

centre until Amsterdam and Antwerp took over about a century later.

Chapter 11 covers ‘The Value and Assessment of Diamonds’, where the author states that ‘in the past, as today, diamonds were a sign of wealth, if not wealth itself, and their value was of concern to dealers and owners alike’ (p. 203). Ogden follows diamond prices through the ages and the criteria for the assessment of the diamond qualities, as well as the motivations behind both. He stresses the great importance of honesty and experience, quoting Thakkura Pheru (India, 14th century): ‘Those who fix a high price for an inferior gem or a low price for a superior gem, due to arrogance or avarice, will become lepers’ (p. 231).

The last four chapters are dedicated mainly to India. They describe ‘The Indian Diamond Mines’ (Chapter 12), ‘The Diamond Trade in India’ (Chapter 13), ‘Diamond Cutting in India and the East’ (Chapter 14) and, finally, ‘The Eclipse of Indian Diamonds’ (Chapter 15). In all four chapters it becomes evident that the ‘knowledge’ described in ancient sources was mostly a compilation of myths and legends (e.g. the Valley of Gems). With growing contacts, first by people such as Marco Polo, and later by traders such as Jean-Baptiste Tavernier and the activities of the major trade organisations such as the East India Company, more and more first-hand information reached the Western World and created a detailed and realistic picture of the situation in the Orient.

After a short epilogue, the volume is rounded off with an appendix reproducing Nathaniel Cholmley’s *A Description of the Diamond-Mines* of 1677, followed by an impressive bibliography of 462 titles and an index, which contains primarily names and places, with less than a tenth of the entries devoted to general keywords.

With this book, Ogden does not claim to reinvent the wheel:

This is not the first study of the history of diamonds and their cutting—there is Godehard Lenzen’s 1970 study—but new research means that we can supplement or suggest some reconsideration of the findings of his and older works (Preface, p. x). Nor does he claim to have exhaustively covered the topic:

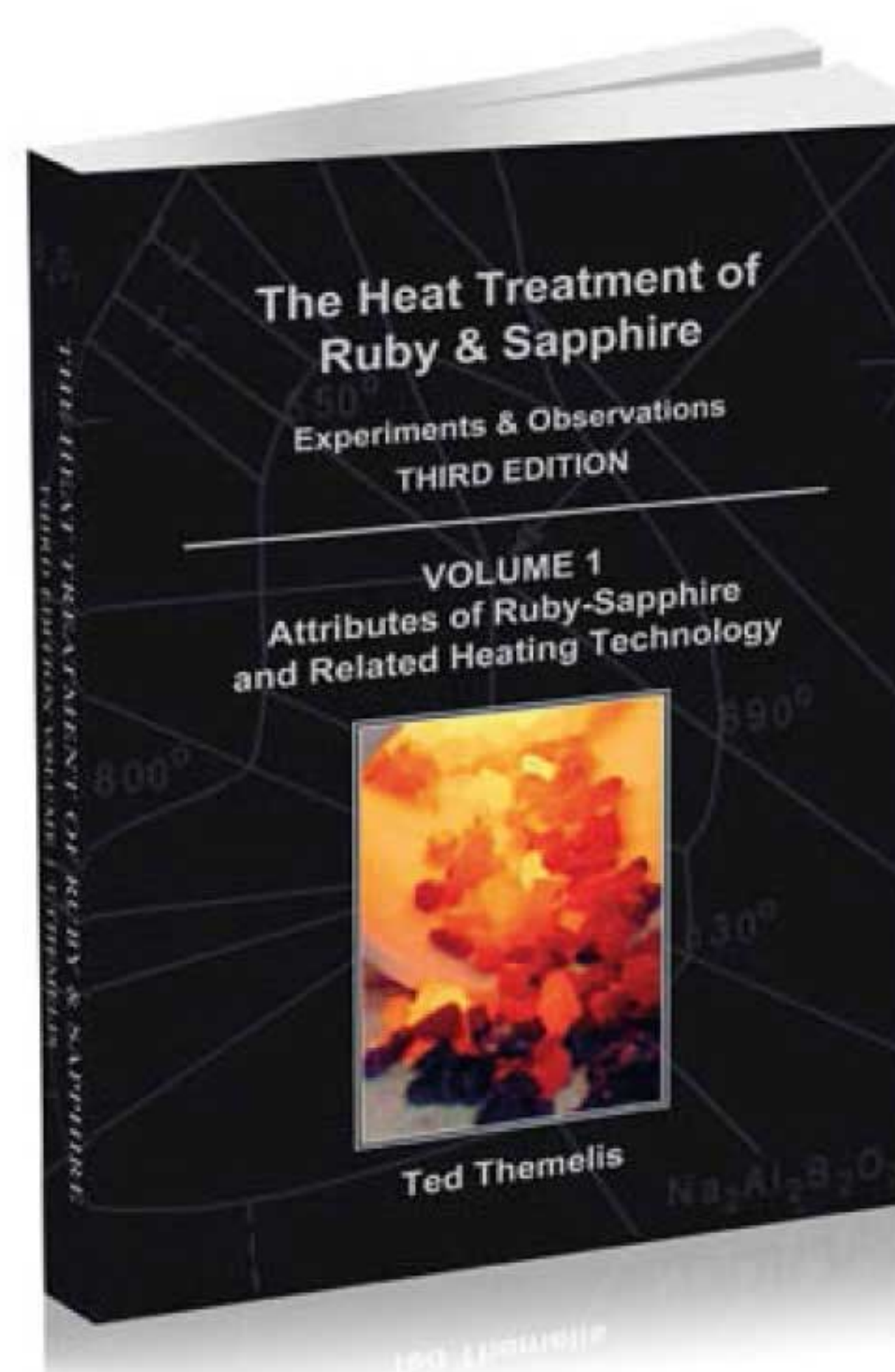
There will always be further archives, inventories and collections that could shed light on this subject, there is much of relevance out there in myriad languages (...) that will have to await consideration by those with the relevant skills (Preface, p. xi). On the other hand, he states that ‘this book has been interesting and enjoyable to research and write’ (Preface, p. xi). I would like to add that reading it was equally

enjoyable and interesting. It is written in an easily readable, yet eloquent, style and Ogden manages to present the history of diamonds as an exciting adventure, while at the same time he has written a well-researched scholarly work. Ogden’s meticulous and painstaking approach leads to an almost flawless result (in fact, I stumbled over just one error: the author talks about ‘the Florentine Diamond, now in Vienna’ [p. 215], which is surprising, as this stone was stolen in 1918 and has never turned up again). To complement the text, this book is richly illustrated with pictures of old diamond jewels and images from old sources, some of which are rare and difficult to find.

All in all, Ogden’s early history of diamonds is not only an impressive scholarly masterpiece, but is also a great pleasure to read which I would recommend to everyone.

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### **The Heat Treatment of Ruby & Sapphire: Experiments & Observations, 3rd edn., Vol. 1: Attributes of Ruby-Sapphire and Related Heating Technology**

By Ted Themelis, 2018. Self-published, <http://themelis.com/Books-Heat-TRS3.html>, 294 pages, illus., ISBN 094-0965577. US\$150.00 hardcover.

**W**hen I was invited to review this book I was very excited, since I have long been curious about the processes that happen when a gemstone is heated, but never had the chance to get actively involved. When I then held the book in my hand, I almost rejected the task because it was full of so much information that it seemed impossible to get through. However, the more

I read, the more I was captivated by it.

In his preface, Themelis points out that this book is not intended to be scientific, and the results presented are often based on trial and error without any explanations behind them. He also gives a short rundown on the instruments, furnaces and samples that he has used for his experiments.

The book then starts with a very informative chapter about the history of heating corundum, giving some early accounts, and then delving into more precise descriptions when heat treatment became more common in the 1970s. Themelis then goes into the history of heating corundum from certain origins.

Following the historical part, there is a wild mix of introductory subjects, including corundum definitions, disclosure issues, stability of heat treatments, values of the treated gems compared to their untreated counterparts, as well as information about the gem trade and various markets, economic impact, the value of gemstone reports, gemmologists in the trade, technologies for heat treatment, and the physical and chemical properties of corundum. For a laboratory gemmologist like myself, some of these subjects (e.g. various markets and worldwide heat-treatment facilities) were extremely interesting because I am not often exposed to them. However, I missed seeing a paragraph about trade shows, and also sample reports from the various laboratories (at least the better-known ones).

The next two chapters are dedicated to the properties of corundum and the effect of heat treatment on them. A detailed account of all possible colour impurities and irregularities is given, often with further explanations on their reaction to heat treatment, accompanied by numerous images of corundum from various localities, as well as charts for a better understanding. Themelis also describes different types of colour zoning and other defects such as twinning, parting, fissures, etc., and their effects on the outcome of heat treatment. A large part of the book is concerned with the description of internal features in corundum, again noting how they are affected by heat treatment. This includes not only mineral inclusions, but also fluid inclusions, 'silk' and staining in fissures. Material on the surface of a stone is also covered. A special section mentions inclusions separately in alphabetical order with their origins and melting points. The descriptions in these chapters are complemented by numerous images.

Starting with Chapter 5, the volume covers the practical side of heat treatment. It lists various heating parameters for different cases with detailed explanations of why it is important to choose certain steps,

and explains the types of heating environments and the gases that are used. This is followed by a chapter that alphabetically lists additives in the heating process, with their chemical formulas, melting points and where and how they are used. Themelis then goes on to review other additives such as fertilisers, natural substances, etc., followed by helpful notes.

In Chapter 8, Themelis describes the entire methodology involved in heating corundum, starting with identifying rough material in the field and sorting it from other gem materials. He also gives an overview of classical gemmology, as well as advanced gemmological instruments for identification found in major gemmological laboratories, before continuing with a sub-chapter on the chemical cleaning of corundum. He lists all the acids that are used in various cleaning processes, generally with a description of the substance it is supposed to remove, the necessary equipment and a detailed description of how to clean the corundum. He then describes pre-burning processes and why they are performed, why shaping the rough stones may be necessary, how to assess certain features and attributes of the corundum, and how to classify it into different groups. Afterwards, he explains step by step how to determine the appropriate heating process, with many tips on what to watch out for when loading the crucible, choosing the right atmosphere, running the heating process, retrieving the stones and assessing the results.

In Chapter 9, Themelis gives a rundown of heating equipment from blow pipes to primitive furnaces to the most complicated electric furnaces. This chapter again gives many examples of which corundum is heated with which oven, together with some historical data from the 1980s. It is followed in Chapter 10 by an account of problems and damage that can occur during the heating process, be it failure of the instrument, overheating or contamination, as well as the effects fluxes may have on equipment.

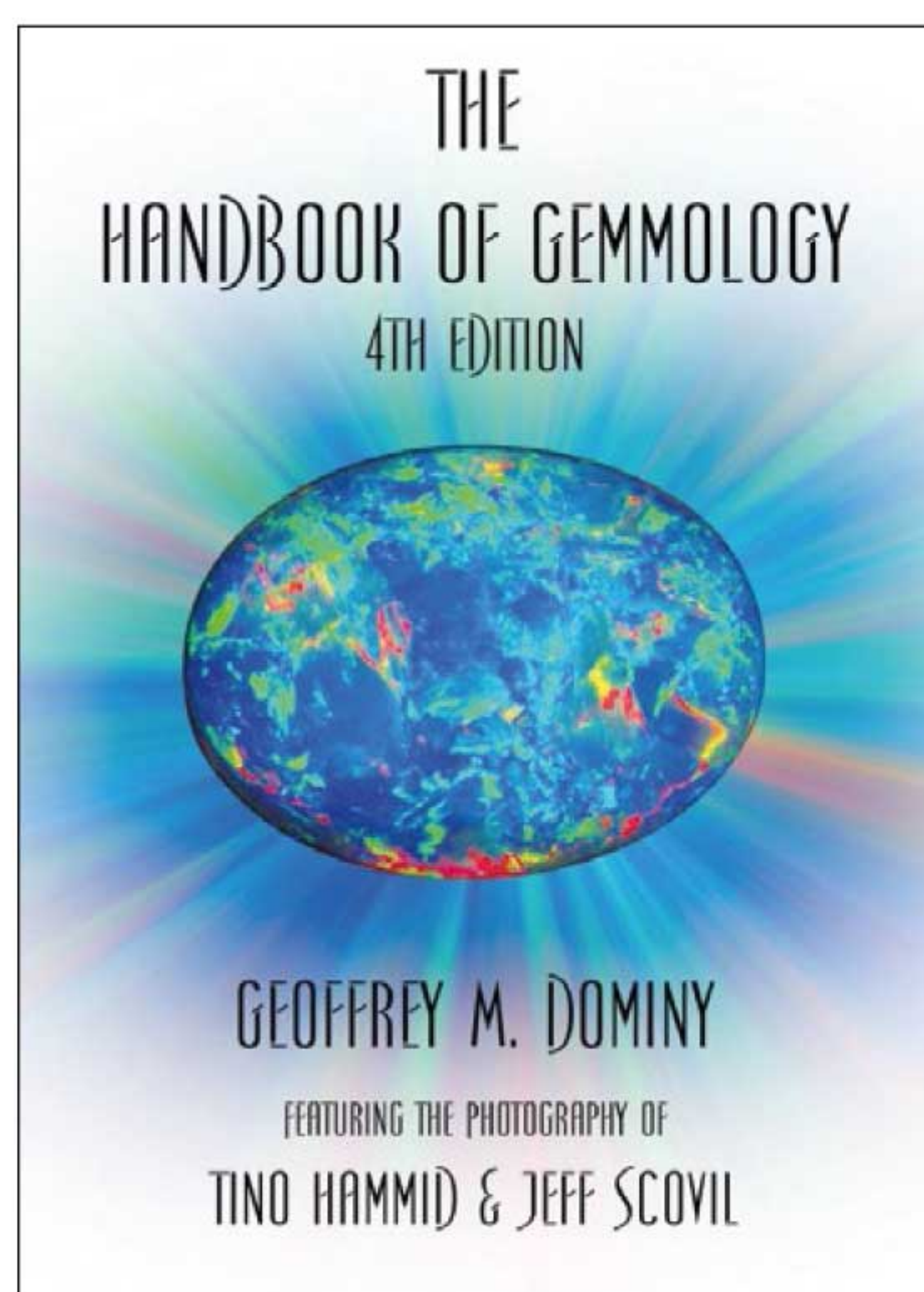
The final chapter (Chapter 11) gives a classification of the heating processes for ruby and sapphire, accompanied by flow charts and before-and-after images of treated corundum. Here, I was a bit puzzled about the group classifications in the flow charts because I did not see an explanation why Themelis provided these group names without using them elsewhere to describe the processes (perhaps this will be done in Vol. 2).

In conclusion, this is a very thorough book, mainly addressed toward someone wanting to learn about heat treatment, but I also highly recommend it to the interested gemmologist as there is information that is not found elsewhere (e.g. types of fluxes and cleaning

substances, the effect of heating on certain inclusions and the temperatures used for certain treatments). However, the book contains such a wealth of information based on experience that it is sometimes hard to combine the information found in the various chapters. The individual pages appear slightly overloaded with images and text, but this helps to keep the book at a reasonable size that is easy to use as a reference guide. Overall, I think it is a valuable book wherever heat treatment is concerned, and I am curious how Themelis will follow it in the second volume.

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## The Handbook of Gemmology, 4th edn.

By Geoffrey M. Dominy, 2017. Amazonas Gem Publications, Mallorca, Spain, <http://handbookofgemmology.com>, 1,342 pages, illus., ISBN 978-0991888238. US\$49.95 eBook.

**N**ow in its 4th edition, Geoffrey Dominy's digital *Handbook of Gemmology* continues its expansion into the gemmological field, creating an indispensable electronic reference that should be in every gemmologist's library. Running an impressive 1,342 pages, this edition aims to be a one-stop reference source, more easily carried and accessed than any traditional paper book of this size.

If downloaded as the 'flip-book' option, the *Handbook* comes complete with a handy overlay function that details the interactive features of the book and helps the user get the maximum potential from this format. Thumbnail previews allow the equivalent of quickly flicking through a traditional paper book, enabling

sections to be easily located. The book also can be downloaded as a PDF file which, for technophobes, still allows a high level of interactivity and searchability. Colour-coded bookmarks, highlights and positionable 'post-it' notes are available, thus making each person's copy a truly unique and individual book. These features provide an interesting crossover from paper to digital format, and are bound to prove useful to those not wishing to mark up a traditional paper book. Another way to access the eBook is to log in and view it online, so there is no need to take up space on one's hard drive.

Using a columnar format, and high-quality images throughout, Dominy illustrates each chapter, often with full-page views of gemstones or features, bringing his customary style to all areas of the book.

Certain areas enjoy greater detail and more in-depth discussion than previous editions. For example, when considering atoms and bonding, Dominy includes s, p, d and f orbitals in a way that the lay person can follow. This is beyond the information provided by most other gemmological courses, but with advances in treatments and synthesis, it is increasingly important to have a greater understanding of such properties in gem materials.

Each crystal system also gets its own explanation, often covering several pages, and is related back to familiar household items, such as the tetragonal system that is explained by way of a milk carton. Crystallographic concepts are often difficult for students to grasp, which makes this a useful teaching tool. Within the same chapter the author also lists an extensive range of magnetic/paramagnetic reactions from various gem materials, an area that I have always found interesting but lacking in most mainstream texts. Dominy provides a reasonably extensive list of these magnetic reactions, covering the main gem materials that are found in today's jewellery market.

Spectroscopy and light absorption are covered in another chapter, and a variety of spectra are provided, with colour illustrations accompanied by lists of important absorption lines. With an ever-expanding use of laboratory equipment, these spectral lines play an increasing role in gemmological testing. This is demonstrated at the end of the chapter, where the visible spectrum is overlaid onto spectral traces obtained from a spectrophotometer, which allows direct comparisons to be made and eases the transition from traditional to modern laboratory gemmology.

The section on refraction covers detailed use of the refractometer and underlying theory, and gives an excellent visual representation of the distant-vision or spot method for obtaining a reading from a non-planar surface.