Liquid Membrane Phenomena: Biological Implications. R. C. Srivastava. Indian Society for Surface Science and Technology, Department of Chemistry, Jadavpur University, Kolkata 700 032. 271 pp. Price: Rs 500 (India and Bangladesh); US $100 (other countries).

From the 1930s, the attention of physicists and chemists has been diverted towards the understanding of the intricate life processes which are essentially physico-chemical. This had led to the development of interdisciplinary subjects such as biophysics, physical biochemistry and molecular biology.

In this context, the book under review is significant and is the outcome of the author's lifelong sustained efforts. It seeks to consolidate and focus on liquid membranes, liquid–liquid interfaces in relation to their biological relevance, and the role they play in living systems. The principal focus has been on (i) the workability of liquid membrane bilayer as a model biomimetic system, (ii) the role of liquid membranes generated by surface active drugs, and (iii) some recently explored possibilities of biotechnological applications.

Other important areas include liquid–liquid interfaces, pollution abatement, solar energy transduction, reverse micelles, etc. The book contains a comprehensive overview of the present state-of-the-art on the areas focused. Discussions on mimicking sensing mechanisms of taste and smell, transport through liquid membranes in pollution abatement, the use of liquid membrane bilayers in fabricating urea and cholesterol sensors and solar hydrogen production, are novel features of the book. Research contributions of the author and his associates have enriched the book. The amazing simplicity of the well-improvized experimental set-ups deserves special mention.

The lucid presentation of the subject matter appears to be interrupted by the style of presentation of the experimental parts, which have been more like those in scientific journals. The get-up of the book leaves something to be augmented, particularly the narrow margins of the pages and the small character of letters. The cover page should have been more attractive. An improved quality of printing would have done better justice to the book.

Lastly, the Indian Society for Surface Science and Technology should be commended for its venture in publishing a monograph of high scientific standard involving the interdisciplinary field of surface science.

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Hepatitis B: The Hunt for a Killer Virus. Baruch S. Blumberg. Princeton University Press. 2002. 272 pages. $27.95.

This book is a personal account of the discovery of hepatitis B virus (HBV) by Baruch Blumberg, for which he was awarded the 1976 Nobel Prize in Physiology and Medicine.

Hepatitis B virus (HBV) is one of the most common viruses in the world. It is estimated that more than 2 billion people alive today – over a third of the world's population – have been infected with HBV. Of these, about 350 million will become chronic carriers of the virus and 1.5 million will die each year as a direct consequence of this infection. The disease shows a wide spectrum from acute hepatitis (jaundice) to chronic liver disease that can progress to cirrhosis and cancer of the liver. HBV is the cause of about 80% of the world's primary liver cancer, one of the three most common cancers in parts of Asia-Pacific and sub-Saharan Africa.

Blumberg's discovery of Australia antigen, a specific marker of hepatitis B virus infection, in the mid-1960s, was followed by intense research by his team and others. These efforts resulted in a blood test for HBV infection and a first generation vaccine by the end of that decade. The discovery also came at an opportune time when recombinant DNA technology and the science of molecular biology were in the early phases of their development. Subsequently, HBV became the first human pathogen whose genome was sequenced and against which a recombinant vaccine was prepared. Even after a quarter of a century, this remains the only recombinant vaccine for human use.

The HBV genome is a 3.2 kilobase circular partially double-stranded DNA. It contains four genes: S, C, P and X that code for the viral surface, capsid, polymerase and regulatory proteins, respectively. HBV is unique in many ways, its genome being an excellent model for conservation of sequence space. Despite being one of the smallest viral genomes, it contains two enhancers, three promoters and a coding capacity that is over 150% of the genome size. It can synthesize at least seven different proteins using tricks such as overlapping reading frames, multiple AUG codons and post-translational processing. The DNA genome replicates through a RNA intermediate, placing HBV somewhere between retroviruses and DNA viruses. This unique virology was recognized by classifying HBV as a Hepadnavirus (hepatotropic DNA virus), together with similar viruses that infect non-human primates and other animals such as woodchucks, ground squirrels and ducks. These animal viruses have been instrumental in understanding replication of the HBV genome and virus-mediated cancer of the liver.

HBV is a blood-borne pathogen and is transmitted mainly through blood transfusions, from a mother to her newborn during childbirth, by sexual intercourse and within households by close contact. An organism with only four genes would be considered too primitive to plan strategy. But consider the evolution of virus behaviour to ensure efficient transmission. In Blumberg's words, 'HBV has managed to insinuate itself into the main functions that allow humans to perpetuate themselves: childbirth, sexual union, and family interaction. It doesn't kill its host until the later decades of life when the possibilities of transmission are greatly decreased.'

Blumberg's fascinating story is presented in this book in a simple and insightful manner. It discusses the development of scientific temper and impresses upon its readers the process of scientific discovery. To quote Blumberg: 'Basic research is often Shandean... . Events ramble from one apparent irrelevancy to another, but a strange sense of order nevertheless emerges. Science proceeds from one uncertainty to another, serially validating each sufficiently that the next step can be undertaken'. The discovery of HBV is an example of this. Blumberg and his colleagues studied protein polymorphisms in human populations. They ended up discovering Australia antigen and HBV. Was this an accident or just plain

luck? It is a strange coincidence in science that luck always favours the prepared mind. The process of scientific discovery produces many answers but raises even more questions. Albert Einstein once noted that the larger a circle of light, the greater is the perimeter of darkness around it.

The account of Blumberg's life, his professional career and the story of HBV should also be read by policy makers and administrators who are responsible for formulating and implementing national education and research policies. Blumberg's early education was at a New York high school that has the distinction of producing three Nobel Laureates, including the legendary Richard Feynman. This was not a coincidence, but the result of a very high intellectual atmosphere at school. It is often asked why India, with a vast army of trained scientists and engineers, has not been able to produce a Nobel Laureate in its 50-plus years of independence? Do we inculcate scientific temper in our schools or simply carry out rote learning of science? Do we provide an intellectual atmosphere to our young people? Some of these questions do come to mind on reading about Blumberg's life.

On page 207, one paragraph is devoted to the period in 1986 Blumberg spent at the Indian Institute of Science as a Raman Professor. He offered sane advice to Prime Minister Rajiv Gandhi about hepatitis B vaccination, improvement of water supply and sanitation, and the manufacture of disposable needles and syringes. Our scorecard after 15 years is a mixed one. We seem to have finally found the resources and the political will to begin the process of including hepatitis B vaccination in the national programme of universal immunization. The country has, to a large extent, shifted to using disposable needles and syringes but their safe disposal and alleged recycling remain difficult issues. We have failed to improve sanitation and our drinking water supplies have deteriorated further in the face of greater urbanization and increasing population. On the whole, there seems to be little improvement on the public health front.

One glaring omission from Blumberg's interaction with India is his research on the plant *Phyllanthus amarus* and its use as a therapy for hepatitis B. Between 1988 and 1990, Blumberg published three research papers on this subject with colleagues from Chennai. Since Blumberg has a patent on this application (US Patent 4,673,575) and considering *Phyllanthus* extracts have been used in traditional Indian medicine for ages and continue to be used today, it is surprising not to find any mention of it in this autobiography.

Blumberg's research started out as an esoteric investigation of human diversity and resulted in a discovery whose applications contributed directly to preserving lives, preventing illness and saving millions on health-care costs. This is therefore a good example why basic research should be supported. Good basic research with an open (and prepared) mind is the way to good applications.

The book makes interesting reading and would be of interest to scientists of all hues, students aspiring to learn about the process of scientific investigation and anyone who is interested in the mysteries of viruses. It should be made compulsory reading for the many scientist-bureaucrats at granting agencies who often question the value of basic research and its relevance to the country's problems.

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A New Kind of Science. Stephen Wolfram. Wolfram Media, Champaign, IL 61820, USA. 1200 pp. 2002. Price: US$ 44.95.

Whatever else this book may or may not be, it represents a most unusual effort. Its British-born author has always been known to be brilliant, indeed a prodigy. He got his Ph D from Caltech when he was 20, was a MacArthur Fellow at 22, became well known for his early research, and went on to set up a company of his own to produce and market the very innovative and powerful software known as *Mathematica*. He has now written a book which, with 'the science it describes[,] has been a vast personal undertaking, spanning the better part of half my life so far'. He would never have been able to do it, he says, if he had remained part of the traditional academic community as he was at one time, 'even in the highly favourable academic circumstances in which I found myself'. In the event we have a work here of which Wolfram is author, publisher, patron, client and perhaps many other things as well, such as reviewer and editor – one man who has concentrated within and into himself all the functions that the vast scientific enterprise of the world has found necessary to distribute to different people and agencies. Wolfram can clearly afford to do this, and we are seeing here a new breed of professional that may be called the entrepreneur-scientist.

The book is 1200 pages long, not including a preface and an extensive index; of this length almost 30% is Notes at the end of the book. Although some of these end-notes are historical, the book in fact contains no specific references at all to any earlier work (you can anyway find them on the internet, says the author). And there are no equations either in the main text (a few appear in the end notes). (This absence of equations is, by the way ironic, for what the author's own *Mathematica* did was to provide a powerful tool for manipulating symbols, algebra and equations.) The book has in fact been written to communicate directly with the non-scientist reader as well as the scientist. It does this effectively because of the graphics, which (as might be expected from a software maestro) are both professional and beautiful, even without the aid of colour: the work is in many ways a computer-age book. It has already created big waves in the lay press (*New York Times*, *Time*, *Newsweek*, etc.).

The author's scientific ambition, and his self-confidence, are almost boundless; and the language he uses to announce his thoughts is appropriately decisive and sweeping. Thus, he has found 'a crack in the very foundations of existing science'; his work 'touches almost every existing area of science, and quite a bit besides' (this includes the social sciences, the question of free will, etc.), and uses 'new ideas and new methods that ultimately depend very little on what has gone before'; and he provides an opportunity for the reader to 'glimpse for the first time some new and basic truth'. The book starts with the statement, 'Three centuries ago science was transformed by the dramatic new idea that rules based on equations could be used to describe the natural world. My purpose in this book is to initiate another such transformation, and to introduce a new kind of science that is