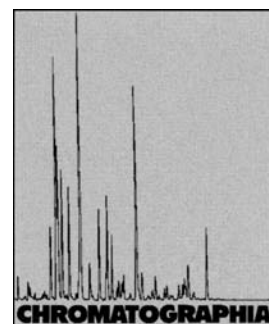


## Book Reviews



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### Carl Friedrich Gauss – Titan of Science

by G. Waldo Dunnington, with additional material by Jeremy Gray and Fritz-Egbert Dohse

The Mathematical Association of America, Washington, DC, and Cambridge University Press, Cambridge, UK, 2004,

xxix + pp. 537,  
ISBN: 0-88385-547-X  
Price: GBP 30.00

Carl Friedrich Gauss (1777–1855) is generally considered as one of the two or three most important mathematicians whoever lived. In Germany his portrait and a Gaussian distribution curve decorated the ten Mark bill in use before the introduction of the Euro. His contributions to science are too extensive to elaborate them; just a few are stated here. Among others he is credited with the development of the method of least squares used in statistics (let us not forget that we call the shape of our peaks *gaussian!*) and a number of fundamental theorems; but he also had major contributions to studies on magnetism (in W.W.II, the demagnetization of ships was called *degaussing*); and to astronomy. In addition to science Gauss excelled in foreign languages. He was fluent in Latin (some of his most important books were written in that language), Greek, French and English, and had sufficient knowledge in Danish, Swedish, Italian and Spanish to read publications in these languages. At the age of 65 he started to learn Russian (to be able to read the publications of Lobachevsky in original) and, just for fun, Sanskrit. He had an extensive knowledge of Classical (Greek and Latin), French, English and American literature; and out of curiosity he learned to master such quite different disciplines as financial bookkeeping and shorthand. This brief enumeration just illustrates the wide range of his interest until the last moment of his life.

Gauss was not an ivory-tower scientist. From 1808 until his death 47 years later, he was professor of mathematics and astronomy at the University of Göttingen and the director of the university's astronomical observatory; each semester he presented a number of courses, and was active in the university and social life. He married twice and had six children, two of whom emigrated to the United States. In his lifetime Gauss received the highest decorations of a number of countries and was elected a member of practically every scientific academy and learned society, from Uppsala, Sweden, to Madrid, Spain, and from Kazan, Russia, to Boston, U.S.A. (the notification about his election as a Fellow of the American Academy of Arts and Sciences was signed by John Quincy Adams, the sixth president of the U.S.).

It is always fascinating to read the biography of a titan of science, even if the reader is not much familiar with the particular field in which the person had been active. This is such a book.

This well illustrated biography of Gauss by Dunnington was originally published in 1955. Last year it was republished, with extensive additions, by the mathematical Association of America and is distributed by Cambridge University Press. The biographical part of the book systematically discusses the periods of Gauss' life and his achievements in various fields of mathematics and science, in a fairly understandable language (more difficult mathematical passages can be skipped without losing the overall discussion). The controversy about the priority of the development of non-Euclidean geometry, how much Gauss actually contributed to this field, is discussed in a reasonably fair way. (For those who are not familiar with this question: The first contributions to this field were published, completely independently of one another, by Johann Bolyai

(1802–1860), in Hungary, and Nikolai Lobachevsky (1793–1856), in Russia. Gauss knew about their work and in fact, corresponded about it with them; however, for unexplainable reasons, he never mentioned them in his printed works but instead hinted that he actually reached the same conclusion earlier although he never published about it. For this reason Gauss received – in fact, unjustly – credit in the German literature for the discovery of non-Euclidean geometry.)

The Appendices representing 35% of the book present the genealogy of Gauss and the list of his descendants, a chronology of his life, information on his university activities, and on his private mathematical diary, and a detailed bibliography of both the publications of and about Gauss. A 30-page long index concludes the book.

Dunnington's book about Gauss might be of interest to anybody who want to know more about one of the most important persons of science who formed our present-day knowledge.

L. S. Ettre

### High Throughput Analysis for Early Drug Discovery

by J. N. Kyranos (Ed)  
Elsevier Science B.V., Amsterdam,  
The Netherlands, 2004, pp. 185,  
ISBN 0-12-431165-2  
Price: EUR 145,00, USD 160.00

This short volume covers, in 9 contributed chapters, the topic of high throughput analysis (HTA) for drug discovery. As one might expect for such a topic the contributors are all pharmaceutical industry-based (mainly from the US) and combinatorial library analysis features highly.

The first chapter examines the HTA of combinatorial libraries encoded with

electronic tags. This contribution is followed by a chapter on the analysis of a combinatorial library synthesised using a "split-and-pool Irori Microkan" method. Two chapters are then provided by different groups on HT flow injection analysis (FIA) using mass spectrometry (MS). These HTFIA-MS methods offer very high throughputs with MS via either electrospray or atmospheric pressure chemical ionisation interfaces. The use of Fourier transform ion cyclotron MS (FT-ICR MS) to provide exact mass data to confirm elemental composition is also described.

These chapters are then followed by articles concerned with assessing the purity and amounts of material prepared by parallel synthesis experiments (based largely on HPLC-MS and evaporative light scattering detectors (ELSD)). The use of multiple parallel chromatography with MS detection via the "MUX" interface also features in this area. Other contributions include chapters on the purification of parallel libraries via high throughput preparative HPLC, screening single-bead combinatorial libraries using capillary HPLC and MALDI-TOF-MS and a final chapter on the role of NMR spectroscopy in chemical library analysis. In this chapter NMR spectroscopy is compared with HPLC-MS and chemiluminescent nitrogen detection (CLND) for quantification purposes (both NMR and CLND proved to be accurate).

The volume presents a mixture of review and experimental data, generally from pharmaceutical industry-based authors. Each contribution has references ranging from a few to a lot, generally to 2001 (there is a short index of 4 pages).

Given the rate of progress in this area some of the contributions may now be rather dated, but as an introduction to the field, and the issues involved with HTA for drug discovery, this may well be a useful volume.

I. D. Wilson

**Pharmaceuticals in the Environment: Sources, Fate, Effects and Risks.** Second edition

by K. Kümmerer (Ed)  
Springer-Verlag Berlin – Heidelberg, 2004,  
pp. 527,  
ISBN 3-540-21342-2  
Price: EUR 79,95, USD 109.00

After pesticides it is quite likely that the next wave of environmental concern will be the fate of human and veterinary drugs in the environment where they have the potential to interact with organisms other than those for which they were intended (e.g., the potential feminisation of male fish because of human contraceptive hormones etc). The first edition of this work was published in 2001 and the editor has taken the opportunity provided by this second edition to revise and extend the work in line with the expanding body of knowledge on the subject. The volume is a multi-author work (not obvious until one gets to the individual chapters) with a total of 34 contributions divided into 6 parts of unequal length. The introductory section contains two chapters, the first by the editor setting out the scope of the volume whilst the next considers the "Special characteristics of pharmaceuticals related to environmental fate".

The next section on the "Use and occurrence of pharmaceuticals in the environment" consists of 12 chapters covering such areas as "emissions from medical care units", several chapters on the occurrence of drugs in the environments of Switzerland, Italy, Canada and the US, as well as more specific topics such as drugs in landfill sites, antibiotics in soil, wastewater etc. and 3 chapters on the topic of veterinary drugs in the environment.

Section 3, which comprises 5 chapters, is concerned with "the fate and effects of pharmaceuticals in the environment" with chapters dealing with modelling the distribution and fate of compounds in the environment and more specific contributions on carbamazepine, antibiotics and antibiotic resistance, ethylestradiol and methyltestosterone.

The following section covers the "risk assessment and risk management" of pharmaceuticals in the environment (11 chapters) providing regulatory perspectives from the US and EU, as well as a number of chapters on risk assessment, a contribution on the removal of drug residues from raw water sources by membrane filtration and a chapter entitled "potential environmental risks by cleaning hair and skin; ECO-label – a possibility to reduce exposure to personal care products". The latter is somewhat surprisingly in a volume on pharmaceuticals in the environment as the subject is

"shampoos, shower gels and foam baths".

The penultimate section deals with "the need for further research" in 3 chapters whilst the final concluding section is by the editor and provides a short summary covering use patterns of pharmaceuticals, analytical data, fate and effects, risk assessment and risk management.

Each chapter has a list of references and these generally cover the period up to 2003. There is also a reasonably comprehensive index of 23 pages.

The book is well produced and extensive in its coverage. Whilst not a book for the non-specialist, for anyone involved in the topic of environmental pharmaceuticals, this will no doubt be an essential companion. It will also prove useful to those wishing to enter into this emerging research area. There is however, relatively little in terms of analytical methodology for the determination of pharmaceuticals in wastewater or slurry etc. and those interested in the "nuts and bolts" of the topic will need to delve directly into the literature, for which this volume may provide a useful point of entry.

I. D. Wilson

**Statistics for the Quality Control Laboratory**

by E. Mullins

Royal Society of Chemistry, Cambridge, UK,  
2003, Xviii + pp. 456,  
ISBN 0-85404-671-2  
Price: GBP 34.95

I have to say that from the outset I found this substantial book really user-friendly, in both writing style and content. It addresses the techniques of statistical quality control (SQC) so completely that most practicing chemists and managers will find everything they require here. As an instruction or self study manual it is difficult to make any adverse comment. From elementary to advanced, the real life worked examples will give the dedicated reader a grasp of the principles and practice of quality control methods. From the reviewer's viewpoint, the numerical size of many examples and exercises made working through them a substantial keyboard chore, so only a sample has been tried, all with outcomes identical to those given. This gives great confidence in the care that has gone into

the preparation of this book. There is frequent emphasis on the need for compatibility between formal statistical assessment of data and the practical considerations that are the domain of the chemist – the presence of possibly abnormal values, for example – which serves as a reminder of the realities of laboratory investigations. In this respect liberal use of graphical displays of data and analyses are used effectively throughout the text.

Looking in more detail at the contents, the opening sections on sources of variability in analytical work – a vital concept in SQC – immediately engage the attention with their clarity. The classical techniques of several types of control charts, which are still effective and simple tools, are discussed next, with the author's style of lavish use of real life examples already established. In view of the fact that much SQC work produces time ordered data I was slightly surprised to find no mention of the use of Cusum techniques in this section. The following section introduces some of the essential statistical ideas that underlie the topics still to be addressed. Simple comparative studies are then tackled in a section that

occupies over 10% of the book, a good choice, I believe. It leads smoothly to a section on more complex systems in which multivariable two-level factorial experiment designs and some variants are described. Those who are not yet convinced of the value of good statistical design will find this very enlightening.

Only at Section 6 is the topic of regression and curve fitting introduced. The now familiar blend of discussion, practical examples, statistical theory and graphical displays is used to show both the power and limitations of regression. In particular the awkward topic of calibration lines (curves) is addressed. This includes what are probably the most complex ideas (and algebra) in the book – the method of iterated weighted least squares – which I feel are unlikely to be used by many chemists. Nevertheless it is important that the problems associated with calibration curves are recognised, especially those in which the variance of both “x” and “y” data are substantial. (In standard least squares the “x” variable is assumed to be known with complete accuracy.)

The final sections are concerned with use of analysis of variance in laboratory

studies of methods and their precision. These include one, two and three way analyses and their variants. Here the sources of variability are again explained, with reference to single and multi-laboratory investigations, and the concept of random effects models is discussed, again with examples and exercises. The concept of variance components is well covered and illustrated, giving an insight into the structure of “classical” error sources. The final section is, appropriately, centred on the assessment of measurement quality. Both classical and recent techniques are explained, with references to recent standard documents. However, for all but relatively simple situations completely within the control of the experiment designer it will be necessary to consult the references that are given, and probably to enlist the support of a professional statistician.

The book provides copious references throughout for further reading, only a few of which are familiar to the reviewer, I am afraid. This book will be a most welcome addition to any laboratory library, and is heartily recommended.

G. R. Edwards