991–94), and retired as ICAR National Professor (1995–99).

Sinha was a complete plant physiologist and tried to integrate the disciplines of physiology, genetics, biochemistry and breeding in the analysis of research problems. His greatest asset was the novelty of ideas, ability to conduct original research using simple tools and interpret the data to give new concepts. At CTCRI, his laboratory had only an oven, a microscope and an old spectronic 20. He started research on the mechanism of tuberization, source–sink relationship and cyanide content in *tapioca*, an important crop in south India. This research helped in relating starch deposition with root development, highlighted the importance of leaf area for *tapioca* productivity and helped in characterizing the breeders' selection for edible purposes. These were new findings for this crop and are included in books on tuber crops. At IARI, Sinha initiated research on the mechanism of heterosis, a phenomenon which has revolutionized agriculture. I had the privilege of writing a doctoral thesis on this subject under his chairmanship and also co-authoring a review in *Advances of Agronomy* in 1975. In the