Particle Modeling D Greenspan. Birkhäuser Verlag, Postbach 133, CH4010, Basel, Switzerland. 1997. 274 pp. Price: SFR 128.

The idea on which this book is based is, no doubt, appealing. Many physical phenomena are inherently time-dependent and have to do with matter, which is an aggregate of atoms or molecules. This being the case, why not model all such phenomena by representing matter by mass points, postulating appropriate inter-particulate forces and just computing out the evolution of the system of particles? In this manner, complex problems involving continuous fields with unknown boundaries can be solved by solving systems of 2nd order ordinary differential equations (ODEs) in time, rather than solving partial differential equations for continuous fields. In principle, this sounds very attractive.

Using particle modeling, Greenspan 'solves' a large number of problems from a variety of fields. There are problems from engineering: elastic snap through and crack development in plates. Fluid mechanical problems include colliding drops and turbulent vortices. From physics we have the calculation of melting points and special relativity. There is even a chapter on biological self-reorganization. So there is an impressive range of interesting material spanning many scientific fields, something for almost everybody.

This slender book is organized as follows. Part I consists of two chapters totalling 18 pages, the first of just 3 pages sets out the general philosophy of the book, while in the second, the numerical methodology used to solve the relevant systems of second order ODEs is clearly explained. Thus, if a body is *represented* by N particles, P_i, $i = 1, 2, 3 \ldots N$, with m_i being the mass of P_i, for any given initial data we need to solve the coupled system of ODEs

$$\vec{F}_i = \vec{F}_i^{**} + \vec{F}_i^{*} = m_i \ddot{\vec{r}}_i, \quad i = 1, 2, 3 \ldots N,$$

where $\vec{F}_i^{**}$ is the external force and $\vec{F}_i^{*}$ is the short range force due to intermolecular forces. The intermolecular force F between two particles distant r apart is usually modeled by

$$F = -\frac{G}{r^p} + \frac{H}{r^q},$$

where G, H, p and q are positive constants with $q > p$. And that is all the machinery that is used! Starting with some initial data and some suitably chosen values for the parameters, Greenspan models a variety of evolution problems by computing the above initial value problem for the N particles. These applications are covered in the 16 chapters that make up parts II and III. Finally the 5 appendices contain listings of the FORTRAN programs used to generate some of the fields discussed in the main body of the book.

The alert reader would by now have come to the conclusion that, surely, there has to be a catch somewhere. Can one simple methodology reasonably model such a wide variety of phenomena in a number of different fields? I believe the answer is, not really. Let me confine myself to some of the problems in fluid mechanics with which I am familiar. In chapter 7 the author considers the flow in a two-dimensional cavity generated by the motion of one of the side walls. One is immediately struck by the fact there is no mention of the Reynolds number, a parameter whose value crucially determines the nature of the flow in a cavity. Secondly, a filtering procedure is required to 'clarify the gross fluid motion'. Thirdly, although the primary eddy is qualitatively captured by this procedure, the corner eddies are not resolved. Greenspan claims that his results are in agreement with experimental results, but no fluid dynamicist would accept this because no Reynolds number is specified for a field which is very sensitive to this parameter and the results are at best qualitative. The next chapter on turbulent and non-turbulent vortices is, perhaps, even more misleading.

Let me summarize the major shortcomings of the method. In many situations it appears that the parameters have to be tuned to get the desired results, sometimes may be to even get any result at all. Moreover, the modeling may be incapable of fully specifying the real phenomenon. These are serious shortcomings when one is faced with a new situation, when one may not even have a clear idea as to what the result should be like. A good model should yield something that it at least qualitatively right. In my opinion, based on the results displayed in this book, particle modeling may yield results that may be misleading, if not completely wrong. This weakness is compounded in the book by Greenspan's uncritical assessment of the results presented and his failure to warn the readers of the pitfalls in the method.

The book is easy to read, especially because the chapters are so short. I would not recommend this book to a student because it is likely to be very misleading. I would, though, to the mature worker who has wide interests and wishes to learn about a conceptually simple and interesting method which leads to results in a range of fields. But even this reader should be warned that not all that one reads is likely to be true.

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Annual Review of Public Health 1997. J. E. Fielding, L. B. Lave, B. Starfield (eds). Annual Reviews Inc., 4139 El Camino Way, P.O. Box 10139, Palo Alto, California 94303-0139, USA. Volume 18, Price: Individuals, US $ 69; Institutions, US $ 138. 605 pp.

As a well-defined discipline public health took shape only in the nineteenth century, though its practice is perhaps older than organized medical care. Thus in one sense public health is a much younger profession than medicine. Scholars have acknowledged that the 'health transition' that occurred in most industrialized societies in the nineteenth and early twentieth centuries owes much to advances in public health. To the common man, the diagnostic and therapeutic triumphs of modern day technology represent the great contribution of science to healing. He does not realize that side by side, conceptual revolutions and methodological breakthroughs in public health research have had an equal if not greater impact on improvement of health status of mankind.

The last thirty years have seen a sea-change in public health research. This has come about because of two related

developments: (a) the ability to store, manipulate and transfer large volumes of data using electronic devices, and (b) the refinement of statistical techniques that allow for control of a large number of factors while looking for a specific cause-and-effect relationship. Both of these have meant that we can now have very large scale studies, both experimental and observational, where previously we had to be content with isolated, small sample investigations in settings which could not be generalized.

Public health practice now rests on multiple pillars: quantitative analytical techniques of epidemiology and statistics, biomedicine, social sciences like economics and sociology, and the behavioural sciences. There is a tendency to emphasize some approaches to the detriment of others, especially in health policy discussions relevant to developing countries. Currently, the hegemony of the World Bank in policy affairs has led to greater stress on the economic dimension of public health: cost containment and cost effective strategies. There is great concern among a large number of professionals in the discipline that this has come at the cost of ensuring entitlement to primary health care to all.

The concerns of public health in the Third World do not figure largely in the *Annual Review of Public Health 1997*. The book looks at the current controversies and developments in the field as applicable mostly to the United States, and, to a lesser extent, industrialized countries. Within this constraint, the editors have done an admirable job of presenting a broad overview of the field, highlighting the areas attracting most research attention, and focusing on points of view demanding serious consideration.

The prefatory chapter on 'Reinventing public health' by P. R. Lee and D. Paxman sets the tone for the book by covering extensively the present status of public health in the US, including such topics as public health agencies, their effectiveness, major challenges, emerging issues of lifestyle diseases, and the like. Particularly important is their identification of public health information systems as perhaps the most important innovation in technology capable of influencing future trends in health. Also discussed are the wealth and income disparities in the US as a cause of ill health, and the failure of the country to evolve a comprehensive health care system with entitlement to all citizens. The article rightly emphasizes that while public health has been a major contributor to the improvement of health of the American people, the public neither recognizes this nor gives adequate support to public health agencies.

'Searching for the biological pathways between stress and health' by S. Kelly, C. Hertzman and M. Daniels addresses an interesting issue: why is it that poor socio-economic status translates into poor health status? While many hypotheses have been floated – poor genetic stock, inferior quality of the environment including inadequate nutrition, and greater propensity to high risk behaviour among the poor, to name a few – this article probes a new link: the possibility that poor health outcomes among the poor could be mediated through greater stress. This is a plausible explanation; the poor do live under great duress materially as well as psychologically. But the important thing is to discover biological markers for greater levels of stress and link them to poor socio-economic status. Most affluent groups enjoy a better standard of health. This is true in most countries. This seems to be true within communities also, thus belying the simple explanation that the external environment alone can explain the poor health status of poor people. The biomedical pathways through which social environment influences longevity belong to the realms of psycho-neuro-immunology (PNI) and psycho-neuro-endocrinology (PNE). The biological markers for these mechanisms include glycosylated proteins, peripheral benzodiazepine receptors, the waist–hip ratio, and the functioning of the immune system and hemostatic mechanisms. It is easy to see how chronic stress can be behind certain markers such as glycosylated haemoglobin (indicative of diabetes control), and delayed clotting mechanisms. Waist–hip ratio is a measure of obesity, which in turn, is dependent upon the levels of circulating hormones in the blood. Measuring levels of such markers, however, only provide us with a snapshot of the process. To understand it in full, we need a video clipping.

While it is universally accepted that social position and access to economic resources could play a vital role in determining health status, measuring social class has always remained a problem. In the US, unlike many European countries, official statistics do not routinely report on social class, tending instead to categorize people according to 'race' and 'ethnicity'. 'Measuring social class in US public health research' by N. Krieger, D. R. Williams and N. E. Moss reviews the evidence linking social class and health status in the US, and probes some of the little known aspects of investigations into social class. Definitions of 'social class' and 'socio-economic status' are dissected out; existence of individual, household and community level variation in effects are focused on, and the interactions of various categories in definition are brought out.

In one of the few articles which may have some relevance for India, G. F. Brown and E. H. Moskowitz write on 'Moral and policy issues in long acting contraception'. Long acting contraceptives offer a choice between user controlled, but unreliable methods such as the pill and long term, but irreversible methods like sterilization. But the history of long acting contraceptives has been marred by the social and political abuses they have been allegedly put to. In the US, contraception has been tainted with the history of its association with the eugenics movement, which strove to eventually rid the US population of all 'inferior' stock by sterilizing them. In the developing world, activists have accused clinical trials of long-acting hormonal contraceptives with being associated with gross abuse of the human rights of the women involved. The article gives a comprehensive account of the issues involved, from the scientific point of view. The social and political issues, especially from a Third World perspective, have not been fully discussed. Issues of choice take on a new dimension in a population of women most of whom cannot understand the concepts of risk and complications.

The HIV epidemic has brought out in sharp focus the social factors behind vulnerability to disease. One recurring theme is the susceptibility of women. Women's risk of AIDS is often discussed as a purely biological issue: how because of greater exposure of the mucosa and likelihood of trauma during intercourse women have a higher risk of contracting the virus. The article by S. Zierler and N. Krieger, 'Reframing women's risk: social inequalities and HIV infection', on the other hand, uses social science frame-

works such as ecosocial theory, feminist perspective, political economy, and the human rights point of view. The article shows that all frameworks converge to the disadvantage of women: economic disadvantage, racial discrimination, and gender inequality compound each other and result in a greater risk of HIV infection among women of poor economic background, and black and hispanic women. The authors suggest pathways through which these frameworks interact. The message is that AIDS prevention strategies should not concentrate on individual interventions; rather, they should move towards approaches to build a more equitable society.

The United States has gone through successive stages of the epidemic of coronary heart disease. Public health measures such as building awareness about the importance of diet, the need for keeping in check serum cholesterol levels, daily exercise and abstinence from smoking have paid rich dividends in reducing the incidence of coronary events. 'Aspirin in the prevention and treatment of cardiovascular disease' by C. H. Hennekens discusses the role of aspirin in prevention of cardiovascular events such as acute myocardial infarction, reinfarction, and angina, the mechanism of action, its role in women, and the optimum dosage. Though there is scientific evidence for the role of aspirin in prevention of coronary events, its actual use seems to be restricted. Strong evidence of benefit in primary prevention has been demonstrated in trials as far back as ten years ago; however, there is also a concurrent, small increase in risk for haemorrhagic stroke. This has perhaps restricted its universal use. Primary prevention of coronary events through drug interventions is a new strategy which seems to be catching up. Unlike the statins which have been shown to be beneficial in lowering serum cholesterol levels and thus decreasing the risk for coronary disease, aspirin, though scientifically proven to be of use, is not aggressively promoted. Perhaps the reason might be that promoting aspirin use does not lead to the possibility of realizing enormous profits through its sale, since it is no longer a patented medicine. This could be reflective of the extra-scientific considerations in clinical decision making.

The *Annual Review of Public Health 1997* provides an insight into the topics of current importance in international, especially US, public health. All practising public health professionals and doctors, besides health policy makers, would benefit from the volume.

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Dynamics of Cell and Tissue Motion. W. Alt, A. Deutsch and G. Dunn (eds). Birkhaeuser Verlag, Basel. 1997. x + 336 pp, price not stated.

Not all that long ago, if you spoke to experimentalists about theoretical cell and developmental biology, you were left with the impression that in their opinion there was something dubious about the whole enterprise. When asked to explain what they meant they would say that theorists appeared to operate solely on the basis of unfounded assumptions regarding how living systems worked; indeed, to revel in their ignorance concerning basic facts, let alone details (not that the experimentalists knew all that many details themselves: one reason why it is only recently that phenomenology has started coming into theoretical biology). The grander and more ambitious a theory, the more out of touch it was with reality. There is a telling anecdote that symbolizes this attitude: apparently the distinguished molecular biologist S. Spiegelman once told a prospective post-doctoral fellow that the only good that might come out of modelling a cell as an oil drop was lots of oil. Needless to say, theorists, who had their own notions of what constituted worthwhile science, did not take kindly to such views. But they tended to combine disagreement with the unpleasant habit of talking down to experimenters. As a result, communication between the two groups remained poor. This worked mainly to the detriment of the theorists; after all, biology was and is primarily an experimenrtal science.

For anyone not convinced that a wide gap separated these two sub-cultures, a study of the output of the Rashevsky school would be instructive. Those who are unsure of what this means are directed to *Mathematical Biophysics* by N. Rashevsky – cited in the book under review, to my pleasant surprise. That work epitomizes a great deal that was good as well as many things that were bad about the school. With hindsight, it is clear that one cannot blame Rashevsky and his co-workers all that much; by the standards of today, ignorance concerning the biology of intercellular transport, or signalling, or cell movement, was enormous. Because of this, model-building at the level of tissues or embryos or whole organisms was in certain respects simple-minded; also, it was carried out largely on the basis of a mix of hope and faith. If anything, Rashevsky must be looked upon as a pioneer and ahead of his time.

Both in terms of its achievements and in terms of the way people look at it, what is the present-day status of the theoretical biology of shape and form? Has the field advanced significantly since the days of D'Arcy Thompson? With regard to one important criterion, that of bringing theory closer to factual knowledge, progress has been spotty. The bulk of the new information that we have concerning cells, what they are made of and how they behave comes from genetics and molecular biology; and only a tiny fraction of that information has been assimilated into theories or models. The mathematical analysis of biological oscillations is a prominent exception to this generalization in that it demonstrates an impressive interplay of contemporary ideas from biochemistry, genetics and cell and organismal biology. Apart from the field of oscillations, the modelling of cell movement and tissue patterning has attracted a fair amount of effort in recent years. *Dynamics of Cell and Tissue Motion* offers testimony to the vigour of the effort.

This book is the result of a Workshop organized in Bonn in March 1995 under the aegis of the German Research Council (DFG). During a final plenary discussion the participants identified, as suitable for bringing out in book form, presentations pertaining to a set of 'hot topics'. What has come out is the result of a series of prolonged exchanges between the editors, reviewers and authors. Each chapter is embellished with quotations, many of them in German. The latter are accompanied by an offer to supply English translations on request, not that that is