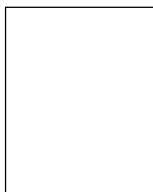


The Trail of Genetic Detectives

Vani Brahmachari



Mapping our Genes; the Human Genome Project & the Future of Medicine

by Lois Wingerson. Price \$ 12.95

In 1986–87 a major worldwide project in biology was conceived namely the human genome project which is often compared with the Manhattan project in terms of its magnitude and financial investment. This raised a lot of debate on its utility and need. But taking a stock after 10 years one begins to realise the impact of the project not only in terms of the information on genome and genetic disorders that is acquired in a worldwide effort but equally significant are the techniques and technology that were developed as a means to achieve the goals of the project. The book *Mapping our Genes; the Human Genome Project and the Future of Medicine* by Lois Wingerson is a lucid narration of the story of human genome project. As the title suggests, the book highlights the efforts at gene mapping rather than genome sequencing. The two differ in that mapping is like finding an address for a house while sequencing is like identifying every brick that makes up the house. One of the premises that is explicit throughout the narration is that the first step in curing a disease is to know what the disease is and to

find out the cause of the disease. This requires enormous time and effort to understand aspects related to the disease which sometimes may be very remotely related to the cure; almost beyond the comprehension of a non-scientist. But Wingerson makes it comprehensible by an optimum mix of scientific details and the personal stories of families afflicted with a certain genetic disorder. Each of the chapters discusses one genetic disorder, and the progress being made in mapping, the approaches taken and then is left at a point that was current for the time of publication (1990). But the writing is not in the order I have just listed but is built impressively around an individual, his/her family and their interaction with geneticists and clinicians. This engaging style brings it close to a novel in style that would appeal to a large readership. For instance Betty LeBlanc's son Darren is suffering from Freidreich's ataxia, slowly Betty realises that three of her six children have the disease. While the name does not mean much to the family it gives an assurance to Darren that it is not that he is clumsy by choice but he has a reason for it. What is remarkably presented is Betty's efforts at tracing her own and her husband's genealogy triggered by a question asked by almost every clinician whom she consults, are you and your husband related? It was an inevitable query as Freidreich's ataxia is a recessive disorder; for a child to be affected both of his/her parents should carry a copy of the defective gene (see Know your Chromosomes, *Resonance*, Vol. 1, March 1996). This whole story of Betty's kindred, strikes as a robust



example of what education can mean to a society. The detailed account of the efforts of clinicians and scientists starting from sample collection to analysis makes it difficult not to admire their tenacity and perseverance however self-centred the punchline could be for the investigating scientist. As the author mentions in the preface to the book the information was gathered not only from books but by personal interviews and from conferences and meetings that the author attended. This authentic information has been deftly combined with a novelist's narrative style thus making it almost gripping like a detective story.

It is said that many a time the scientists forget the men, women and children behind the cells, the DNA and protein that they handle. There are occasions that lack sensitivity in an over enthusiasm to prove one's contentions specially in research related to human subjects. This aspect has been well illustrated in the book, in the discussion on Tourette's syndrome, a condition where the patient has involuntary tics and twitches. A mistaken association of this condition with socially unfavourable traits such as alcoholism, drug-addiction and aggressiveness had been concluded based on disputed methods of study. While debating the validity of these results one group of scientists point to lack of sensitivity of scientists in attaching a label of psychosis and antisocial traits to individuals already suffering from a genetic tragedy.

The existence of a slightly different but equally unacceptable attitude is brought out

in the discussion of the role of Amish community in genetic research. As the author points out, a sociologist's approach of winning the confidence of the people helped the geneticists at large to collect some information that would have been impossible for someone who went with a clipboard knocking at the door and ticking a questionnaire. It is through the efforts of this sociologist turned geneticist that the famous geneticist Victor McKusick became aware of the Amish community; as also the creation of immortalised cell lines derived from large pedigrees. The author projects the unjust claims and possessiveness of scientists over the cell lines while the people from whose blood samples these cell lines were derived had no claim on them. The return of benefits to people who donate blood samples that are so vital to genetic research is an aspect that is most critical from the point of view of society but is taken for granted most often.

The book presents a comprehensive view while projecting the impact of the new approaches in genetics to address the etiology of diseases that are known for many years and are reasonably well managed. There is an informative discussion on cancer and the concept of predisposition to cancer that is within the realms of genetics. The author has not left out the details of methodologies utilised in the effort to map human genome, which at times may go beyond the comprehension of the uninitiated reader. At the same time there is no loss of continuity if one skips these sections. It is indeed creditable



that the author has discussed the problem of 'phase' and 'lod' scores. One of the issues that is widely debated is the question of predictive medicine. Is it necessary to know at the age of twenty that at the age of 60 one would suffer from Huntington's disease, is it worth ruining a perfect present by worrying about a tragic future? By narrating a story that ends happily the author dismisses a lot of negativeness about predictive medicine. But there is an objective description of the counsellors and clinicians on this issue, that leaves a positive note.

The book could have had a few more illustrations. The author has also provided a list of books and research papers that an

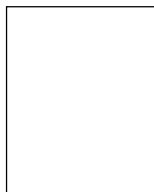
interested reader can consult.

I recommend the book not only to everyone who has curiosity about the Human genome project, but also to anyone who is sceptical about the project. I believe it helps even people from families afflicted with a genetic tragedy. Through the personal stories of several families the book succeeds in replacing the feeling of personal failure of patients and their families with an assurance that these are genetic accidents for which they are not responsible.

Vani Brahmachari, Dr B R Ambedkar Center for Biomedical Research, University of Delhi, Delhi 110 007, India.

Organic Chemistry: The Name Game – Modern Coined Terms and their Origins

Uday Maitra



Organic Chemistry: The Name Game – Modern Coined Terms and their Origins
Alex Nickon and EF Silversmith,
Pergamon Press, New York, 1987.

It is perhaps time to disclose an important classified information. Many of the questions in the Chemistry quizzes conducted by me as well as by my colleagues during the last decade have been taken from a book named *Chemistry -- The Name Game*. The book is not just a

catalogue of names of chemicals or a collection of trivia. It is full of highly racy accounts of molecules and reactions. There is a great deal of useful, interesting and exciting chemical information packed in this rather easy to read book. The book has twenty chapters, but the main theme is about the origin of names associated with molecules and reactions. And what kind of names? You name it, the book has it! Thus, there are examples like felicene, pterodactyladiene, crown and lariat ethers, propellanes, rotaxanes, molecular tweezers, calixarene, basketene, kekulene, bullvalene, betweenanenes, pagodanes, cryptates, cryptophanes, Srilankine, sydnones, NIH shift, fredericamycin A, bolaamphiphiles, just to name a few, and, of course, Buckminsterfullerene. For most examples, the authors have provided not only interesting anecdotes

behind the naming process, but have also provided appropriate references. Here are a few examples of unusual natural product names: megaphone comes from the roots of a plant *Aniba megaphylla* mez., complicatic acid comes from *Stereum complicatum*, and betaine ($\text{Me}_3\text{N}^+\text{CH}_2\text{COO}^-$) comes from sugar beets, *Beta vulgaris*.

Apart from the origin of names, there are other kinds of useful information which you will probably not find anywhere else! Did you know that there is a chemistry paper with 49 authors? Or for that matter did you know that Thiruvengatanathapuram Ramanathapuram Balasubramanian is the longest name in a chemistry paper? Or that the longest run of chemistry papers on a *single theme* has been on 'Synthesis of heterocyclic compounds and natural products', by the Japanese chemist T Kametani (publication no. 1000 came out in the *Journal of Organic Chemistry* in 1983)? One can find many such examples in the book – the bactericidal properties of *Penicillium glaucum* was noticed in 1896 by a French medical student, many years before it was reported by Alexander Fleming. A classical organic reaction which is commonly taught in the first year undergraduate chemistry course is the Hunsdicker reaction. But how many of us actually know that this reaction was originally discovered by Borodin, and

subsequently refined by the Hunsdickers (husband and wife team)? Nickon and Silversmith also tell us about the involvement of **two** Karl Ludwig Reimers in the discovery of the famous Reimer–Tiemann reaction.

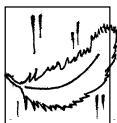
At the end of chapter eleven you will find information like (these may not be true today): the compound with most elements (10), the longest CA index name (1578 characters), the longest single-ring parent (288 carbons), the largest ring system (61 rings), the longest aliphatic chain (384 carbons), and so on.

Finally, there are a number of add-ons at the end of the book in the form of appendices, of which the most useful ones are on brief etymology of some traditional chemical names (over 300 entries), origin of element names, and Nobel Prizes in science from 1901 to 1986.

A final word on this book which we often ignore while teaching: a lot of chemistry is described with good humor. In fact, the authors make a statement in this book which may be somewhat relevant here: *“actually, chemists do have a good sense of humor but lose it when they serve as referees”*.

I recommend the book to everyone.

Uday Maitra, Department of Organic Chemistry, The Indian Institute of Science, Bangalore 560 012, India.



Rumford took the subject of heat as his special study and dealt with it in all its aspects. He even applied himself to the design of kitchen fires and to the best use of fuel in cooking and heating rooms. Indeed, the fireplaces used in England today owe much to his original suggestions.

Stories from Science, Vol.4, A Sutcliffe and A P D Sutcliffe



Intuitive Topology

Parameswaran Sankaran



Intuitive Topology
V V Prasolov
Universities Press (India) Ltd.
1998, Price: Rs.85

Topology is usually taught in India in the second year of a master's degree programme. Much of the time is spent on developing such basic notions as connectedness, compactness, product topology, and the course ends with Tychonov's theorem or Urysohn's lemma. At best, the student learns a bit about the fundamental group and covering spaces. But the teacher is well aware that point-set topology is but one aspect of the subject and that some of the major branches of topology such as homology and homotopy theory, differential topology, low dimensional topology, etc., are left completely untouched. On the other hand, popular science articles on topology usually describe some select problems in topology such as the Jordan curve theorem, the Brouwer fixed point theorem, the Königsberg bridge problem, the four colour theorem and so on. But no serious attempt has been made, (to my knowledge), to impart a flavour of the subject to undergraduate students that conveys some idea of what topology really is beyond, set topology. V V Prasolov, in his book under review, has made a bold attempt at this, and what is more, his book is accessible even to students at

senior secondary school level. Indeed, as the author says in the preface, the book grew out of his lectures at a high school in Moscow.

The book appeals to the reader's intuitive understanding of such concepts as deformations, continuity, isotopy, etc. There are plenty of examples and problems to help one's understanding of the various concepts dealt with. The book is beautifully illustrated with over 150 figures and these are indispensable for one's understanding of the subject, given the informal way the material is presented. Often the solution to a problem is given pictorially!

The book has nine chapters in all, on knots, links and surfaces. Chapters 1–4 cover deformations, knots and links, spanning surface of knots and links, knot diagrams and their colourings. In these chapters one learns many interesting facts about knots and links. The author's selection of examples makes the subject very fascinating. For example the author's discussion on Borromean rings and tips for mountaineers as a possible application should make interesting reading.

Chapter 5 deals with homeomorphisms of surfaces. From chapter 6 onwards the material and the presentation becomes fairly sophisticated and more demanding on the reader. By now theorems begin to appear at regular intervals and proofs, though at times diagram dependent, become more and more rigorous. Chapter 6 introduces the notion of a vector field on the plane. Here he proves the Brouwer fixed point theorem for the two dimensional



disk and the Fundamental Theorem of Algebra. The author deals with vector fields on surfaces in chapter 7. Here it is shown that the sum of the indices at singularities of a vector field (with only isolated singularities) on the two-sphere equals 2. He also proves a similar theorem for a genus g surface, i.e., the surface obtained by attaching g handles to a two dimensional sphere. As an application, the author obtains the famous formula due to Euler, namely, $V - E + F = 2$, where V, E, F denote the number of vertices, edges, and faces respectively of a convex polyhedron in three-space. Chapter 8 is on fixed point free and periodic homeomorphisms where one learns how to construct fixed point free maps and homeomorphisms with specified periods on certain surfaces. The last chapter, chapter 9, is mostly a collection of problems on surfaces (with solutions).

This book should be in every college library. It will definitely be inspiring for very talented high school students. But I would expect that

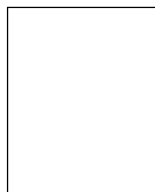
most students at the high school level, will find it tough going beyond chapter 4 or 5. Some of the problems are hard. Although solutions are given, one might still be unconvinced and this may disturb the young reader. But complete and rigorous proofs at this stage are simply not possible. Remember, this is only a book on 'Intuitive topology'. Indeed the main purpose of such books is to arouse the curiosity of the reader for the subject; it is not intended to be a substitute for the conventional type of course, which develops the subject in a systematic and rigorous manner.

In conclusion, this book is highly recommended for talented high school students and for undergraduate students. The more mature graduate student will also benefit from reading this book as she will not have seen much of the material in her standard topology course.

Parameswaran Sankaran, Chennai Mathematical Institute, 92 G N Chetty Road, Chennai 600 017, India.

Watching the Weather

J Srinivasan



Watching the Weather
John and Mary Gibbin
Universities Press, 1998, Rs.120.

This book is based on regular contributions by the authors to the 'Weatherwatch' column

of the British newspaper *Guardian*. The book contains a large number of short pieces on various facets of weather and climate. The authors are renowned for their ability to convey complex ideas in science in a simple and readable manner. This book is a pleasure to read and contains interesting nuggets of information. It is both entertaining and informative. It can be read by anyone with an interest in weather and climate.

The introductory chapter provides a good

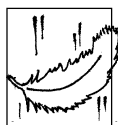
overview of the topic of weather and climate. The remaining nine chapters cover various topics such as greenhouse effect, climate extremes, myths and legends, human impact on climate and impact of weather on people. These nine chapters contain ten to fifteen short essays on a single theme.

The first chapter explores the nature of weather in various planets such as Mars and Jupiter and also the influence of sun and moon on our weather. The second chapter is concerned with past climate. The authors reveal an intriguing fact that the amount of dust in the atmosphere was about 200 times larger during the last ice age 15,000 years ago. In chapters three and four, there are interesting anecdotes about scientists who study weather. The authors show how Louis Agassiz, who initially did not believe in the existence of ice ages, became a great evangelist for convincing other scientists that ice ages existed in the past. There is an interesting piece on Lewis Fry Richardson who dreamed about predicting weather using numerical techniques long before the advent of computers. In another piece the authors point out that the practice of drawing lines of constant pressure on weather charts (called iso-bars) was invented by Francis Galton, a cousin of

the famous biologist Charles Darwin. The practice of keeping accurate records of weather and forecasting weather is traced to Vice-Admiral Robert FitzRoy. FitzRoy was the captain of the ship HMS Beagle in which Charles Darwin was a passenger. Based on the observations on this voyage, Charles Darwin wrote his famous book 'The Origin of Species'. Chapter 5 explores the extremes of weather and climate. The authors indicate that the largest hailstones ever reported were as large as a melon and weighed almost one kilogram! In Chapter 6, interesting myths and legends such as the use of leeches for predicting weather are mentioned. In Chapter 7, various issues related to global warming are discussed. The impact of human beings on climate is explored in Chapter 8. The last chapter contains miscellaneous anecdotes related to weather including the British obsession with rain, use of tree rings to predict past climate and dinosaurs.

On a rainy afternoon, you will enjoy curling up in bed and reading the interesting information about the weather contained in this book.

J Srinivasan, Centre for Atmospheric & Oceanic Sciences, Indian Institute of Science, Bangalore 560 012, India.



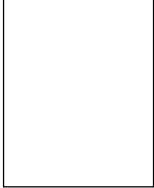
*For there was never yet philosopher
That could endure the toothache patiently.*

Shakespeare



Watching the Universe

Chanda J Jog



Watching the Universe
John Gribbin
Universities Press
234 pages, Rs 140

This is a popular science book, and it consists of a collection of 17 articles all of which had earlier appeared from mid-1970's to mid-1990's in the *Griffith Observer*. The articles cover a vast range of topics in the areas of earth sciences, astronomy, and cosmology – this is the order in which the author has arranged the articles, and he has written an introductory paragraph for each.

The writing style of the author is clear, concise and inspiring, which makes it enjoyable to read the book. Each article is informative and on reading it, it makes the reader curious to want to know more about the topic. The author manages to convey his own enthusiasm about the various topics and ideas explored in the book.

Some of the articles cover straightforward astronomical topics such as 'How galaxies form', and 'Stardust memories' about production of heavy elements in supernovae with a particular reference to SN 1987A. There are also stories of discovery – particularly gripping are the articles on 'Puzzling pulsars' about the discovery of

pulsars, and 'The man who proved Einstein right' about the light bending observations during the solar eclipse of 1919 by Eddington.

On the other hand, several articles are fairly speculative, which may leave a newcomer to the field with the wrong notion of the problem at hand. For example, in 'How normal is our Sun?', the author suggests that the low flux of neutrinos from the Sun could be attributed to the accretion of dust as the Sun passed through a spiral feature in the Milky Way some 20000 years ago.

The first two articles deal with topics which are staple of science fiction, such as the kind of extra-terrestrial life possible. However, unlike in science fiction where strange creatures are common, the author makes an interesting point that a water-rich, earth-like planet around a star like the Sun is the most likely place for a stable life form to arise and to flourish; and that such life forms will be bipedals with 8-10 digits or fingers in the limbs.

An interesting and recurring point that is brought out in the various articles is the key role played by astronomy in shaping such apparently diverse phenomena on earth as – the earth's climate, the recurring ice ages; and indeed, the very formation of life on earth, which would not have been possible without the heavy elements produced in supernovae.

The main criticism I have about the book is that the material in some of the articles is

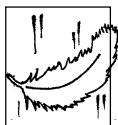
outdated, since there have been significant changes in astronomy in the past 20 years due to new observations. Further, the date for the initial appearance of an article in the *Griffith Observer* is not given. For example, the picture of galaxy formation and structure formation in general has changed substantially after the COBE observations of 1992. A more detailed revision (than given by the author) or a postscript giving the changes in the field since the article was written would have been useful to bring the articles up-to-date where necessary.

The other criticism is that there are some factual errors. For example, the author says in 'The air we breathe' that most stars like the Sun have planetary systems like our solar system; whereas it is well known that most

solar-type stars form a part of a binary or a multiple system of stars. Hence a direct analogy for the planetary system may not be valid. In fact, the observational detection of planetary systems around other stars using the Hubble space telescope has just begun.

In summary, given that this is a popular science book, it satisfies the broad objective of the book well, except for a few shortcomings as mentioned above. The book is ideal for young students who are generally curious about science. The price, as for the other titles by the Universities Press, is reasonable. Certainly it would make a valuable addition to the library of any college.

Chanda J Jog, Department of Physics, Indian Institute of Science, Bangalore 560 012, India.



The Origin of Bottled Ale

The English method of making ale has not changed very much since it was first discovered. Barley grains are soaked in water and kept in a moist atmosphere at a suitable temperature until they sprout, that is germinate, and form a substance known as malt. The malt is then heated to stop germination, put in hot water and flowers from the hop plant are added. The hot liquid is then cooled and yeast added to it. The cold liquid soon begins to bubble, because carbon dioxide is produced in the liquid. Because the liquid appears to be boiling this bubbling process is called fermentation (from the word *fevere* to boil); during fermentation the alcohol is formed.

The events in the story of bottled ale take place shortly after the idea of adding hops to the brew had been introduced into England. Hops give the liquid a bitter taste, and in time the 'hopped ale' became known as beer. Today the two names, ale and beer, are often used for the same kind of drink.

Stories from Science
Vol.4, A Sutcliffe and A P D Sutcliffe

