mous in the legal sense, administrative practices negate the principle. Sarabhai, all through, was a passionate believer in real autonomy for scientific establishments. The article 'Permissive leader' by Kirit Parikh contains a list of science-based developmental efforts that Sarabhai desired. It may be good to revisit the 27 items when the worlds 'thrust areas' or 'missions' have today become fashionable. The list provides a glimpse of the foresight of Vikram Sarabhai. Ramnathan's article is a superb summary of Sarabhai's contribution for the space programme. Similarly, Ramanna's article describes his contributions to the atomic energy programme.

The section 'educationist' comprising six articles mentions Sarabhai's contributions to the many facets of the educational system. The article. 'The satellite and TV in national development' by B. S. Rao *et al.* provides Sarabhai's vision for the use of satellite for TV, only partly realized through the *present-day INSAT system.*

Appendices while useful do not appear complete. For example under the major institution-building efforts of Vikram Sarabhai the name Indian National Committee for Space Research (INCOSPAR), the real cradle of the Indian Space Programme, nor ISRO to which it was converted are mentioned. There is also a mix-up between institutions and projects.

Notwithstanding these limitations the book is a valuable contribution to stimulate further work.

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State of India's Health. A. Mukhopadhyay, ed. Voluntary Health Association of India, Tong Swasthya Bhawan, 40 Institutional Area, South of IIT, New Delhi 110 016, 414 pages, hundreds of illustrations. Price: Rs 300 plus packing and air postage Rs 343 (US $26); books ordered from TALC, P. O. Box 49, Saint Albans, England, with payment in sterling £15 will be dispatched from India.

India, that vast country of hundreds of millions of people, extremes of wealth, climate and health, is surveyed. Any attempt to survey health must begin with the extreme optimism of the health officials in the capital and be tempered with the realism of health workers in the clinics in the slums and the villages. Yet VHAI has done the seemingly impossible: it has produced a readable, non-technical, beautifully illustrated book, crammed with interesting accounts of all aspects of health. The photographs, drawings and cartoons vividly illustrate not just the problems, but also the hope and joy which charm visitors even in the midst of poverty and pain. In each chapter, boxes large and small detail vignettes of the problems and remedies, and lighten the facts with personal experiences and explanations.

There are more than one hundred medical schools in India, some with very high standards and good students. However, for most of them, medicine is the gateway to a good standard of living, not necessarily a dedication to improving health. Very few wish to work in the rural areas. Doctors who work in the public sector may neglect their patients and clinics to see paying patients at home or at their private clinics in the towns. I visited a public hospital early in the morning; it was deserted. I found the doctor busy with a crowded private clinic in his quarters in the hospital grounds. The government targets for immunization filter down to the health workers. As in other countries, paper targets are fulfilled, but no-one knows what is really happening in villages and slums and official statistics are suspect. However, in the last three years, great progress has been made in immunizing children and the reported cases of polio paralysis have fallen dramatically.

Although India has good doctors, many leave to work in the US and the UK. Those who remain and work for the people are overwhelmed, research becomes almost impossible. One result is that common diseases are likely to be seen through Western text books rather than local observation. Thus, poliomyelitis is represented on p. 382 by an adolescent struck by paralysis, although the shortening of the limbs would only occur after paralysis in a young child. In India, the median age of paralysis has been about 12 months, truly infantile paralysis rather than the poliomyelitis which struck adolescents and adults in the West.

Women's health is neglected in India. Sex ratios range from 1032 females to 1000 males in Kerala, to only 870 in Haryana (p 268); Kerala has the highest female literacy and women are 'regarded with respect and dignity'. However, groups of women like the wonderful Working Women's Forum of Madras have shown what great progress can be made in economic status, education and health.

As if there were not enough health hazards provided by Nature, Man continues to add his own. In Pondicherry I saw an unpublished thesis recording farmers who use their domestic water containers in which to dilute the concentrated pesticides, mixing it with their bare arms. This book vividly discusses the problems of pollution, effluents and hazards at work; the clouds of poisonous smoke belching from huge factories are dimly reflected in the stinking pools of effluent from village industries. Westerners are shocked by the level of cigarette smoking.

There are more then 7000 voluntary groups or Non-Governmental Organizations (NGOs) in India. They represent the very best of Indian philosophy and are increasingly being used by the Government to deliver primary health care, rehabilitation and leprosy treatment. Some are supported by gifts from abroad. The NGOs I have seen bring committment and skills, replacing the apparent cynicism of the bureaucratic government services. VHAI itself publishes *Health for the Million* and many booklets and information on all aspects of health. I found that few health workers had heard of Teaching Aids at Low Cost (TALC) books, slide sets and materials. In particular, the TALC weighing scale and integrated growth chart form a simple low cost way of monitoring child growth, which I never saw in India although all kinds of less satisfactory and more expensive apparatus were used.

The book begins with nutrition, health systems, the environment, indigenous and alternative health systems then passes to the underprivileged, family welfare, health education and information, women, medical and nursing education, research, finance, legal and ethical issues, disability and mental health. There is no index and this is a minor handicap. There are references at the end of several chapters, but these will not be very helpful to the reader. Many are from Indian newspapers and others have incomplete addresses of

publishers and other sources, no explanation of initials of societies etc; these are worldwide failings. I am sure that VHAI would help workers who wanted to follow such articles. The book is beautifully produced and pleasingly free of errors, although I am puzzled by a figure on p. 271 from a UNICEF publication with no explanation. This book deserves the widest circulation not only in India, but also among health workers and well wishers everywhere.

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Annual Review of Immunology 1993. W. E. Paul, C. G. Fathman and H. Metzger, eds. Annual Reviews Inc., Palo Alto, California 94303-087, USA. 843 + viii pp. Price: USA $45, elsewhere $50.

The structure, function and genetic regulation of diverse cell surface receptors which are responsible for the fledgling interactions of various cells and molecules of the immune system constitute an area of intense research these days. No wonder this volume incorporates five reviews devoted to this subject. There are three reviews each on HLA/MHC and T lymphocytes, two each on B lymphocytes and interleukins, and one each on regulation of lymphocyte function by protein phosphorylation, defensins, immunity to intracellular bacteria, immunological memory, autoantibodies, antigen processing and presentation, dominance and crypticity of T cell antigenic determinants, molecular basis of allorecognition, gene therapy of immune system and development of malaria vaccine.

It has been known for sometime that interaction of antigenic peptide – MHC complex with T cell receptor (TCR) alone is insufficient to trigger an optimal immune response and some costimulatory signals are mandatory. It is in this context that Linsley and Ledbetter discuss the interaction of CD28, a T cell molecule, with B7 molecule present on the antigen presenting cells (APC). The antigen-specific interaction between T cells and APC triggers the expression of interleukin-2 and its homologous receptor (IL-2R). Minami *et al.* give molecular structure of IL-2R describing, in detail, various functional domains of IL-2Rβ, the subunit which plays the most critical role in interleukin-2 signal transduction. The linking of IL-2Rβ with intracellular signaling pathways that mediate induction of nuclear proto-oncogenes has also been discussed. Leiden while reviewing regulation of TCR gene expression by T-cell specific transcriptional factors emphasizes the need to study several yet unidentified factors, evidences for the existence of which are nevertheless there, to fully understand the underlying molecular mechanisms. The review by Yokoyama and Seaman on structure and genetics (NK gene complex) of lectin-like receptors present on the surface of natural killer (NK) cells will be of interest to many immunologists. Discussion on the possible mechanisms by which these receptors, namely rat NKR-P_1 and mouse Ly-49, mediate stimulatory/inhibitory functions of NK cells though still postulatory represents a substantial leap in our understanding of the functioning of NK cells.

Although not entirely under the ambit of classical receptor-ligand interactions of the cells of immune system, endothelial-leukocyte adhesion has recently emerged as an area of no less importance. Bevilacqua presents a detailed account of selectin (E,P,L)-carbohydrate and ICAM-integrin interactions. The possibility of LFA-3 and MHC molecules contributing to such interactions has been probed. The roles of endothelial-leukocyte adhesion molecules in acute inflammatory processes and tumor cell metastasis have been dealt with briefly.

In an extremely interesting and entertaining prefatory chapter titled 'HLA and I', van Rood of University Hospital, Leiden gives a vivid account of the development of the field of HLA and brings out complementary roles the clinic and the laboratory played in making major breakthroughs in this area. An intellectually satisfying review on molecular descent of *Mhc* by Jan Klein *et al.* will be of much interest to evolutionary biologists especially molecular population geneticists. The remarkable reasoning by which the authors refute the commonly held views of the evolution of *Mhc* makes a fascinating reading. Remmensee *et al.* describe in detail the nature of the peptides and the mechanism by which these are presented by MHC Class I molecules. Its significance for immunity as well as for self-tolerance has been discussed.

Further insights into the development and functioning of T cells have recently been obtained. Fitch *et al.* discuss several regulatory influences that differently affect murine T lymphocyte subsets especially T_H1 and T_H2. T cell-dependent B-cell activation has been described by Parker with particular emphasis on contact dependent help provided by T cells to B cells. This has been discussed in view of the identification of a ligand which is strictly restricted in expression to CD_4^+ T cells and binds to CD40, a B-cell differentiation antigen. Wenar Haas *et al.* discuss specificity of γ/δ T cells and cite several observations which support the possibility of their role in host defence against infectious diseases, graft rejection and immunodeficiency disorders. The author suggests that studies on the interaction of γ/δ T cells with different APC (which utilize different antigen-presenting molecules and reside in different tissues) hold the key to unravelling the mystery of γ/δ T cells.

B lymphocytes, hitherto considered relatively simpler, have sprung some major surprises in recent years. Kantor and Herzenberg present substantial evidence to show that B-Ia, B-Ib and conventional B cell subsets appear sequentially during development and arise from separate progenitors thus representing separate lineages. This means the 'single progenitor' hypothesis is no more held sacrosanct. Harriman *et al.* discuss various models that have been proposed to explain molecular mechanisms underlying immunoglobulin class switch. Class switching without DNA recombination and effected by alternative splicing of long nuclear RNA/trans-splicing has been discussed briefly.

Of late an increasing number of investigators are getting involved in unravelling the physiology of lymphocyte responses and in this regard protein phosphorylation seems to be in the eye of the storm. The detailed review (340 refs) by Perlmutter *et al.* on this subject is an inventory of protein kinases and phosphatases for which evidence