Introductory chemistry in the market place

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Fundamentals of Chemistry. 4th Edn. By F. Brescia, J. Arents, H. Meislich and A. Turk. Pp.781. (Academic: 1980.) $21.95, £13. *Foundations of College Chemistry.* 3rd Edn. By D. B. Murphy and V. Rousseau. Pp. 767. (Wiley: 1980.) $29.20, £12.45. *Basic Chemistry: General, Organic, Biological.* By D.M. Callewaert and J. Genyea. Pp.837 (Worth: 1980.) $19.95, £9.25.

THE teaching of introductory chemistry has given rise to much discussion in recent years due to two main factors. The first of these concerns the question of the topics to be taught and the level of presentation to be attempted. The second has to do with the wide variation in the abilities of the students who take such courses. These range from individuals who have received good preparation in secondary school and have little difficulty dealing with the abstract concepts which are inherent in the subject matter, to students who are ill-prepared to deal with these concepts. Although the second factor may be more common to US colleges and universities, it would be surprising if it were totally absent from classes in other countries as well.

In order to compete in the current market, textbook authors are called upon to provide books which are both broad in scope and flexible in level. The three discussed here are intended to accommodate students of varying backgrounds with potentially different career goals who need a general chemistry course; that is, students who are likely to major in science although not necessarily in chemistry. Despite this common objective, and a number of similarities among them, these books actually provide a wide choice in level and approach, and each offers something unique.

Each book is about 800 pages in length, has been produced in an attractive manner with an extensive use of colour, and all seem to have been well-edited with few errors. All three cover the topics usually treated in general chemistry: stoichiometry, atomic structure, bonding, states of matter, thermodynamics, equilibrium, kinetics, acids and bases, electrochemistry, elementary organic chemistry, polymers and (except for Callewaert and Genyea) coordination and nuclear chemistry.

Of the three, the book by Brescia *et al.* seems to be the most student-orientated, each chapter containing learning objectives, key terms, self-tests, worked-out examples and many practice problems, with answers given in an appendix. (A companion student guide is also available for this text.) Each of the other books possesses only some of these features. The authors have adopted the technique of presenting topics more than once, first on a qualitative level, then on a more intensive basis. Although this approach is successful in most cases, it is surprising to find the second stage of bonding deferred to Chapter 20 after the initial treatment has been presented in Chapter 9. The bulk of thermodynamics is presented as it relates to phase changes, rather than in a more abstract fashion. Descriptive chemistry appears mostly as a means of illustrating principles rather than in a separate chapter or chapters. A chapter dealing with environmental chemistry is presented, as is one on radiation and matter. The latter provides coverage of infrared, ultraviolet, nuclear magnetic resonance and mass spectroscopy in much greater depth than is usually encountered at this level, although some instructors may find it appropriate.

The text by Murphy and Rousseau is the highest in level mathematically and provides the greatest emphasis on physical chemistry. It presents numerous derivations including the Bohr radius, van't Hoff and Balmer equations, and the gas laws (from kinetic theory). Three centre bonds (boron hydrides) are discussed in some detail and the Debye–Huckel theory is mentioned. It is the only one of the three books in which descriptive chemistry is discussed separately. A 35-page chapter on group IV (emphasizing the variations in properties observed as the family is descended) precedes a chapter on organic chemistry, which is followed in turn by one of 57 pages in which the remaining non-metals are discussed. A separate chapter on metallurgy is also presented. The book offers many problems, both worked-out in the text and at the ends of chapters (with answers to odd-numbered ones given in an appendix), and provides a list of suggestions for further reading after each chapter. In addition, a student guide and solutions manual are available.

The distinguishing feature of the Callewaert and Genyea text is the heavy emphasis on organic and biological chemistry. Approximately one-half of the book is devoted to "general" chemistry with the remainder being divided about evenly into three sections devoted to organic molecules, biological molecules and metabolism. In addition, many of the examples used in the first portion of the text are biochemical in nature. This text was the hardest one for me to evaluate, having had little experience teaching such a course. Although the authors say that their intent is "explaining essential chemical concepts rather than providing a cursory treatment of a much larger number of topics", some of the discussions seem too brief to provide a real understanding of the material. For example, kinetic molecular theory, solids, liquids, gases and elementary thermodynamics are discussed in a chapter of 27 pages. Similarly, equilibrium and kinetics (including the disproven direct collision mechanism for the H_2–I_2 reaction) are "covered" in 21 pages. Further, it is surprising to find electron configurations relegated to an optional section of a chapter and to encounter a discussion of bonding without substantial use of orbitals. This approach may be appropriate and even necessary in order to cover all the material included in the text (and presumably in such courses), although the book's use in the broad general chemistry market is likely to be limited. The book does give study objectives, useful chapter summaries and solutions to exercises at the end of each chapter, but has relatively few problems and worked-out examples and is the least mathematical of the three.

These three texts represent only a small sample of the total number which is currently available, although they do provide some indication of the almost limitless variety which exists in this highly competitive market. □

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Biophysical challenge

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Topics in Classical Biophysics. By H. J. Metcalf. Pp.286. (Prentice-Hall: 1980.) Pbk £6.45, $9.95.

MY readiness to review this book lay in its intriguing title and my need of a broadly based text for students pursuing a BSc degree in "physics with medical applications". The format is primarily that of a textbook, although the author suggests it "is not intended for students alone". The first eight of its nine chapters present appropriate basic theory — biomechanics, heat and energy, fluids, blood circulation, feedback and control, nerve cells, sound and hearing, light, colour and vision. The final chapter is a somewhat mixed bag entitled "Experimental Techniques" but, with its emphasis firmly on the use of physics to acquire information, nicely draws together the joint application of various principles previously discussed.

Essentially, the theoretical treatment is that of classical continuum physics, with basic equations developed at the beginning of each chapter and then applied to some selected topics appropriate to that field. Whilst the question as to whether this justifies the title *Classical Biophysics* could be debated, I found that the material chosen represented a useful introduction for any undergraduate interested in the applications of physics to medicine. The only pre-requirement is an elementary