ous edition. However, this is in fact the third version of such a book, the first was titled *Color: Essence and Logic,* which was an interesting choice for a title. Mr. Kuehni states that about three-quarters of this book has been newly written since the earlier edition. If you reviewed the two editions side by side, you could not help but agree with his claim.

There are many books that deal with the mathematics and the nuances of the various models and equations involved but this book, as the author states clearly, is non-mathematical in nature. The intent of this book appears to be putting all of the algebra in perspective alongside with its meaning and implications for one of the richest fields of scientific study. Clearly, this has its downside. For example, for those readers without prior exposure to color difference formulas, the latter part of the chapter on "Calculating Color" may seem a bit rushed. To be fair, a slower more involved treatment would require dealing with the models used and that might lose the attention of a non-experienced reader. Mr. Kuehni does provide adequate references for those who wish to seek out more details.

For a layperson with moderate interest in "color," this is an excellent book with just the right amount of information to tickle the curious researcher in them and still leave them with a good sense of understanding. This earlier edition of the book left me with the impression of imbalance in the level of detail in some instances. Some sections seemed to have too much detail while others did not have enough, but in this edition the author has the balance just right. For example, otherwise hard to recreate experiments with Agrolite lamps, schematics of the visual cortex and details about the electron orbits, have been carefully edited for ease in interpretation and comprehension.

For the practical color researcher this book opens up new avenues to a vast realm that would otherwise be inaccessible. There are numerous references in the book that are from more recent sources, some as recent as 2004. These more recent references are easily accessible from any university library and through the Internet, which has increasingly become the first source to seek out of information. Although by no means a measure of how much revision this book has undergone, the first edition contained just 8 pages of notes while this edition has as many as 12 with over 50 references published between 1997 and 2004. This does not include the older texts that the author has cited, in addition to websites and notes in the form of the author's commentary.

It would be fair to say that, for the most part, this edition addresses the same questions as the earlier one. However this edition is more historical in nature than the first and the framework in which it is presented has been greatly widened to include a listing of a large collection of additional sources. This is largely due to the nature of Mr. Kuehni's careful and structured research as well as to the availability of many recent works and translations of older works. Good examples of this are the chapters titled, "The Web of Color" and "Color (Theory) in Art."

This book, much like most others in this field, is largely based on the experiences and thoughts of the Western world. This should not however diminish the significance of this book or the wealth of knowledge it holds. Mr. Kuehni does bring to the attention of the reader the complex, perhaps cultural, nature of why color harmonies in different parts of the world may not be readily appreciated everywhere. He uses the example of a collection of harmonious combinations from Japan to offer a different perspective. All of these factors combine to make this book a must for any collection of books on color.

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". . . , and everything looks worse in black and white!"
Simon & Garfunkel (*Kodachrome*)

Color Chemistry: Synthesis, Properties, and Applications of Organic Dyes and Pigments. 3rd revised edition, by H. Zollinger: Helvetica Chmica Acta/ Wiley-VCH, 2003, 637 pp, $245 hardback. ISBN 3–9063-9023–3

Color Chemistry, by Zollinger has been one of the leading texts on the subject for many years. From a nice little pocket size book it has developed through two rounds of "molting" into a kilogram tome. Irrespective of its size at any one time, it has retained its reputation as an authoritative account of the field. Colored compounds are an important and omnipresent part of our lives even if it rarely consciously comes to our minds. The chemistry of colored compounds has been a regular topic in textbooks of organic chemistry in the 1950s and 1960s where it frequently had been devoted a chapter of its own. For some ill-explained reason this subject matter has fallen out of favor in later years, so much so indeed that good introductions were hard to find at all. Maybe this fact had been the initial spark for the first edition of this treatise. That the topic has got an appeal is borne out by the fact that the two previous editions have been hugely successful. Every chemistry teacher will confirm that color chemistry is very popular with pupils of all ages for its sensuality.

This third edition of *Color Chemistry* has been written for the professional. It requires an extensive background in organic chemistry to make full use of it. Users from the advanced undergraduate level onwards will profit from it. Apart from chemists in industry who are concerned with the commercial production of dyes, final year undergraduates and graduate students taking advanced courses in synthetic organic chemistry will be the book's main users.

After a brief introduction, the first full chapter provides a background in the physical chemistry underlying the phenomenon of color, including a brief excursion into color perception. As is the case throughout the book the discussion is at a high academic level requiring the reader to have a sound background in physics and physical chemistry. Approximately half of the book is devoted to a systematic discussion of the major classes of colored compounds on the

basis of their chemical constitution. This is the obvious criterion to organize the subject matter so it requires no further comment except that it is rather curious to observe the extreme differences of these chapters. This reflects either our current knowledge or, more likely, the relative importance of the class of compounds under discussion. The size range is from very brief for sulfur dyes (five pages) and di-/tri-arylmethine dyes (ten pages) to the really comprehensive for the economically highly important azo dyes (some eighty pages) and the carbonyl dyes (ninety pages). It is nice and advantageous for the chemist to have minor topics given equal status as the "big topics" rather than to indiscriminately bundle them in a "miscellaneous" chapter.

From Chapter 10 onwards, the book takes a different point of view looking at colored compounds (colorants) from a functional rather than a systematic chemical perspective. I tend to include the chapter of fluorescent brighteners into this group of "applied" chapters as the brighteners are a chemically heterogeneous group rather than the chemically defined compound classes we had met in the previous chapters. Among the "applied" topics the author discusses in great detail are the use of colorants in various industries such as analytical chemistry, including biomedical applications (clinical chemistry). In this chapter, Chapter 15, is included a section on fluorescent dyes in biology and medicine, a field that is currently growing vigorously and which is likely to expand further in the near future. In recent years, a number of companies specializing in the manufacture of fluorescent dyes for these applications have been founded. This shows the potential for the commercial exploitation of an area of chemistry which has a long history and which some academic teachers might have regarded as too traditional to be included in current curricula. Maybe it is time to re-think that premise. In fact it is worth remembering that the first phase of the vigorous growth of industrial organic chemsitry in the nineteenth century had, to a large extent, been ushered in by Perkin's first synthesis of an artificial dye, mauvein, in England. In the wake of this seminal discovery a great number of chemical companies devoted to the production of colorants were set up throughout Europe, many of which have subsequently grown into international giants of the trade (although many admittely later changed the focus of their activities).

"Colorants for Imaging and Data-Recording Systems," is one further example of the chapters on applications, and is another token of how alive the field is. The traditional photographic industry is probably slowly giving in to the "digital craze" but even in recent years new products with enhanced color ranges have been introduced to the market. The chemistry of color as well as black-and-white photography is being discussed in detail by Zollinger, of course.

In accordance with the increased awareness of environmental issues in a grossly overpopulated world, the third edition of *Color Chemistry* features a concluding chapter on ecological and toxicological aspects of colored compounds. Industrial manufacturers of colorants and their customers (voluntarily or forced by legislation) have to take these issues into account.

Finally we have to notice that Zollinger's book deals exclusively with organic (carbon-based) compounds. The equally interesting colored inorganic compounds (foremost transition metal complexes) are completely excluded from this treatise. This is no major criticism, though, as the book's intentions are clearly defined by its subtitle. I just mean to point out to the reader that behind this universe of color chemistry there is another one deserving recognition as well.

If there is anything missing in *Color Chemistry* and therefore to be wished for in a future edition, it might be a chapter on colored compounds occuring naturally. The living world is making copious use of colors for functional (light absorbing compounds in photosynthesis), signal (warning colors of poisonous animals) and ornamental purposes ("showing off" colors of [mainly] male animals). As a scientist with an industrial background the author might be forgiven to have endowed his book with a strong industrial flavor but a chapter on colored compounds in biological systems (i.e., living beings) would be a most welcomed addition. We only need to remind ourselves of the fact that colorants extracted from plants and animals have been used for millennia before chemists had learned the art of synthesizing them. Royal purple, extracted from marine snails, is probably the best known example of this ancient "industry." Nature, by employing its supreme design strategy, evolution, is a master engineer. Including a chapter on its range of products and their molecular designs would make this reference treatise more complete. Of course the current edition briefly discusses some natural compound types such as carotenes and flavonoids but just as it looks at heterogenous groups of compounds in the above mentioned later chapters on applications a new chapter on "biochemical color chemistry" from a specific, integrating point of view would be highly interesting.

In the meantime the chemist with a liking for color will rely on this up-to-date, third edition of his favorite field's classic.

THOMAS LAZAR

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Contemporary Color Theory & Use, by Steven Bleicher, Clifton Park, NY: Thomson/Delmar Learning, 2005, 190 pp, $39.95 ISBN 1–4018-3740–9

Most college or university design programs are unwilling or unable to release valuable curricular space to a course that focuses exclusively on the subject of color. As a result, most design students graduate with little or no understanding of how the dimensions of vision and light can be utilized to enhance their own creative work. This is particularly challenging when art and design students must master traditional techniques and materials for producing color as well as the rapidly emerging technologies not discussed in traditional educational resources.

Are you sure you want to remove Color chemistry from your list? Color chemistry. syntheses, properties, and applications of organic dyes and pigments. 3rd, rev. ed. by Heinrich Zollinger. The well-received monograph Color Chemistry, now revised and updated in its 2nd edition, provides a thorough treatment of the synthesis, properties, and industrial applications of organic dyes and pigments. brbrThis is what the reviewers had to say about Color Chemistry#58; 'Recommended as essential reading not only to color chemists in all stages of their careers, but to The well-received. monograph Color Chemistry, now revised and updated in its 2nd edition, provides a thorough treatment of the synthesis, properties, and industrial applications of organic dyes and pigments. brbrThis is Zollinger, H. (2003) Color Chemistry: Synthesis, Properties and Applications of Organic Dyes and Pigments. 3rd Edition, Wiley-VCH, Cambridge. has been cited by the following article: TITLE: Synthesis and Investigation of Phenol Red Dye Doped Polymer Films.Â JOURNAL NAME: Advances in Materials Physics and Chemistry, Vol.6 No.5, May 24, 2016. ABSTRACT: The optical properties of the pure polymer film and polymer films doped with Phenol Red dye at different concentrations were investigated. The films were prepared using the casting technique. Poly (methyl-methacrylate) (PMMA) polymer was doped with the Phenol Red dye dissolved in a mixture of chloroform and little quantity of methanol, used as suitable solvent for both the dye and the polymer.