

## BOOK REVIEWS

**History of rockets and astronautics** Vol. 7, Parts I and II edited by R. Cargill Hall. American Astronautical Society, 1986, pp. 250 + 502, \$ 80. Orders to Univelt, Inc., P.O. Box 28130, San Diego, CA 92128.

This volume is the first of two parts comprising the proceedings of four history symposia organised by the International Academy of Astronautics during 1969-72, now being reprinted and published by the American Astronautical Society (1986). The first volume in this series was reviewed earlier in this journal.

It is useful to think of the history of rocketry as falling into three distinct periods (although nobody here makes any attempt at such analysis). In the first, rockets slowly spread from China (where they were used in the 13th century) through the Arabs to Europe. They fell into disuse after a few centuries (guns could kill better), but returned to Europe in the 19th century *via* India in the second period. In the later half of the 19th century rockets once again lost favour with the armies of the world (artillery could kill better), but have reappeared (as we know) in the 20th century.

Except for one paper on a Romanian *vade-mecum* on rocket technology published in the 16th century, half of this volume is concerned with the second period and the other half with the beginning of the third. The flowering of rocket technology in Europe during the 19th century was the result of Congreve's work in Britain (though there are no papers in this volume about British developments at all). Frank Winter notes how British victory in the Battle of Leipzig in 1813, when their rocket corps frightened two French brigades into surrender with a few volleys, led to an arms race in which almost every European nation began to raise its own rocket corps. It appears that Austria went much farther than anybody else in this race, and accounts of the Austrian effort are among the most interesting in this volume. The Austrians first tried very hard to purchase the technology from Britain and Denmark: even the direct intervention of the celebrated Prince Metternich, and the secret expedition of his engineer Augustine to Denmark, could not deliver the technology. Eventually Augustine set up his own rocket establishment in Wiener-Neustadt, and helped the Austrian rocket corps become an effective imperial tool for suppressing colonial insurrection in Italy and among the Austrian Alps. Rocket technology was considered so secret that entry to Wiener-Neustadt needed the permission of the Emperor himself. An English officer who managed to sneak past in 1835 reported amazement at the performance of Austrian rockets.

Two decades later military technology had changed again and the same Italians (with French help) showed in 1859 that they were no longer afraid of rockets, and the Austrian establishment was quickly wound up. Nevertheless it is probably this historical

experience of the old Austro-Hungarian Empire that explains why so many 20th century pioneers (Oberth, Sanger and Von Karman, to mention only a few) came from Central Europe.

There are many other interesting studies in this volume, but I would like to mention a fascinating article on nonmilitary applications by Mitchell Sharpe. This points out how, although the rocket was developed as a weapon of destruction, it has probably saved more lives than it has taken: between 1871 and 1962, 15,000 escaped otherwise-certain death from ship-wreck in Britain alone. (Rockets hauled rope between ship and shore.) Among a variety of other curious peaceful applications of rockets was their use for some time to carry mail: a regular service was set up by a Dr. Steven Smith, a dentist in Sikkim, who also transported a rooster and a hen in 1937 across the River Damodar by rocket! We can all agree with the author of that 16th century Romanian treatise when he said, "... but my advice is for more peace, and not war".

It is well-known that what I have called the second period derived its inspiration from the India of Hyder and Tipu, as the first did from Mongol China. It is therefore a great disappointment that neither this volume nor its predecessor pays any attention to the Eastern roots of rocket technology. Prof. Needham has recently described Chinese contributions in monumental detail, but Indians and Arabs still await their historian.

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**Elliptic functions and rings of integers** by Ph. Cassou-Nogue's and M. J. Taylor (Progress in mathematics, Series editors J. Coates and S. Helgason). Birkhauser Verlag, CH-4010, Basel, Switzerland, 1986, pp. 220, SFr. 220. Indian orders to Springer Book (India) Private Ltd. 6 Community Centre, Panchsheel Park, New Delhi 110 017.

The following theorems will serve as a good introduction to the book.

Let  $p$  be a prime  $\geq 5$  and  $\zeta = \exp [(2\pi i)/p]$ . It was proved by E. E. Kummer that the  $(p-3)/2$  units

$$u_s = \frac{\zeta^s - 1}{\zeta - 1} \quad s = 2, 3, \dots, \frac{p-1}{2}$$

are multiplicatively independent. However the following result is not true in general. Let  $f > 1$  be a natural number with  $\phi(f) > 2$  ( $\phi$  being the Euler's totient function) and let  $\zeta = \text{Exp} [(2\pi i)/f]$ . Then the  $\frac{1}{2}\phi(f)$  units

$$u_s = \frac{\zeta^s - 1}{\zeta - 1} \quad (1 < s < \frac{1}{2}f, (s, f) = 1)$$

are multiplicatively dependent. This was pointed out by the reviewer<sup>1</sup> who gave the correct generalisation to composite  $f$ . It is as follows.

Let  $f = \prod_{i=1}^k p_i^{a_i}$  be the prime factor decomposition of  $f$  and let

$$v_s = \prod_{e_i} \left[ \frac{1 - \zeta^{sp_1^{e_1} \dots p_k^{e_k}}}{1 - \zeta^{p_1^{e_1} \dots p_k^{e_k}}} \right]$$

where the product is extended over all  $e_i = 0$  or  $1$  ( $i = 1$  to  $k$ ) except  $e_1 = e_2 = \dots = e_k = 1$ . Then the  $\frac{1}{2}\phi(f) - 1$  units  $v_s$  are multiplicatively independent. From this it is a simple matter to get explicitly a maximal set of units of any abelian extension of the rational number field which generate a subgroup of finite index in the group of all units of the abelian extension. These results depend on the result  $L(1, \chi) \neq 0$  which follows from the result of Kummer that the zeta function of a cyclotomic field has a simple pole at  $s = 1$ .

Similar results were obtained (first for the abelian extension of any imaginary quadratic field) by the reviewer<sup>2</sup> (see this reference for the earlier history of this problem). The function values that were used in the solution of this problem are the values of the functions (see p. 119 of reference 2).

$$\Delta_g(2) = q^\lambda \prod_{h=-\infty}^{\infty} (1 - q^\mu)^{12g}$$

where  $q = e^{2\pi z}$  ( $\text{Im } z > 0$ ),  $\lambda = g - 6 + 6/g$ ,  $\mu = |n + (1/g)|$ ,  $g = 2, 3, \dots$ , for  $z$  taking values in the imaginary quadratic field (for further details see reference 1). The reviewer also gives explicit generators for the corresponding abelian extensions (see for example theorem 10 on p. 132 of reference 2).

The authors start with the theorem of L. Kronecker and H. Weber that every abelian extension of the rationals is a subfield of a suitable cyclotomic field. The fields that correspond to cyclotomic fields in the general theory of class fields of algebraic number fields are ray class fields and the class field theory tells us that every abelian extension of an algebraic number field is the subfield of a suitable ray class field. The authors develop the theory of class fields. However, the explicit theorems stated in the beginning are known only for the abelian extensions of the rationals and also of imaginary quadratic fields. The authors give a proof of the theorems of G. Robert which are very closely related to the theorems of the reviewer stated in the beginning of this review. For this purpose the authors develop the theory of the Weierstrass elliptic function and the arithmetical side of the elliptic modular function and the Weber-Fricke functions. They also discuss (as in H. Hasse's papers cited in the book and the work of M. Deuring cited in the book) the generations of ray class fields. In addition they discuss elliptic curves with complex multiplication. There are some algebraic results such as the explicit description of certain rings both as algebras and as Galois modules. On the whole the treatment is based on principles of complex function theory rather than algebraic geometry. The book can be read by those who have a sophisticated course in algebraic

number theory. It will be useful to those interested in algebraic number theory, especially in the structure of Galois modules.

### References

1. RAMACHANDRA, K. On the units of cyclotomic units, *Acta Arithmetica*, 1966, 12, 165–173.
2. RAMACHANDRA, K. Some applications of Kronecker's limit formulas, *Ann. Math.*, 1964, 80, 104–148.

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**Seminar on stochastic process, 1984** edited by E. Cinlar, K. L. Chung, and R. K. Gettoor. Birkhauser Verlag, P. O. Box 133, CH-4010, Basel, Switzerland, 1986, pp. 258, SFr. 68. Indian orders to Springer Book (India) Private Ltd., 6, Community Centre, Panchsheel Park, New Delhi 110 017.

This book consists of 12 papers presented during a three-day seminar on stochastic processes held at Northwestern University, Evanston. The articles deal with various aspects of Markov processes, potential theory, and stochastic calculus.

Bruce W. Atkinson in the first paper (Two-sided time-homogeneous Markov processes) discusses sufficient conditions under which it is possible to construct a Markov process indexed by  $\mathbb{R}$  with random times of birth and death and which is time-homogeneous in both directions.

Martin T. Barlow, Edwin A. Perkins and S. James Taylor (The behaviour and construction of local times for Levy processes) discuss the properties of the map  $(x, t, \omega) \rightarrow l_t^x(\omega)$ , whenever the local time  $l_t^x$  (of a Levy process  $X_t$ ) exists. In addition to surveying known conditions for the existence of jointly continuous local times, and known properties of  $l_t^x$  when a continuous version does not exist, the authors also include some new results and pose a few unsolved problems. The problem of constructing the local time as the limit of a sequence of functionals of the path of the process is also discussed.

In the next paper K. L. Chung gives a probabilistic approach to the solution of the inhomogeneous Schrödinger equation  $(\frac{1}{2}\Delta + q)u = \phi$  with vanishing boundary conditions. This approach *via* the potentials (described in terms of the standard Brownian motion) requires only mild assumptions. In the fourth paper K. L. Chung and Pei Hsu, (Gauge theorem for the Neumann problem) define the gauge function for the Neumann problem (for the Schrödinger equation) using the boundary local time of the standard reflecting Brownian motion on a bounded domain  $D$ ; they show that the gauge function is continuous on  $\bar{D}$ , if it is not identically infinite.

Joseph Glover in the fifth paper (Quasi-stationary distributions, eigenmeasures, and eigenfunctions of Markov processes), gives conditions for the existence of eigenmeasures (also called quasi-stationary distributions) and eigenfunctions for Ray resolvents on a

Lusinian state space; he gives a concrete procedure for obtaining an eigen-function under certain conditions. He also extends some energy results of Chung and Rao.

In the following paper titled "Mean exit times of Markov processes", Joseph Glover and Ming Liao show that a Hunt process is determined by its mean exit times; they also demonstrate that such is not the case with mean last exit times.

The seventh paper by Frank B. Knight is titled "On strict-sense forms of the Hida-Cramer representation". To quote the author, the paper "delineates more clearly than before the role of the standard Brownian motion and Poisson processes in generating general stochastic processes", using prediction processes.

In "A time reversal study of exit/entrance processes" Joanna B. Mitro shows that the entrance process and a 'modified' exit process of a Hunt process are related by a time reversal.

In "On the continuity of the local time of stable processes" by Edwin Perkins, the exact modulus of continuity of  $L^x$ . (uniformly in  $x$ ) is found, where  $L^x$  is the jointly continuous local time of a strictly stable process of index  $\alpha > 1$ . The methods are also extended to Levy processes.

In the tenth paper "Convergence in energy and the sector condition for Markov processes", Z. R. Pop-Stojanovic explains the meaning of the sector condition (introduced by M. L. Silverstein) in relation to convergence in energy for certain classes of Markov processes.

In the subsequent paper Thomas S. Salisbury considers the problem of whether every continuous strong Markov process of bounded variation is deterministic. This is a problem posed by Orey and Çinlar and Jacod; and the latter have already established an affirmative result in the one-dimensional case. In this paper, Salisbury shows that the result is false in dimensions bigger than one by exhibiting a nondecreasing, non-deterministic, continuous, non-time-homogeneous diffusion process.

The last paper titled "Large deviations in ergodic theory" by Steven Orey is also the longest paper of the volume. The objective of the paper is to obtain a large deviation result for dynamical systems; such a result would be a refinement of the ergodic theorem just as Cramer's theorem is a refinement of the law of large numbers. And the large deviation result involves finding a "deviation function" for a canonical random variable on the dynamical system. The author establishes the existence of deviation functions for dynamical systems given by certain discrete parameter stationary stochastic processes, and for their 'homomorphic images'.

To sum up, probabilists, especially those working in the area of probabilistic potential theory, will find the book a good collection of interesting articles.

**The art of Prolog: Advanced programming techniques** by Leon Sterling and Ehud Shapiro. The MIT Press, 28 Carleton Street, Cambridge, Mass. 02142, 1986, pp 470, \$ 29.95. Indian orders to Affiliated East-West Press Pvt. Ltd., 104, Nirmal Tower, 26, Barakhamba Road, New Delhi 110 001.

*The art of Prolog* by Leon Sterling and Ehud Shapiro is an outstanding book containing a masterly and lucid treatment of logic programming and Prolog. It deals more with the programming aspects of Prolog than its deep theoretical foundations; of course, an excellent self-contained treatment of the basic of logic programming is provided in the book. The most striking aspects are the breadth of topics covered and the lucidity of the explanations. A large number of non-trivial examples have been provided. In the reviewer's opinion, it not only describes the "art of Prolog" but also the art of writing a good book on logic programming and Prolog intended for people interested in getting a good practical knowledge of these subjects.

The book consists of four parts: logic programming, the Prolog language, advanced techniques, and applications. The first part contains five chapters devoted to basics of logic programming. All the important ideas are illustrated with plenty of examples to drive home the point. The second part introduces Prolog in eight chapters. The entire language is discussed with the help of excellent programming examples. The main part of the book, part three, contains advanced prolog programming techniques that have evolved in the Prolog programming community. Each technique is illustrated with small yet powerful example programs. The final part consists of four chapters that show how to build application programs. Fairly large applications are covered.

On the whole, it is one of the finest books written on logic programming and Prolog and it is highly recommended to everybody interested in this subject. No background, apart from some programming knowledge, is really required to understand the contents of the book. It is going to be useful to students, programmers and researchers in India also because of the increasing interest in artificial intelligence in this country.

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**Plant genetic engineering** edited by John H. Dodds. Cambridge University Press, The Edinburgh Building, Shaftesbury Road, Cambridge, CB2 2RU, UK, 1985, pp. 312, £ 25.

In this volume the authors have presented the basic concepts of tissue culture, biochemistry of storage proteins of seeds and recombinant DNA technology including the transfer of genes into plant cells. Attempts were made to bring forth the importance

and significance of changing the genetic elements in plants by altering the existing genes or introducing new ones to improve the quality of the seed. The reviews are addressed to the general scientific community and not to specialists in plant genetic engineering.

Large number of plantlets free from viruses could be generated from a single source in a short period for propagation by the plant tissue culture techniques. Gene transfer with isolated DNA, organelle uptake and subprotoplast fusion are some of the direct approaches to the selective transfer of genetic information into plant cells. The details of tissue culture techniques which may not have much relevance to the genetic engineering, except that the protoplast serves as a recipient for foreign DNA, are spread out into three chapters.

The vectors such as Ti plasmid and double-stranded plant DNA viruses in introducing foreign DNA into plant cells are covered in two chapters. The Ti plasmid present in the *Agrobacterium tumefaciens* integrates into the chromosome of the host and pass from generation to generation. The coli-flower mosaic virus with 35 S promoter has been tailored into a powerful expression vector. This does not integrate into the host genome and hence could be used for vegetative propagation of plants. However, these vectors are limited to dicot species with some exceptions, may cause disease and do not have enzyme system for proof-reading. Other methods of introduction of foreign DNA into plant cells such as microinjection, electroporation and use of micro-projectiles are not covered. Perhaps the microprojectile delivery of nucleic acids into plant cells, may replace all the other methods.

The importance of altering the Ribulose biphosphate carboxylase (Ribisco) enzyme to increase the efficiency of carboxylation reaction in crop plants has been highlighted. The genes for the large and small subunits of the enzyme have been cloned and sequenced. The alteration of the gene for the large subunit, which could suppress or decrease the oxygenase function of the Ribisco and the delivery of it into chloroplast are yet to be worked out.

In developing countries, most of the protein is derived from the stored proteins in seeds of cereals and legumes, while in developed countries, it is from animals reared on cereals and legumes. Hence, improvement of the quality and quantity of seed protein is of paramount importance in developing countries. About half the volume is devoted for the genetic engineering of storage proteins of the seed. The biochemistry of the storage proteins in maize, barley, wheat, soybean, French bean and pea are discussed. It is not complete without the storage proteins of rice seed which is the staple food of more than half of mankind. The major storage protein gene of rice has been cloned and sequenced. Generally cereal proteins are deficient in lysine and tryptophan, while legume proteins are short of sulphur-containing amino acids. Genetic engineering technology which could be exploited to create herbicide resistance, increase the amino acid content, alter Ribisco for better carbon dioxide fixation, improve nitrogen fixation and assimilation of nitrate, are touched without going in depth. The conclusions and future prospects do not highlight the important aspects of plant genetic engineering. The potential of altering or introducing new genes into crop plants in a directed manner opens new avenues for plant

breeders. Basic defect is the lack of knowledge of fundamentals of plant physiology, biochemistry and molecular biology.

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**Genetic variation and its maintenance** edited by D. F. Roberts and G. F. De Stefano. Cambridge University Press, The Edinburgh Building, Shaftesbury Road, Cambridge, CB2 2RU, UK, 1986, pp. xi+286, £ 22.50.

Genetic variability is so fundamental for the improvement of any genetic system — be it plant, animal or human that many a scientific investigation will demand *a priori* as complete information on it as possible. Comprehension and study of the nature and magnitude of genetic variation are relatively simpler in plant systems followed by animal and human systems in that order. While the variation can be studied in respect of a number of quantitative characters in plants and animals, such a possibility is rather restricted in humans. In turn this would also imply that measurements can be made with relative ease in the first two systems while elaborate and complex methods are needed to study variation in humans. The more sophisticated and precise the methodology is, the more precise can be the analysis of genetic variation.

Equally important is the need to maintain genetic variability. Mechanisms by which polymorphic variation is maintained in humans are multifarious and highly dependent on the nature and genetics of the trait measured. Published literature on them is scattered and conscientious efforts are needed to collate them for an effective comprehension.

Selected papers presented at the meeting sponsored by the International Union of Biological Sciences in 1985 constituting the volume, *Genetic variation and its maintenance* fulfil the above goals, bridge the gaps and update our knowledge on genetic variation in humans to a great extent.

The book opens with a modern account of human polymorphisms tracing the developments from the 17th century to date; this is immediately followed by a good exposition of the latest methods to identify various genotypes like isoelectric focusing, a relatively new electrophoresis technique in the study of genetic diversity. Important areas like HLA variation, chromosome polymorphisms, restriction fragment length polymorphisms and human mitochondrial DNA diversity are explored in some detail in the successive papers. Analysis of some of these polymorphisms has been presented with real data on mitochondrial DNA variation from human populations in New Guinea and Israel.

In the second part, the mechanisms of maintenance of genetic diversity are explored exhaustively using a wide range of examples such as human genetic diversity in the Pacific, malaria-protective polymorphisms in Southern Africa, and genetic factors leading to the variability in the expression of the Hb S gene. Evolution and maintenance



of genetic variation in black Carib populations in Central America are dealt in good detail. Two very informative papers discuss the migration pattern and consequent genetic polymorphisms in Congo peoples, and the human population structure from a theoretical population genetics angle. Interesting case studies like recessive disorders due to inbreeding in India, polymorphisms of red-green vision among populations of the tropics, physiological adaptation leading to maintenance of genetic diversity in tropical Bangladesh populations provide a broad exposition of the various mechanisms of maintenance of genetic variation.

The book thus contains a valuable repository of current information on detection and maintenance of genetic variation in humans. A number of new experimental techniques to detect the sources of variation are presented. The choice of papers has been purposeful and renders ample justice to understanding a tough, modern and vital area like human genetic variation. Researchers, no doubt, and students offering advanced courses on experimental and theoretical population genetics would benefit to a large extent by the wealth of information offered in this book.

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Darwin's metaphor: Nature's place in Victorian culture by Robert M. Young. Cambridge University Press. The Edinburgh Building, Shaftesbury Road, Cambridge, CB2 2RU, UK. 1985. pp. xvii+341, £ 9.95.

The intellectual debate of the late 19th century Britain did not, oddly, concern itself with Science. It was God, Nature and Man that monopolized discussion. Not only scientists, almost everyone was drawn into it; nothing else seems to have mattered. One man was responsible for this, and one book he wrote: Charles Darwin: and *On the origin of species by natural selection*. Other men followed as did other works; but it was Darwin and his *Origin* that not only transformed Victorian culture but also polarized British lives as nothing before or since has done.

Darwin's theory of evolution as presented in his book is now so well known that it does not seem necessary or appropriate to claim space in this brief review. However, in recent years, several publications have appeared questioning the unequivocal acceptance of natural selection as the sole, or even the major, agency in evolution. That Darwin's ideas prevailed over a period of century with almost no challenge or with only feeble attempts of hesitancy and uncertainty, is most puzzling. That with the late seventies, the flood of doubt and dissent has attained irresistible dimensions is just as interesting. Scientists, philosophers and others too have joined together to express their astonishing dismay at the acceptance of, and unquestioned reliance on, such an inadequate, and unsatisfactory mechanism as natural selection. As recently as in 1959, at the Centennial of the publication of *Origin* in London and Chicago, vigorous and forceful support was provided to Darwin's theory.

Then suddenly, it seems, the ground underneath collapsed and natural selection fell. It was not as if at any time during its history, natural selection had exhibited an inner strength and credibility on which it could stand and sustain itself. Ever since Darwin thought of it and proclaimed it as the mechanism of evolutionary change, natural selection has presented one problem or another. Darwin's contemporaries perceived its weakness. A. R. Wallace, Darwin's co-author, suggested that Darwin rethink on natural selection's role. Indeed, Darwin himself admitted to its inadequacy and in the latter part of his life was forced to admit that it was no more than a Metaphor. However, Darwin was reluctant to abandon his "metaphor" under the belief that continual usage had made it acceptable.

Robert Young takes a close look at Darwin's metaphor, as a social scientist and historian of science. And his evaluation is scathing. Darwin's analogy between artificial and natural selection has been from the beginning defective and unsustainable. *Nature just does not select.*

It is in the context of the social conditions of Victorian Britain that the impact of Darwin's work is to be viewed. "Man's place in Nature" assumed an urgency and compulsive interest in cultural debate as nothing else did before. Indeed, overshadowing all that Charles Darwin said or failed to say, his singular contribution was to place man squarely in Nature. In the closing decades of the 20th century, when Darwin's concepts of the mechanisms of evolution are being assailed, it is interesting that nearly everyone acknowledges Darwinism as the greatest factor in the advocacy of Man's place in Nature.

Robert Young's role in this series of essays is to direct attention to the history of ideas of 19th century Britain in the context of Darwin's thoughts. Young's formidable competence as well as his impressive research and analysis has helped understand, for the first time in recent years, the usefulness, indeed the indispensability of viewing science as a social phenomenon. No biologist or historian has, as Young has done, so astutely lifted the concepts of Darwin and set them so neatly in the context of the society and culture of 19th century Britain.

Young's credentials are impressive: student of philosophy, of science, of medicine and of history and philosophy of science. Clearly, written over a period of time, the six essays in the book present the Problem of Darwin.

Young's last and final message is of special interest. His passionate plea for a re-appraisal of science in relation to human values is of intimate relevance today. The powers of man and those of his science have multiplied several-fold, in the latter half of the 20th century. So have his responsibilities. Without a competent appreciation of the relationship between the two, at once informing and compassionate, the missions of both science and philosophy will result in failure.

**Progress in drug research** edited by Ernst Jucker. Birkhauser Verlag, P.O. Box 133, CH-4010, Basel, Switzerland, 1984, pp. 346, SFr. 158. Indian orders to Springer Book (India) Private Ltd., 6 Community Centre, Panchsheel Park, New Delhi 110 017.

*Progress in Drug Research*, Vol. 28, keeps up the objective of the series to provide comprehensive information in important areas of drug research and leads for new research. The current volume deals with eight areas in as many articles written by experts in the area. I agree with Dr. E. Jucker who states in the foreword that authors have tried and succeeded to summarise current status of particular fields of drug research and have provided leads for future research activity.

Important topics discussed in the book are 'Biogenic amines and drug research' by G. B. West; 'Pharmacology and toxicology of axoplasmic transport' by F. Samson and J. A. Donoso; 'The Pharmacology of immune system' by J. Drews; 'Antiviral agents' by D. L. Swallow; 'Recent developments in 8-aminoquinoline antimalarials' by B. K. Bhat, M. Seth and A. P. Bhadhuri; 'Immunology in drug research' by W. J. Wechter and B. E. Loughman; and 'The role of adipose tissue in the distribution and storage of drugs' by M. H. Bickel.

G. B. West in his article 'Biogenic amines and drug research' has discussed the current status of catechol amine, histamine and 5-hydroxy tryptamine research. The review covers the research efforts of Dr. West from 1947 to present day and represents the history of research and development in the area of the biological role of biogenic amines. Important data are presented in tabular and comprehensive form. For example, the amount of catechol amines in adrenal glands of various adult animals starting from dogfish to man can be found in this review. Similarly research in histamine and 5-hydroxy tryptamine has been comprehensively treated. One of the interesting aspects of histamine research has been the discovery of its elevation in mast cell tumors. The content of histamine and heparin provides a diagnostic indicator for detection of primary and metastatic mast cell tumors. This information is useful for cancer researchers who are trying to identify and use various neoplastic markers for diagnosis of cancer. The physiological action of biogenic amines dealt in this review are in anaphalactoid reactions, experimental shock and inflammation and arthritis.

'Pharmacology and toxicology of axoplasmic transport' by Fred Samson and Alejandro Donoso essentially presents various aspects of intracellular transport or the movement of intracellular cytoplasmic constituents which in turn governs the flow of nutrients in the cell which is a vital physiological process. The axoplasmic transport deals with intracellular movement of materials in neurons. This review attempts to highlight research which has illuminated the axoplasmic transport process or has indication that axoplasmic transport is the target of particular pharmacological tissue action. The substances which affect the cytoskeleton, energy flow, membrane properties and ion fluxes and induce neuropathy are discussed.

'The pharmacology of the immune system, clinical and experimental perspectives' by Jurgen Drews deals with the emerging area of immunopharmacology. This is an important area in drug research and in understanding the regulation of immune

response. The authors point out that pharmacological manipulation of the immune system is a prerequisite in the following situations – the acceptance of transplanted allogenic organs, treatment of autoimmune disorders, prevention of malignancy or effective therapy of malignancies, and the therapy of infections in immunocompromised patients. To this may be added the therapy of the disease, acquired immune deficiency syndrome (AIDS). The authors provide a list of substances of immunopharmacological importance, substances of microbial origin, mammalian cells and synthetic compounds. This review is not an exhaustive one, and does not attempt to delineate the activity and pros and cons of the use of the various substances listed. However, it is useful as it provides useful references to other works in the area where one can look for more detailed information.

Another article which deals with a similar topic is "Immunology in drug research" by William Wechter and Barbara E. Loughman. The authors deal with immunoregulatory properties of several specific substances namely cytokines, immunoglobulins, azathioprine, cyclophosphamide, prostaglandins, cyclosporin A, thiocarbamate, levanisole, niridazole and pencillamine. All these reagents are of topical interest as immunoregulatory molecules of clinical importance. Much useful information can be found about these reagents and their action in this review.

There are three topics which deal with drugs used for treatment of specific diseases. These are "Drug treatment of asthma" by A. F. Wilson, "Antiviral agents" by D. L. Swallow, "Recent developments in 8-aminoquinoline antimalarials" by B. K. Bhat, M. Seth and A. P. Bhadhuri. The review on asthma is very well-written and covers areas from causes and physiological effects of asthma to treatment of the disease by specific reagents. The drugs used for treatment of asthma are essentially bronchodilators. The author carefully points out that the route of administration is extremely important for therapeutic efficacy of the drug. This article is very useful for the physician as well as the patient who wishes to understand the treatment he is receiving.

D. L. Swallow in his review presents the advances made in antiviral research in last few years. The wide range of antiviral agents covered are alicyclic compounds, heterocyclic compounds, nucleoside analogues, amidines and guanidines, benzene derivatives, aliphatic and inorganic compounds, amino acids and peptides and natural products. The author clearly states that in spite of the advancements made, the major viral diseases like herpes simplex and zoster, influenza, common cold, hepatitis and cytomegalovirus remain unconquered. To these diseases one may add AIDS and virally induced cancers. Thus the present article provides a wealth of information for researchers who wish to carry the war against viral diseases farther.

Bhat, Seth and Bhadhuri from Central Drug Research Institute, Lucknow, India review the recent developments in 8-aminoquinoline antimalarial agents. The authors in a lucid chart have described the problems of interest concerning 8-aminoquinoline antimalarials. These include clinical problems, pharmacokinetics, metabolism, structure-activity relationship, pharmacology and biochemistry of 8-aminoquinolines, toxicology and development of less toxic reagents, and the role of liver. Since malaria has made a resurgence in various parts of the world, specially in India and Africa, this review is timely.

The last article by Bickel deals with the role of adipose tissue in the distribution and storage of drugs. In general, this volume presents the state-of-the art/information in the areas mentioned and should find a place in every medical library.

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**Science, computers and people** by Stanislaw Ulam. Birkhauser Verlag, P.O. Box 133, CH-4010, Basel, Switzerland, 1986, pp. 264, SFr. 78. Indian orders to Springer Book (India) Private Ltd., 6, Community Centre, Panchsheel Park, New Delhi 110 017.

This volume of essays is a pleasant excursion into the penetrating mind of Stan Ulam. This reprint collection of some twenty-and-odd informal (and less technical) selected writings during 1946 – 82 deals with men, machine and matters arising 'from the tree of mathematics'. Several topics are considered dealing with computers in mathematics, mathematics and physics 'in each other', 'mathematisability' of biology, patterns of growth, early efforts at playing chess with a computer and biographical sketches of Von Neumann, Banach and Smoluchowski – all these and more, offering a freshening Ulamian bouquet!

Though with small (yet remarkable) beginnings, the flow of mathematics has meandered through vast areas of thought and abstraction-transcending the early ancestry of numbers and figures. In contrast to 'the *method* in mathematics', the *objects* (and their *idealizations*) have proliferated, leaving one 'curiouser and curiouser'. Even more so, are the case of applicability and an air of indispensability of these in the apparently strange territories of physical and life sciences or technology and computers. This sense of wonder and marvel at the mathematical structures being amazingly equipped to play this (almost proselytising) role, forms the backdrop in Ulam's writings.

Stanislaw Ulam's ability 'to see through' and touch the inner core of a problem is proverbial. 'The inexorable laws of elegant reasoning . . . . became his allies as he drew out the essentials of a new idea, a gem of the mind that he would casually toss off at the world, always at the right time, when ready to be pursued and developed by others' – as Gian-Carlo Rota puts it.

The role Ulam sees for mathematics is universal and not merely supportive and passive. 'Mathematics not only applies itself, as it is and as it develops, to other sciences, but perhaps has a direct biological role for the human race. Mathematics, and perhaps other sciences like physics, have the mission to prepare or improve the human brain, be it the brain of an individual or the collective brain of mankind, for developments yet to come. Just as animals play when they are young in preparation for situations arising later in their lives, it may be that mathematics to a large extent is a collection of games' (p. 153). It is not as if Ulam is narrow or partial in his appreciation; he is well aware that

'activities, other than science, like art, give a different set of uniformalised impressions or impulses; or morality and ethics in religion give one, on a different level and in a different way, descriptions of the universe which include the collection of human activities' (p. 36).

Ulam was involved in Los Alamos (thermonuclear) and the Orion project and there are two interesting essays describing technological and scientific aspects connected with these. It is especially interesting to note in this context, what he has to say on morality in scientific work. In his own words, 'one of the duties of a scientist is to inform those concerned and perhaps the whole public of the possible consequences of their discoveries. Another duty is to teach others and make available all our findings. The immoral thing is to conceal or make false statements . . . one should certainly allow free expression of all true facts' (p. 36).

This is a book that satisfies. The best way to express an opinion on this is to merely repeat what Ulam himself says about Von Neumann's book '*The computer and the brain*': 'the book, like everything (he) wrote, remains highly original and intensely stimulating . . . .'

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**From folk psychology to cognitive science – The case against belief** by Stephen P. Stich. The MIT Press, Cambridge, Massachusetts, 1983, pp. xiv + 266, \$ 25 . 88.

Stich's *From folk psychology to cognitive science* is a study in philosophy of mind and language. An effort has been made to build an epistemological case against belief on the basis of 'S believes P'. In this book, Stich takes the stand of a reluctant scepticism.

The folk psychology or common-sense psychology is expressed in such terms as 'believe', 'remember', 'feel', 'think', 'prefer', 'imagine', 'fear', etc., which are in use for a long time. The use of these terms is governed by a loose network of largely tacit principles, platitudes and paradigms which constitute a folk psychology. William James's (1910) *Principles of psychology* is an example of folk psychology. The concepts of folk psychology were replaced by new terms as stimuli, response, conditioning and reinforcement with the emergence of behaviourism and experimental learning theory in the early twentieth century. But, all this changed with the emergence of cognitive psychology in mid-twentieth century to account for complex, intelligent or innovative behaviour in terms of the concept of folk psychology.

The book under review is divided into two parts. In part one Stich takes an analytical look at the working of folk psychological notion of beliefs, the historical perspective of belief system and what we are saying of a person when we ascribe a belief to him. In part two, a case is made against invoking folk psychological notions of belief in cognitive

science. The proposition made by some philosophers that cognitive science and folk psychology are well matched is examined. The central thesis of the study is that the concept of belief ought not to play any significant role in a science aimed at explaining human cognition and behaviour.

Stich is not in agreement with philosophers who explain belief in terms of 'functionalist account of mental state' and beliefs as mental sentences. The reason is that the narrow casual version of mental sentence is not able to explain folk psychological notion of belief. Another explanation offered, is in terms of the theory of mental sentence. Stich holds the view that beliefs are univocal.

In part two, Stich deals with cognitive science which includes the contemporary work on memory, language-processing, reasoning, problem solving, decision-making and higher perceptual processing. He observes that cognitive theories fit or ought to fit certain model or paradigm. For this, three theories of mind are described: (i) Strong Representational Theory of Mind (Strong RTM); (ii) Syntactic Theory of Mind (STM) and (iii) Weak Representational Theory of Mind (weak RTM). Out of these three, Stich advocates that theories in cognitive science should be guided by STM. The STM assumes that cognitive theories treat mental states as relations to purely syntactic mental sentence tokens; and (ii) they detail the interactions among the mental states in terms of formal or syntactic properties of those tokens.

Regarding the question whether the folk psychological notion of belief is likely to find a comfortable place in cognitive science, two theories of mind, *viz.*, Strong RTM and Weak RTM, answer in the affirmative, whereas STM replies in the negative. To prove his point, Stich reviews some studies from experimental social psychology on dissonance and self-attribution. On the basis of these experiments Stich observes—"My thesis is not that the presuppositions of folk psychology have been shown to be false. My claim is only that the jury is still out. Much important work is being done in a framework compatible with the folk psychological picture of the structure of the mind. However, as Wilson's model illustrates, there is also much serious work which does not compost comfortably with that folk psychological picture" (p. 237). Finally Stich answers the above raised question—"The best strategy for cognitive science is the one advocated by the Syntactic Theory of the Mind, and by the time folk concepts have been modified *that* drastically, there can be little question that they no longer merit their ancestral titles" (p. 219). Probably, philosophers, as Balasubramanian<sup>1</sup> pointed out, are interested in developing a presuppositionless language that is characterised by establishing a topic neutral, commitment-free meta language for philosophical discourse (p. 166). It is a far distant aim and till such time folk psychological notions are bound to stay.

This book has implications for theory formation in cognitive psychology. The theories based on STM can do justice to all the generalisations capturable by quantifying over content sentences while avoiding the limitations that sequence folk language of content impose. Such a sequence can aspire to be broadly applicable to developmental, clinical and comparative theories all of which are problematic of the content-based theories because of the constraints of ideological similarity. The theories in folk psychology are broad based and make wider generalisations. Two guiding principles for theory

formation in cognitive science are: (i) narrow causal taxonomy, insensitive to those reference fixing relations that extend beyond the cognitive stimuli and the behaviour of the subject; and (ii) postulating formal operations of mental states – it ought not to postulate processes which apply to mental states by virtue of their semantic properties. In this context the views of B. B. Wolman and Joseph R. Royace are of some relevance. Wolman<sup>2</sup> in concerning psychology and philosophy of science observed that theory formation is an exercise in formal science involving formal logic, semantics and syntax. An analysis of psychological propositions, formulation of hypothesis and other procedures must be geared to the specificity of psychological data. Royace (1973) in Present situation in theoretical psychology, observed that overall optimal results occur when there is high empiricism (*i.e.*, sticking close to the facts) or relevant high formalism (*i.e.*, high powered analytical models such as appropriate mathematics) as in the case of test theory, or learning theory or both, as in the case of Thurstone or Spence, and when the theorist confines himself to a relatively limited domain rather than attempting to all of behaviour (*i.e.*, conditioning rather than behaviourism, vision rather than all sense, etc.).

So in agreement with Stich, Wolman and Royace have emphasized syntax and working in a narrow domain, which afterwards can be extended to broader areas.

The philosophers have a role to play in psychology, as Wolman (1973) noted that the nature of psychological observation is another problem that must be solved by philosophers of science versed in psychology or by psychologists versed in the philosophy of science. There is an undeniable impact of observers on observed subjects in ethological research. In this study Stich has made a case against belief. For a different point of view that is presuppositional philosophy the reader will find P. Balasubramanian's *The concept of presupposition: A study* of some interest.

This book is a philosophical treatise which can be read by students and teachers of philosophy and psychology. The author has been successful to bring home his views on readers to a great extent. The reviewer hopes that this book will generate some heat and discussion on this problem and will help in some way in improving the theory formation in psychology. Stephen P. Stich deserves compliments for his commendable work.

## References

1. BALASUBRAMANIAN, P. *The concept of presupposition: A study*, Radhakrishnan Institute for Advanced Study in Philosophy, University of Madras, Madras, 1984.
2. WOLMAN, BENJAMIN B. (Ed). *Handbook of general psychology*, Englewood Cliffs, Prentice Hall Inc., New Jersey, 1973, pp 8–48.



**Scientific and technical information sources** by Ching-Chih Chen. The MIT Press, 28, Carleton Street, Cambridge, Massachusetts 02142, USA, 1977, pp. 519, \$50. Indian orders to Affiliated East-West Press Pvt. Ltd., 104, Nirmal Tower, 26, Barakhamba Road, New Delhi 110 001.

In the light of the dwindling resources and increasing user needs, today's library and information service managers need more help than ever in making informed and effective decisions about planning and budgeting of building resource collection. This book aims to provide the hard pressed science and technical librarians with a balanced selection of science and technology information resources. One advantage of having a book devoted to information sources in science and technology, as opposed to a chapter in a more general book on general information, is its much more comprehensive coverage of the subject.

The objective of this book is to serve as a reference guide for science and engineering librarians and as a text-book for library school students engaged in the study of structure and properties and output of scientific literature. It is also the hope of the author that this work will prove useful as a handy reference manual for scientists, science students and other users of science library resources.

The directory is split into 23 subject areas and lists 3650 sources each with a brief description of the subject followed by major sources of information, mainly books and journals, but, where appropriate, glossaries, bibliographies, conference proceedings, dictionaries and a surprising variety of information-how-to-do-it manuals, field guides and secondary services are also given. The chapters are: (1) Selection tools; (2) Guides to the literature; (3) Bibliographies; (4) Encyclopaedias; (5) Dictionaries; (6) Handbooks; (7) Tables, almanacs, databooks, etc.; (8) Source books, lab manuals and workbooks and How-to-do-it manuals; (9) Guides and field guides; (10) Atlases and maps; (11) Directories/Yearbooks/Biographical sources; (12) History; (13) Series and other reviews of progress; (14) Treatises and monographs; (15) Abstracts, indexes and current awareness services; (16) Periodicals; (17) Technical reports and government documents; (18) Conference proceedings, translations, etc.; (19) Patents and standards; (20) Trade literature (21) Nonprint materials; (22) Professional societies and their publications; and (23) Data bases.

Most of the material included was published between 1970 and the end of 1976. In terms of subject coverage, no clinical literature is included here because, as the compiler mentioned in the preface, a separate volume covering health sciences was being prepared. Although some foreign titles are included, the book has a heavy American emphasis. Few titles published prior to 1980 have been included. While some of the works, included, have suspended publication, they have been retained perhaps as types of sources of information, for most of them are still of current value. All the entries are succinctly annotated with critical evaluations as well as descriptions. The style is terse and direct with clear transition through related topics. The ordering and clustering of subject matter helps the reader to develop perspective on complex and overlapping technologies.

The arrangement of entries seems to be firstly by broad subject groups and then almost classified order within each group. It appears to be, as it were, following the Dewey Decimal classification pattern.

All entries have been arranged by title rather than by the more conventional main-entry approach. This treatment is justified as follows: Firstly, many sources are generally known by their titles and many secondary sources change editorship frequently; Secondly, this arrangement makes the elimination of a title index possible; Thirdly, most users including librarians who are not very familiar with scientific and technical information sources, cannot usually remember authors' precise names; and lastly, scientists and technologists whose key sources, such as *Science*, *Nature*, *Physics Today*, etc., list reviewed books by title, are probably more comfortable with such an approach.

*Aids to users:* (1) Explanation of abbreviations used has been given; Abbreviations to review sources have been used only when necessary and are shown in parentheses, e.g. American Institute of Chemical Engineers Journal, (AIChE J), Science Journal (SJ) etc., (2) Name of author/editor/etc. in an entry is provided for easy subject approach and there is a complete author index, including personal as well as corporate names.

*Special features:* (1) The special features of this book are its critical and descriptive annotations and the provision of review sources of entries included. Review sources when available are provided at the end of the annotations introduced by the letter 'R'. The order of the review information is, science journal sources first, then non-science journal sources, and finally book sources, all by alphabetical order. A list of these sources are included. (2) In addition to the usual guides to literature, encyclopaedias, handbooks, etc., such of the information that is not generally found in these kind of references is collected here: for example, on-line data bases and listing of professional organizations and their publications, etc. (3) Also distinctive is the substantial coverage of primary sources which are usually more important to scientists than secondary sources; (4) Another feature is a subject classified reference list which helps the user with key source of materials and which will be of interest to both science librarians and library users. An author index to this reference source is also provided.

The volume first appeared in 1977 and the second printing which is now the reviewers' copy, has been brought out in 1979. We expect a new edition to be brought out soon.

The treatment of the subject is highly scholarly and professional. The librarians will find this book invaluable and scientists/technologists, for whom it is primarily intended, a good source material. It should be considered as an essential addition to the reference collections of both, and indeed of any one concerned with science and technology information and its availability.

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