

Texts and readings in mathematics

A mathematician tends to have an intense relationship with treatises – one which is more akin to that of a historian than that of her colleagues in the ‘hard’ sciences. A book may be a century or two old and still be relevant as a source of information or inspiration, well-thumbed textbooks from youth might be still consulted decades later, and fierce arguments rage about relative merits of different treatments of the same subject. And much like any book-lover, a mathematician is forever arguing with herself whether she can afford to buy this volume or the other. When the price label is in dollars or euros and the salary paid in rupees, this last dilemma is particularly acute.

This is why the launching, in 1992, of the series *Texts and Readings in Mathematics* (which lends itself to the slightly too cute acronym, *TRIM*) was so welcome. The initiative came from one person – Rajendra Bhatia (then as now at the Indian Statistical Institute, Delhi) – and a venerable name in scientific publishing, the Hindustan Publishing Agency. None of us then foresaw how felicitous this partnership would turn out to be. (Full disclosure: at that time, I was at the Tata Institute and agreed to be one of the editors of the series. When I moved abroad, Rajendra promptly replaced me.)

From the outset, the series was characterized by high production values. It helped that the mathematical typesetting system, TeX, was making it possible for mathematicians to decide for themselves how their work should look in print, and to produce ‘print-ready’ versions of their works that rivalled the work of professional typesetters. But the publishers did their part as well – the quality of the binding, the design of the covers, and the

adoption of a uniform ‘look’ made sure that the bibliophile would have a pleasurable experience the moment she saw and handled one of the volumes.

What makes the series really unique is the quality of the titles and the range. Here the credit goes entirely to Rajendra, who is always on the lookout for possibilities and uses extraordinary powers of persuasion to cajole procrastinating authors to deliver high-quality manuscripts and jealously protective foreign publishers to part with rights.

I should, of course, say something of the books themselves. Quite wisely, *TRIM* has resisted the temptation to fragment into sub-series. So the 50 books published so far include many genres: textbooks, advanced monographs, and even volumes of essays dedicated to distinguished elder statesmen of Indian mathematics. The topics range far and wide, and the authorship as well. The defined audience is ‘advanced students and teachers’. Research manuscripts judged to be too specialized are excluded, as are undergraduate textbooks.

The series has quickly established itself as the definitive destination for high-quality expositions by Indian mathematicians. These include many of Rajendra’s own works – he is a highly successful author himself and has published many of his books in the *TRIM* series. Among them is *Positive Definite Matrices*, published simultaneously by the Princeton University Press and ranked among the top 20 mathematical bestsellers in 2007. A highly effective strategy is the reprinting of classics. (Reprints have been limited to truly outstanding books. Among my favorites: Helson’s *Harmonic Analysis*, Milnor Stasheff’s *Characteristic Classes*,

Mumford’s *Lectures on Curves on an Algebraic Surface*, Parthasarathy’s *Introduction to Probability and Measure*, and – a recent discovery for me – Golub and Van Loan’s *Matrix Computations*.) Rajendra has resisted the pressures to publish conference proceedings, which are rather easy to come by and difficult to assay.

Three recent volumes stand out as publishing coups. *Noncommutative Geometry*, *Quantum Fields and Motives* by Connes and Marcolli, *Introduction to the Theory of Standard Monomials* by Seshadri, and the two-volume textbook on *Analysis* by Terence Tao.

TRIM completed a landmark this December when the fiftieth volume was released by L. Lovasz, a distinguished mathematician and the President of the International Mathematical Union.

There was a time when any serious mathematical library had a standing order for the ‘yellow series’; then for a while the ‘green books’ had a similar status. In an era of stretched library budgets, this policy is often abandoned. I would recommend any academic library to buy every book in the *TRIM* series. (In the case of some of the volumes, there are agreements that restrict their sale to some regions of the world.) For that matter, the prices are so reasonable that even individuals can (and should) consider a standing order!

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Laboratory notebooks: a cautionary tale

While trying to write up for publication the work done by a former student, I looked at his laboratory notebook. Scattered among lists of references, lecture notes, and weekly reports, I found a few pages containing data. One table had 18 datapoints, out of which 12 were embellished with either crosses or ticks; the rest had no special marks. Unfortunately,

there was no explanation for the symbols used. Out of ten points with ticks, only eight were plotted in a figure included in his report. The abscissas of some of the data had been altered from the values recorded in the notebook, perhaps inadvertently. One wonders how much of the data reported in publications from our institutions have been subjected to such

‘mutations’. One of my teachers had remarked that great care should be taken while writing a paper, as it would be stored for posterity in all the libraries of the world. In the spirit of this statement, it may be desirable for authors to ensure that each experimental data point reported in a paper matches the corresponding entry in the laboratory notebook. Some-

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times the elusive nature of the notebook precludes such an exercise, as illustrated by the following conversation between a former student and his advisor.

‘Where is your lab notebook?’

‘Sir, it is in my room. I will bring it next week.’ After a week, on being reminded gently, the student replied, ‘It is in my friend’s room in the hostel.’

‘Please ask him to give me the notebook.’

‘It is in a box containing many textbooks and notebooks. My friend may not be able to identify it.’

‘Ask him to bring all the notebooks. I will search for it.’

‘Actually, all the data are not in the lab notebook. Some of them are in sheets of paper. I will copy the data into the notebook and then bring it.’

Taking a course on ‘experiment methods in chemical engineering’ and reading material on how laboratory notebooks should be maintained¹ had apparently been ineffective, thereby vindicating Gibbon’s view (cited in Feynman²): ‘The power of instruction is seldom of much efficacy, except in those happy dispositions where it is almost superfluous’. On a more optimistic note, we could perhaps follow Hilbert’s suggestion that all the important topics should be taught several times.

1. Skoog, D. A., West, D. M., Holler, F. J. and Crouch, S. R., *Fundamentals of Analytical Chemistry*, Thomson Asia, Singapore, 2004, pp. 51–52.
2. Feynman, R. P., Leighton, R. B. and Sands, M., *The Feynman Lectures on Physics: Mainly Mechanics, Radiation, and Heat*, Addison-Wesley, Menlo Park, 1963, p. 5.

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Algal diversity as a renewable feedstock for biodiesel

Algae have received global attention as a renewable resource of biodiesel and may play an important role as a component contributing to the economic growth of the northeastern (NE) region of India. A variety of blue-green and green algae are found in the wetlands of various districts of Assam, however, they have hitherto remained untapped. There is ample scope for commercial culture of freshwater microalgae to exploit them as a biodiesel feedstock and as a resource for other economically important chemicals such as antioxidants and omega-three fatty acids. Exploitation of algal diversity in the NE region and its sustainable use as a feedstock for biodiesel through biotechnological interventions is the need of the hour to ensure future energy security. The Defence Research Laboratory in Assam (a laboratory of DRDO), is playing a vital role in this regard. To utilize the algal resource effectively for production of biodiesel and bringing it to a commercial scale, research needs to be undertaken to screen the biodiesel potential of existing strains of species native to this region and, assessment of field cultivation with a view to establishing open-

pond cultivation augmenting biofuel production. The isolation and purification to obtain pure strains of microalgae have already been started and are being done successfully in this laboratory. At present, the laboratory is maintaining the pure cultures of few algal strains, namely those of *Ankistrodesmus* spp., *Scenedesmus* spp., *Euglena* sp., *Chlorella* sp., *Chlorococcum* spp. and *Navicula* sp. The strains were obtained by employing tedious isolation procedures involving enrichment of natural waters and agar plating in BG₁₁ and WC media followed by dilution of mixed cultures¹. All the strains except that of *Navicula* can be grown on these two media. For the isolation of this diatom strain, D medium containing soil extract has been used¹. Further work of isolation and biochemical studies are in progress. All these strains are known to accumulate high intracellular lipid content as their storage product, which can also be augmented through manipulation of cultural conditions^{2–4}. Thus the strains can be successfully exploited for obtaining algal oil and its biochemical conversion to biodiesel. The rationale behind this type of study is to attract proper

attention towards sustainable utilization of natural wetlands for obtaining indigenous strains, with a view to exploring their expected role in the development of energy security in the country.

1. Anderson, R. A., In *Algal Culturing Techniques*, Elsevier Academic Press, USA, 2005.
2. Amotz, A. B., Tornabene, T. G. and Thomas, W. H., *J. Phycol.*, 1985, **21**, 72–81.
3. Piorreck, M., Baasch, K. and Peter, P., *Phytochemistry*, 1984, **23**, 207–216.
4. Wright, D. C., Berg, L. R. and Patterson, G. W., *Phytochemistry*, 1980, **19**, 783–785.

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