Media Reviews

The Biographical Dictionary of Scientists, 3rd edition. Consultant Editors, Roy Porter and Marilyn Ogilvie. 2 volumes. Oxford University Press, New York, 2000 x + 1196 pp., hardcover. 16.0 × 23.5 cm. $125.00. ISBN 0-19-521663-6.

In the mid-1980s Peter Bedrick (Bedrick Books: New York, 1984) published, and Harper & Row distributed a six-volume reference set, *The Biographical Dictionary of Scientists*, edited by David Abbott, with the individual volume subtitles—*Astronomers, Biologists, Chemists*, and *Physicists* (all published in 1984) and *Mathematicians* and *Engineers and Inventors* (both published in 1986). Roy Porter, Associate Director of the Wellcome Institute of the History of Medicine, London, together with 34 other contributors, produced a second edition of this reference work in one convenient volume published by Oxford University Press in 1994. Together with Marilyn Ogilvie, Professor and Curator of the History of Science Collections at the University of Oklahoma, Porter edited a third edition of this biographical dictionary. Unfortunately, this highly acclaimed, prolific, and personally unconventional British historian died prematurely of an apparent heart attack on March 4, 2002 at the age of 55.

The new edition includes entries by 43 contributors on 1260 men and women (compared to 1178 in the previous edition) from ancient times to the present day, with an emphasis on contemporary figures, in the fields cited above plus earth sciences, ranging in length from 7 lines (al-Sufi) to four pages (Sir Isaac Newton). Arranged alphabetically from Abbe to Zworykin, the extensively cross-referenced entries not only provide basic biographical information in historical and scientific context but also discuss the significance of the scientists' contributions and show how their personal, social, political, religious, and artistic concerns affected their lives and careers. Once again, a short general introduction and succinct, updated historical reviews of the seven fields (8–10 pages each) are provided. More than 150 portraits, diagrams, photographs, and other illustrations are provided—a welcome change from earlier editions, which did not contain any portraits.

Again, useful but unusual features for a biographical dictionary—an extensive (83-double-column-page) glossary of about 2,000 items from Abelian functions to zygote and appendices listing Nobel laureates for chemistry, physiology or medicine, and physics through 1999 and the grounds for their awards—are included. For the first time a list of recipients of the Field Medal, the international prize for achievement in mathematics awarded every four years since 1936, is included. Other new features are a four-double-column-page general alphabetical list of scientific discoveries and chronologies, ranging in length from three to seven pages, for each of the seven fields in the dictionary. A really unusual feature that I have never seen in any book of this type is the inclusion of striking quotations by some biographees set off prominently in boxes. Once again, a detailed (50-triple-column-page) index with names of the biographees in boldface capital letters is provided, but, as in earlier editions, with no page numbers!

Twenty closely associated scientists (compared to 25 in the second edition; not an actual reduction in number; some composite biographees such as Crick, Watson, and Wilkins now rate separate entries) are discussed in single entries, for example, William Henry and (William) Lawrence Bragg, Carl Ferdinand and Gerty Theresa Cori, Marie and Pierre Curie, Charles Martin Hall and Paul Louis Toussaint Héroult, Irène and Frédéric Joliot-Curie, Orville and Wilbur Wright, and Chen Ning Yang and Tsung Dao Lee. Many, but by no means all, Nobel laureates are the subjects of entries, for example, Michael Polanyi, a nonlaureate, but not his laureate son John.

There has been a marked increase in the number of women scientists included—53 compared to only 19 in the previous edition (About a quarter of the contributors are women). Both well-known scientists, such as Rachel Carson, Rosalind Franklin, Jane Goodall, Maria Goeppert-Mayer, Dorothy Crowfoot Hodgkin, Barbara McClintock, Lise Meitner, and Rosalyn Sussman Yalow and lesser known ones such as Maria Gaetana Agnesi, Laura Bassi, and Alice Hamilton (1869–1970; one of a rare breed of centenarian scientists) are included.

Unlike the 18-volume *Dictionary of Scientific Biography (DSB)* (Gillispie, Charles Coulston; Holmes, Frederic L., Eds.; Charles Scribner's Sons: New York, 1970–1990), the standard in this genre, Porter and Ogilvie's dictionary includes living subjects such as science popularizers David Attenborough, Richard Dawkins, Stephen Jay Gould, and Stephen Hawking. The coverage seems somewhat arbitrary; a number of lesser scientists are included, whereas more important ones are missing. Although Lysenko, Mendeleev, and Pavlov are included, Russian scientists such as Borodin, Butlerov, Chernyaev, Chugaev, Kurnakov, Lomonosov, Vernadsky, and Zinin are missing, as are some important chemists of other nationalities. British spelling is used consistently, and although the scope is international, coverage of British scientists, some of whom are only minor figures, is surprisingly extensive.

The extent of coverage is still not always commensurate with the scientist's contributions and achievements, a defect noted by at least one reviewer of the *Mathematicians* volume of the first edition (Feldman, D. V. *Choice* **1986,** *23,* 1651). For example, Lavoisier rates only 1-1/2 pages, whereas lesser figures, in chemistry and other fields, receive equal or greater coverage. Although touted as updated, the entries on Gerhard Herzberg (p 481) and William Hunter McCrea (p 644), both of whom died in early 1999 (March 3 and April 25, respectively), do not reflect these facts.

The encyclopedia compares favorably with its primary competitors, for example, *Asimov's Biographical Dictionary of Science & Technology*; 2nd rev. ed.; Doubleday: Garden City, NY, 1982 (882 entries, $39.95 paperback; out of print); *The Cambridge Dictionary of Scientists*; Millar, David; Millar, Ian; Millar, John; Millar, Margaret, Eds.; Cambridge University Press: Cambridge, England, 1996 (more than 1300 entries, $39.95; a new edition with about the same number of entries is scheduled for publication in 2002 and should be in print by the time that this review appears); and *Biographical Encyclopedia of Scientists;* 2nd ed.; Daintith, John; Mitchell, Sara; Tootill, Elizabeth; Gjertsen, Derek, Eds.; 2 vols.; Institute for Physics Publishing: Bristol, England and Philadelphia, PA, 1994 (about 2,000 entries, $190; out of print).

The hallmark of a dictionary or encyclopedia, however, is not only coverage but accuracy, and it is in this area that Oxford's *The Biographical Dictionary of Scientists* suffers serious deficiencies. A reviewer of the *Engineers and*

Inventors volume of the first edition stated, "Proofreading is rather uneven," citing errors that still had not been corrected in the second edition (Havlik, R. J. *Choice* **1986,** *24,* 78). In my review of the second edition (Kauffman, G. B. Compromises: Quality, Quantity, and Cost. *Angew. Chem. Int. Ed. Engl.* **1995,** *34,* 2168–2169; *Angew. Chem.* **1995,** *107,* 2774–2775 (in German)) I cited a number of errors, mostly among the chemist entries, which, in my view, cast doubt on the accuracy of the entries on practitioners of the other fields, a point corroborated for the biologist entries by another reviewer (Altman, Jennifer. Five Thousand Years of Certitude. *New Scientist* 1**994** (July 30), *143,* 41).

A few of the errors in the second edition that I cited have been corrected, but, unfortunately, most have not. In the third edition the first names of Bosch (pp 173, 440, 1152) and Scheele (pp 281, 834, 873, 1039) are still given as "Karl" not Carl. Other misspellings or typos include Conte "de" (not di) Quaregna (Avogadro) (p 102), "Marcelin" for Marcellin (Berthelot) (p 143, 1151), zeros for O's in chemical formulas (p 146), *"Encyclopedia Britannica"* for *Encyclopædia Britannica* (p 351), "H+" for H^+ (pp 489, 1040), "OH-" for OH^- (p 1040), "Poirrer" for Poirier (p 595), "Viktor" for Victor (Meyer) (pp 679, 803, 1175), "Konrad" for Conrad (Röntgen) (pp 810, 1185), "Cl" for Cl^- (p 965), "Bresslau" for Breslau (p 440), *"Handwortenbuch"* for *Handwörterbuch* and *"practische"* for *praktische* (p 567), "Frederick" for Friedrich (Kekulé) (p 1041), and the cross-reference for Count Rumford lists him as "Thomson" not Thompson (p 1192). Although my name is given correctly on pp 425 and 866, it appears incorrectly as "George R. Kauffmann" on p 844.

Diacritical marks are sometimes missing, as in Väversunda (p 146), Schönbein (pp 273, 1186), Traité élémentaire (p 280), René (Haüy) (p 462), Birkhäuser (pp 669, 976, 1001), Schütt (p 691), and RuĬiăka (p 780), *Über* (p 1040), and are inserted when not needed, as in "Karlsrühe" (p 210) and "Thénard" (pp 614, 1191). Several chemists are consistently referred to by their first names rather than their more familiar names, for example, "Johann" (not Adolf) von Baeyer (pp 111, 524, 550, 981), "Friedrich" (not August) Kekulé (pp 112, 363, 614, 932, 1013, 1040), and "Pierre" (not Marcellin) Berthelot (p 965).

More serious, however, are the errors of fact. For example, the structural formula for adipic acid shows two nitrogen atoms in place of the two terminal carbon atoms (p 215); the structural formula for a 1-methylphenylhydrazone derivative lacks nitrogen atoms (p 363); the second structural formula for benzene has a double bond missing (p 550); and some of the Lewis structures for NO lack formal charges (pp 612, 619). Heisenberg was born in Sanderau, a suburb of Würzburg, not in Duisberg, an error probably copied from Asimov (p 468); gallium was discovered in 1875 not 1871 (p 673); Moseley's work on atomic numbers as a basis for Mendeleev's periodic system dates from the 1910s not the 1920s (Moseley, as is well known, was killed by a Turkish sniper on August 10, 1915 in the ill-fated Gallipoli campaign) (p 673); Alfred Werner was too ill to work on coordination compounds after the end of World War I (p 853), and he considered only organic compounds, not coordination compounds, in his *Habilitationsschrift* of 1891 (p 965); Guldberg and Waage first announced their law of mass action in 1864 (in Norwegian) not in 1867 (in French) (p 933); and both inorganic and organic nomenclature do not adhere to IUPAC recommendations (too frequent to cite examples).

Reviewers of the first edition called attention to the lack of any citations to sources of biographical information as a serious flaw in this dictionary that makes it of little use to historians of science or readers wishing to pursue additional information about the biographees. This deficiency was not remedied in the second edition, but the latest edition includes a few sources, some as late as 1999, as "Further Reading" for a very small minority of the entries. Unfortunately, none of the entries is signed. I suspect that the continuing prevalence of uncorrected errors is due to the fact that the editors, rather than the individual contributors, were responsible for proofreading.

All things considered, the relatively modest price of Porter and Ogilvie's biographical dictionary and its wide coverage make it a handy first-step reference source for the general public, for high school, college, and university students, and for practicing scientists with an interest in the history of their fields. The frequency of errors, however, will make it necessary for the user to visit a library to consult other more authoritative sources such as the *Dictionary of Scientific Biography*, both to check specific facts and spellings and for additional, more detailed information.

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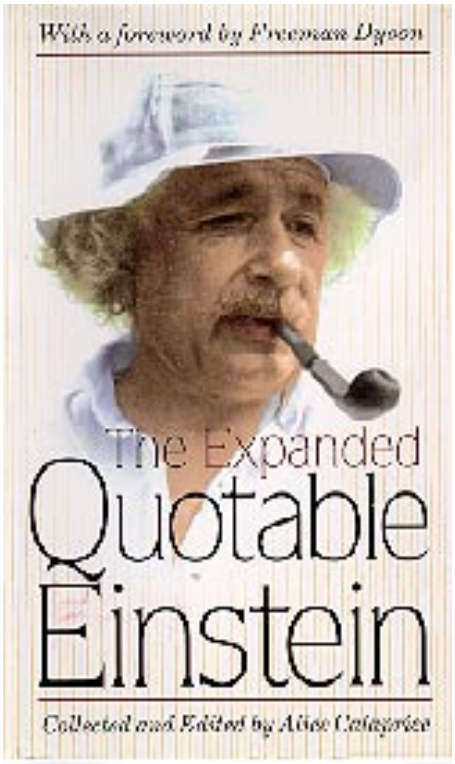
The Expanded Quotable Einstein. Collected and edited by Alice Calaprice; foreword by Freeman Dyson. xxxiv + 269 pp. Princeton University Press: Princeton, NJ; Oxford, England, 2000. Illustrations. xliii + 407 pp, 12.0 × 19.1 cm. $18.95; £11.95, hardbound. ISBN 0-691-07021-0.



At the turn of the Millennium *Time* magazine named Albert Einstein (1879–1955) "Man of the Century," and he is celebrated worldwide as a cultural icon. Consequently, there is

a great demand for readable, factual information about him. Alice Calaprice, Senior Editor at Princeton University Press of *The Collected Papers of Albert Einstein* (1987–1997), recipient of a National Science Foundation grant for directing PUP's Einstein Translation Project, and recipient of the 1995 Literary Market Place (LMP) Award for Individual Editorial Achievement in Scholarly Publishing, has worked with the Einstein Papers for more than a score of years.

In 1996 PUP published her collection of 557 quotations by Einstein, thematically arranged, and 51 quotations about Einstein by others, all with complete reference citations, along with 18 quotations attributed to Einstein, whose sources she could not find. Her handy, pocket-sized anthology of quotations, ranging in length from a single equation ($E = mc^2$) to two paragraphs, also contained an updated family tree that included great-great-grandchildren and a chronology succinctly summarizing Einstein's personal life and career (10 pp). Her book was of great value to anyone interested in Einstein and of special utility to chemical educators who regularly spice up their lectures with quotations and other human-interest items.

Four years and 22 foreign language translations later Calaprice has updated and greatly expanded her popular, critically acclaimed anthology (from 303 to 450 pages), which now includes 364 additional quotations (some as long as several pages) and items (preceded with asterisks). She has also made corrections and additions to the original quotations and sources, retranslated awkward passages, and expanded some annotations. Furthermore, she has added a new section on music, an appendix, and new information that has come to light since the first edition, for example, information on the Nobel Prize, Mileva Marić as his collaborator, and the removal of Einstein's brain. A number of readers sent her the sources of many of the quotations in the "Attributed to Einstein" section of the first edition, and she has inserted the authenticated and documented quotations into the text under the appropriate sections.

For those unfamiliar with the first edition as well as for owners of that edition who would like to see where most of the new material has been added, the following list of the book's sections should be useful. The corresponding numbers of pages in the original edition are given in parentheses:

- On Einstein Himself, 18 pp (13)
- On Family, 24 pp (13)
- On America and Americans, 8 pp (8)
- On Death, 4 pp (3)
- On Education and Academic Freedom, 5 pp (5)
- On Friends, Specific Scientists, and Others, 20 pp (19)
- On Germans and Germany, 6 pp (4)
- On Humankind, 7 pp (3)
- On Jews, Israel, Judaism, and Zionism, 19 pp (10)
- On Life, 3 pp, the shortest section (3)
- On Music (new section), 5 pp
- On Pacifism, 8 pp (5)
- On Peace, War, the Bomb, and the Military, 15 pp (11)
- On Politics, Patriotism, and Government, 10 pp (8)
- On Religion, God, and Philosophy, 21 pp (17)
- On Science and Scientists, Mathematics, and Technology, 40 pp (21)
- On Miscellaneous Subjects, 43 pp, the longest section; topically and alphabetically arranged from abortion to youth) (32)
- Attributed to Einstein, 10 pp (3)
- Others on Einstein, 24 pp (14)
- Answers to the Most Common Nonscientific Questions about Einstein, 16 pp (11)
- Appendix (new section), 11 pp
- Bibliography, 6 pp, with books as late as 1999 (4 with books as late as 1995)
- Index of Key Words, 5 double-column pages to help readers locate familiar quotations (4)
- Subject Index, 15 double-column pages to lead readers to subjects of particular interest. (5)

Each section is prefaced with an illustration. There are 27, all different from the 26 in the first edition, including a caricature by Ben Shahn (frontispiece), Einstein's death certificate (p 58), a photo of his famous violin, nicknamed "Lina" (p 151), and one of Einstein with an Einstein puppet (p 311). The photograph of Einstein's statement of the equivalence of mass and energy ($E = mc^2$; p 223), which opened up the atomic age, written in his own hand in his manuscript of 1912 on the special theory of relativity, shows that in his equation of 1905 he used *L* to represent energy until 1912, when he crossed out the *L* and substituted *E*.

The quotations, which introduce the reader to Einstein's many sides, chronicle his development from age 17 ("A happy man is too satisfied with the present to dwell too much on the future" [p 5].) to his final words at age 76 ("I have finished my task here" [p 22]). In addition to many unfamiliar quotations, all the common ones are here such as those that have appeared on posters and T-shirts, for example, "Imagination is more important than knowledge" (p 10) and "The eternal mystery of the world is its comprehensibility….The fact that it is comprehensible is a miracle" (p 278). Naturally, quotations about relativity abound: "If my theory of relativity is proven successful, Germany will claim me as a German and France will declare that I am a citizen of the world. Should my theory prove untrue, France will say that I am a German and Germany will declare that I am a Jew" (p 9); "An hour sitting with a pretty girl on a park bench passes like a minute, but a minute sitting on a hot stove seems like an hour" (an explanation of relativity given to Helen Dukas, Einstein's secretary and keeper of his archives, to relay to reporters and other laypersons, p 263).

Besides the entire famous letter of August 2, 1939 to FDR, composed by Leo Szilard and signed by Einstein (p 374–377; the first edition gives only the first two sentences) is the unfamiliar statement, "I made one mistake in my life—when I signed that letter to President Roosevelt advocating that the atomic bomb should be built" (letter to Linus Pauling, p 184). Similarly, Einstein's well-known statement, "The Lord God is subtle, but malicious he is not" (p 241) is balanced by "I have second thoughts. Maybe God *is* malicious" (p 241). A number of his prejudices are "politically incorrect" such as his ideas on women in science ("Very few women are creative" [p 307]).

At the time of writing our review (March 10, 2002. In the United States income tax returns are due annually on April 15), we were surprised to find that the statement on a plaque gracing our tax accountant's office wall attributed to Einstein,

"The most difficult thing to understand is the income tax" (p 320), is "probably not by Einstein."

This is not the first anthology of Einstein quotes. In *Albert Einstein, the Human Side* (Princeton University Press, 1979) Helen Dukas and her coeditor, Banesh Hoffmann, presented the view of Einstein that she wanted the world to see—"the Einstein of legend, the friend of schoolchildren and impoverished students, the gently ironic philosopher, the Einstein without violent feelings and tragic mistakes" (p xiii). In contrast, in her collection Calaprice has chosen her quotes impartially, revealing, but not emphasizing, Einstein's darker side, especially with regard to his family. In the words of Freeman Dyson, who wrote the foreword, "the book shows him as he was—not a superhuman genius but a human genius, and all the greater for being human."

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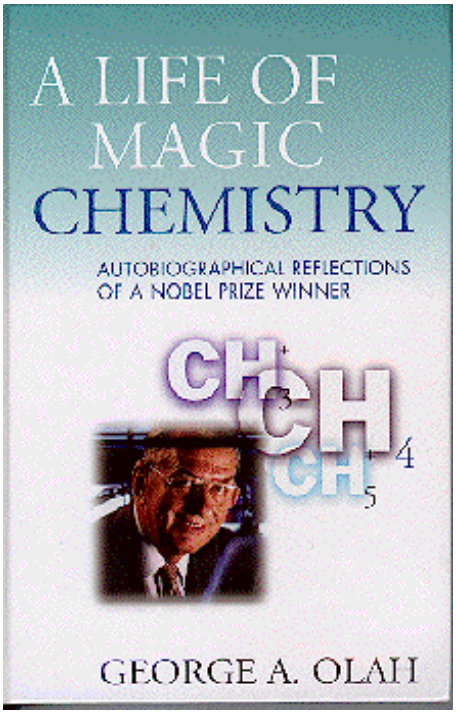
A Life of Magic Chemistry: Autobiographical Reflections of a Nobel Prize Winner. George A. Olah. Wiley-Interscience, New York, 2001. x + 277 pp, hardcover. 16.5 × 24.0 cm. $34.95; £25.50. ISBN 0-471-15743-0.



A detailed understanding of reaction intermediates lies at the very heart and essence of chemical transformations and hence, of modern chemistry itself. Carbocations and related electron-deficient species represent the most important intermediates in all of organic chemistry. George Andrew Olah discovered ways to observe carbocations as persistent, long-lived species. In the words of the Swedish Academy of Sciences, "he gave the cations of carbon longer life." His development of superacids (a term coined by the late James Bryant Conant) billions of times stronger than sulfuric acid and superelectrophiles has revolutionized many fields of chemistry. The reactions and methods that he pioneered are now applied in organometallic, synthetic organic, bioorganic, and industrial chemistry.

From the beginning of his career Olah was fascinated by reaction mechanisms and the unstable intermediates through which chemical reactions were postulated to proceed. His scientific hero was German chemist Hans Meerwein (1879–1965), a prominent pioneer of mechanistic organic chemistry with whom he corresponded extensively. Meerwein proposed that reactions beginning with neutral reactants and leading to neutral products might proceed via cationic intermediates, a suggestion that was greeted with skepticism by his contemporaries. It was assumed that if such transient species existed at all, they would have lifetimes of a billionth of a second or less and would be present in very low concentrations because of their high reactivity.

Olah dedicated himself to the search for these elusive intermediate strong acids and soon realized that they could not be prepared in the presence of any solvents that could act as bases, which would immediately react with and destroy them. Finding suitable media was extremely difficult so he tried using strong acids as the solvent itself. After numerous experiments, by using "superacids" such as FSO_3H, AsF_5, SbF_5, NbF_5, and FSO_3H-SbF_5 ("magic acid")—substances trillions of times stronger than conventional acids, he was able to stabilize and characterize these unstable, short-lived, extremely reactive species that determine the ways in which ionic organic reactions proceed.

Olah's pioneering studies are of more than theoretical interest. They have led to new methods for converting low-octane, straight-chain saturated hydrocarbon fuels to cleaner-burning, higher-octane branched gasoline. His techniques have also enabled chemists to crack heavy oils that readily poison metallic catalysts and to liquefy coal under very mild conditions, yielding liquid hydrocarbon fuels. They have resulted in fundamentally new methods for converting abundant and virtually unreactive methane (CH_4), the main constituent of natural gas, to higher hydrocarbons, permitting it to be used as a versatile chemical building block. An ardent environmentalist, Olah devised various ways of creating more environmentally friendly fuels, plastics, and polymers that have helped to transform our world. Since fossil fuels such as oil, natural gas, and coal—our current sources of hydrocarbons—are limited, nonrenewable sources whose production in nature requires millions of years, the practical significance of Olah's work cannot be overestimated.

Because we had interviewed Olah, a 6-foot, 5-inch, jovial, energetic man with a well-developed sense of humor, on November 14, 1994—after the announcement of his receipt of the Nobel Prize in Chemistry "for his contributions to carbocation chemistry" but before his departure for Stockholm [1], we looked forward to his autobiography with more than usual interest. Knowing of his positive outlook (He had told us, "Life is too short to be a pessimist. If you want to have a productive life, you'd better concentrate on the positive") and his modest but outgoing personality, we expected an upbeat, enthusiastic, frank account of his achievements, adventures, journeys, and vicissitudes. And we were not disappointed.

The book, dedicated "to [his wife] Judy, who made it all possible," is a balanced blend of about equal amounts of science, chemistry, and technology on the one hand and personal reminiscences on the other. After a brief "Introduction" (Chapter 1, 3 pp), in Chapter 2, "Perspectives on Science" (17 pp), obviously intended for the general reader,

Olah explains the way that science functions and its relationship to reason, philosophy, belief, and religion. His extensive use of quotations from a variety of sources bears witness to his wide reading and erudition. In Chapter 3, "Chemistry: The Multifaceted Central Science" (17 pp), Olah presents a brief history of chemistry from its practical beginnings in ancient Egypt to the elucidation of the double helix structure of DNA.

In Chapter 4, "Growing up in Hungary and Turning to Chemistry" (13 pp), Olah begins his personal biography. Györgyi András Olah, the son of Gyula Olah, a lawyer, and Magda Olah (née Kraznai), a housewife, was born in the Pest side of Budapest on May 22, 1927. In this chapter he presents considerable background material on Hungary and distinguished Hungarians who achieved greatness in various fields. He attended an extraordinarily strict Roman Catholic high school (*gymnasium*), where students were assigned lots of homework and attended classes six days per week. He found diverse jobs such as cleaning up rubble and moving pianos in the Budapest Opera House.

Although a "stellar student" (His wife prefers the more contemporary expression "nerd") and valedictorian, Olah was interested more in Hungarian literature and history than in science. Since he would be unable to make a decent living in these fields in post-World War II Hungary, he chose chemistry, particularly organic chemistry, as a practical and interesting profession. He entered the Technical University of Budapest, from which he received his Ph.D. in 1949, the year in which, on July 9, he married Judith Agnes Lengyel, a laboratory technician whom he had met when he was 16 and she was 14 and whom he persuaded to study chemistry at the university. She later became an Adjunct Associate Professor of Chemistry in her husband's institute at the University of Southern California until her retirement in 1990.

In Chapter 5, "Early Research and Teaching: Departing the Shadow of Emil Fischer" (13 pp), Olah describes his years as a faculty member of the Technical University of Budapest (1949–54) and Associate Director of the Central Chemical Research Institute, Hungarian Academy of Sciences (1954–56), where his wife also was employed. He began his research in the university's Organic Chemistry Institute of Professor Geza Zemplen, a noted carbohydrate chemist who had studied under 1902 Nobel chemistry laureate Emil Fischer (Olah meticulously and consistently notes each Nobelist that he mentions and records the year of the award). Under primitive conditions Olah initially investigated reactions of fluorinated carbohydrates and proceeded to Friedel–Crafts acylation and alkylation reactions with acyl or alkyl fluorides using BF_3 as a catalyst. When the 1956 uprising occurred, the Olahs joined the torrent of refugees seeking a new life in the West.

In Chapter 6, "Move to North America: Industrial Experience While Pursuing the Elusive Cations of Carbon" (20 pp), we learn how the Olahs emigrated first to London, where his wife had relatives (winter of 1956–57), then to Canada, where the future Nobel laureate became a Research Scientist at Dow Chemical Canada in Sarnia, Ontario (1957–64), and finally to the United States, where he became a Research Scientist at the Dow Chemical Company, Framingham, Massachusetts (1964–65).

In Chapter 7, "Return to Academia—The Cleveland Years: Carbocations, Magic Acid, and Superacid Chemistry" (24 pp), Olah becomes Professor of Chemistry and Department Chairman (1965–69) and C.F. Mabery Research Professor (1969–77) at Western Reserve University, Cleveland, Ohio, where he played a pivotal role in catalyzing the merger of his university with nearby Case Institute of Technology to form today's Case Western Reserve University. (Not enamoured of administration, he once told us, "The best department chairs and deans should be those who are willing to serve their turn but are eager to get out"). Here we also learn of his philosophy of teaching, research supervision, and the names of his students, topics that are also dealt with in other sections of the book. We are also treated to a short course in acid–base and carbocation chemistry (In 1972 Olah suggested the term "carbocations" in analogy to the term "carbanions" for the corresponding anions).

In Chapter 8, "Moving to Los Angeles: Building the Loker Institute—Hydrocarbons and Hydrocarbon Research" (29 pp), Olah moves to the University of Southern California as Donald P. and Katherine B. Loker Distinguished Professor of Organic Chemistry and Scientific Director of the Loker Hydrocarbon Research Institute, the country's first research institute dedicated to the fundamental study of hydrocarbon chemistry and related graduate education. He co-founded the institute with physical chemist Sidney Benson, aided by a donation from Donald Loker and his wife Katherine, a USC alumna whose father founded StarKist Foods.

Under Olah's direction the institute has made USC a world-renowned center for hydrocarbon research and has attracted significant support from government agencies, industry, and numerous benefactors. Its scientists have published more than 1,000 articles, and its alumni and alumnae include more than 400 Ph.D. students and postdoctoral researchers. Its 25th anniversary was celebrated in March 2002 with a symposium on "Trends in Hydrocarbon Chemistry for the New Century" [2]. In this chapter Olah details the objectives of the institute and its educational work and provides a brief summary of hydrocarbons, coals, and their production and applications for laypersons. He also tells of his life-threatening bout with pemphigus, an extremely rare disease of the immune system, that both he and USC Chemistry Department Chairman Jerome ("Jerry") Segal probably contracted from traces of penicillamine (The old science building had been used for pharmacological research).

The title of Chapter 9, "'Every Scientist Needs Good Enemies': The Nonclassical Ion Controversy and Its Significance" (16 pp), derives from a favorite quotation of Olah's by George von Bekesy, a fellow Hungarian-born physicist and 1961 Nobel physiology or medicine laureate, that is worth quoting here:

> [One] way of dealing with errors is to have friends who are willing to spend the time necessary to carry out a critical examination of the experimental design beforehand and the results after the experiments have been completed. An even better way is to have an enemy. An enemy is willing to devote a vast amount of time and brain power to ferreting out errors both large and small, and this without any compensation. The trouble is that really capable enemies are scarce; most of them are only ordinary. Another trouble with enemies is that they sometimes develop into friends and lose a great deal of their zeal. It was in this way the writer lost his three best enemies. Everyone, not just scientists, needs a few good enemies!

At the 1962 Brookhaven Organic Reaction Mechanisms Conference Olah announced the discovery of the first long-lived alkyl cation salt, *tert*-butyl hexafluorantimonate(V),

$(CH_3)_3C^+[SbF_6]^-$, which was stable enough to be studied both chemically and spectroscopically. Saul Winstein and 1979 Nobel chemistry laureate Herbert C. Brown, who had been carrying on a continuing controversy over the "nonclassical" or "classical" structure of carbocations (then known as carbonium ions), cautioned Olah, then a young chemist from an unknown industrial laboratory, about making such a claim. In this chapter Olah describes how he developed new NMR and ESCA methods of obtaining other long-lived alkyl cations in solution and eventually provided experimental proof of Winstein's view that the 2-norbornyl cation and other carbocations possess nonclassical structures.

Chapter 10, "From Kekulé's Four-Valent Carbon to Five- and Higher-Coordinate Hypercarbon Chemistry" (16 pp), deals with what Olah considers his major contribution to chemistry—his work on carbocations that formed the foundation for the development of what is now referred to **as** "hypercarbon chemistry," that is, the chemistry of five and higher coordinate carbon compounds. CH_5^+ can be considered the parent of these species. Whereas Kekulé's fundamental concept of the limiting valence of four for carbon continues to be a cornerstone of chemistry, the ability of electron-deficient carbon to coordinate with five, six, or even seven neighboring groups or atoms is of increasing significance. This ability also represents the basis of the electrophilic reactivity of C–H and C–C single bonds and thus of alkanes in general.

Chapter 11, "The Nobel Prize: Learning to Live with It and Not Rest on Laurels" (19 pp), begins with an unexpected phone call from Stockholm informing Olah that he had become the first Nobel laureate in his university's 114-year history (USC had previously been known for its athletic achievements), relates how the prize brings a plethora of invitations, tells of his determination not to allow the honor to change his way of life substantially, and provides details of the ceremonies and little known facts about the prize (Did you realize that the United States is the only country that taxes the prize? However, Olah was lucky not to have paid duty on the Nobel gold medal). He donated part of the prize money to endow a chemistry prize in Hungary and a chair in chemistry at USC (His former graduate student G. K. Surya Prakash, now Scientific Co-Director of the Loker Institute, became the first "George and Judy Olah Professor").

Chapter 12, "Post-Nobel: From Superacids to Superelectrophiles" (17 pp), and Chapter 13, "Societal and Environmental Challenges of Hydrocarbons: Direct Methane Conversion, Methanol Fuel Cell, and Chemical Recycling of Carbon Dioxide" (17 pp), are surveys loaded with structural formulas and reaction schemes of exactly what the titles state. Olah's discoveries in the field of carbocations and novel electrophiles provided the insights into his fundamental findings concerning the electrophilic activation of C–H and C–C single bonds and formed the basis for his development of new and improved hydrocarbon transformations. Because the chapter titles are so specific and descriptive, Olah's book lends itself to browsing as well as to complete reading; the layperson may omit the more technical chapter if he or she desires.

In Chapter 14, "Gone My Way" (37 pp, the longest chapter), Olah reminisces on a full and rewarding career from the banks of the Danube River to the shores of the Pacific Ocean. Among the diverse topics that he discusses are conditions and opportunities for scientists in Hungary, the attractions and goals of chemical research, the pros and cons of the grant awarding system, bureaucracy in science, age and its effect on the productivity of scientists, choosing research problems, basic and applied research, writing, editing, reviewing, teaching, lecturing, the obligation to publish, traveling (Like us, George and Judy are basically not "great travelers" and prefer to stay home), graduate students, postdoctoral fellows, scientific fraud, science education, consulting (He abandoned most of his consulting after moving to Los Angeles), patents, awards, honorary degrees, and life's challenges.

Errors are limited to minor misspellings such as "Becker" for Becher (originator of the phlogiston concept) (p 26), "Humphrey" for Humphry (Davy, a common mistake) (p 28), "Oswald" for Ostwald (p 30), "Science" for Sciences (Royal Swedish Academy of) (p 178), and "Carl Gustav XVI" for Carl XVI Gustav (pp 180 and 263). Extensively cross-referenced, replete with 47 photographs (including ones of family cocker spaniels, Jimmy and Mookie, the Olahs' canine counterparts of the Fiesers' cats, who adorn their books), 7 numbered figures, and countless structural formulas, equations, reaction schemes, and charts, and a 17-double-column-page index, this book is not only an engrossing, insightful, and inspiring autobiography of one of the most innovative and productive of contemporary scientists but also a paean to his adopted country. In his brief statement accompanying his *Who's Who* biographical sketch Olah wrote, "America is still offering a new home and nearly unlimited possibilities to the newcomer who is willing to work hard for it. It is also where the 'main action' in science and technology remains."

This fascinating volume will be of interest to scientists in general, chemists in particular, historians of science, and laypersons concerned with the scientific enterprise. We warmly recommend it to this audience and especially to Olah's many friends, former students, and colleagues.

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McGraw-Hill Encyclopedia of Science & Technology, 9th Edition: An international reference work in 20 volumes including an index. McGraw-Hill, New York, NY, 2002. Figures, tables, 90 color plates. xiii +15,320 pp, hardcover, 22.4 × 28.3 cm. $2,495.00. ISBN 0-07-913665-6.

This encyclopedia can only be described in superlatives. Since 1960, when the first edition of the *McGraw-Hill Encyclopedia of Science & Technology* first appeared, it has served the reference and educational science information needs

of students, professional scholars, librarians, and the general public by offering authoritative, up-to-date, and comprehensive coverage of all disciplines in science and engineering. This new 9th edition, which successfully continues to fulfill this purpose, represents the culmination of five years of substantial revision and updating to reflect the numerous important scientific and technological developments that have occurred at an accelerated rate since the 8th edition (1997). For example, the determination of the structure of the human genome was due largely to the growing use of computing and information technology in all areas of science. The implications of such scientific advances for society have been the subject of considerable debate in many quarters, making it necessary for broad segments of the public to gain access to a reliable yet understandable overview of contemporary science. Thus the need for a comprehensive scientific encyclopedia such as the *McGraw-Hill Encyclopedia of Science & Technology* is greater than ever.

Many articles have been revised, and numerous new ones have been added. Although the goal was a comprehensive revision, certain areas were extensively revamped, especially the biomedical sciences; information technology and computing; chemistry and chemical engineering; industrial engineering; environmental, earth, and climate sciences; physics; and astronomy. Neuroscience and forensic sciences are now topics in their own right.

More than 5,000—compared to 3,500 in the 8th edition—distinguished scientists and engineers from around the world (including 30—compared to 19 in the 8th edition—Nobel laureates) participated in this exemplary work of accurate, lucid, objective, thorough, and rigorous scholarship (xiii + 15,320 pp, compared to xiii + 14,885 pp in the 8th edition).

Prepared with the assistance of a 15-member international editorial advisory board and 66 distinguished consulting editors, the encyclopedia's first 19 volumes contain 7,100 signed, cross-referenced, and alphabetically arranged (from "A15 Phases" to "Zygophyllales") articles, covering 87—compared to 78 in the 8th edition—major subject areas from acoustics to virology. Subjects for new entries were selected based on advances in knowledge, new technological applications, and perceived needs of readers. The range of article titles included in each volume is indicated on the spine and front cover so that the reader may quickly locate an article by its title.

Broad survey articles are included for each of the disciplines so that even readers with little prior knowledge of that discipline will find the basic concepts dealt with in these articles. From the survey article the reader may proceed to more specialized articles using the cross-referencing system. The pattern of proceeding from the general to the specific is used not only in the plan of the encyclopedia but also within the body of the individual articles. Each article begins with a clear definition of the subject, establishing the conceptual foundation for the following discussion that moves progressively from elementary to advanced concepts and from the general to the specific. The articles consistently discuss both theoretical and practical aspects, thus providing valuable insights into real-world connections between the two.

Lavishly illustrated and printed on heavy, high-quality paper, the set contains more than 12,000 digitally prepared illustrations (drawings, maps, charts, diagrams, and two-color graphs as well as photographic images (more than 1,900 of which are new to this edition). The volumes are exceptionally well designed with an outstanding visual layout (wide margins, easy-to-read type, and bold headings). More than 1,400 tables provide useful data, and where appropriate, 800 chemical structures, 2,500 chemical equations and reaction schemes, and 8,300 mathematical equations are included. About 62,000—compared to 60,00 in the 8th edition—cross-references set in small capital letters at relevant points in the text allow quick access to related articles, and up-to-date bibliographies of books and articles (many with references as recent as 1999 and a few as late as 2000) facilitate further research. Numerical data are given throughout in both U.S. customary and international (SI) units.

The chemistry articles, of course, predominate in the subject areas of analytical chemistry; biochemistry; chemical engineering; geochemistry; and inorganic, organic, petroleum, and physical chemistry, but many, especially those of an interdisciplinary nature, appear elsewhere. Most of the articles are written by authorities who are prominent in their subjects. Examples include Fred Basolo on coordination chemistry, Glenn H. Brown on liquid crystals; Nobelist Herbert C. Brown on hydroboration; Francis Collins on the human genome project; Harry B. Gray on electron transfer reactions; Nobelist Harold W. Kroto on fullerenes; Nobelist Jean-Marie Lehn on supramolecular chemistry; the late Nobelist Robert S. Mulliken on molecular structure and spectra; the late Nobelist Glenn T. Seaborg on actinides, transuranium elements, and related topics; and Nobelist Henry Taube on oxidation–reduction.

The last volume contains a list of contributors, their professional affiliations, and titles of their articles (122, compared to 110, double-column pages in the 8th edition); a 9-page discussion of scientific notation with conversion tables; and 59 triple-column pages of comprehensive study guides for secondary school and college and university students and science teachers at all school levels based on standard curriculum outlines. The 15 guides (compared to 6 in the 8th edition) comprise agriculture, forestry, and soils; anthropology and archæology; astronomy; biological and biomedical science; chemistry; computing and information technology; earth science; electronics; engineering and technology; environmental science; mathematics; medicine; paleontology; physics; and psychiatry and psychology. The chemistry study guide is divided into eight major areas: inorganic, physical, organic, polymer, supramolecular, analytical, applied chemistry; and chemical engineering.

Volume 20 also includes a topical index (33 four-column pages) listing alphabetically all 7,100 article titles under the 87 (compared to 78 in the 8th edition) major subject areas, making subject-related browsing easy, and an exhaustive analytical index of each important term, concept, and person (more than 170,000 entries in 599 (compared to 520 in the 8th edition) four-column pages, used by library science schools as a teaching tool and called the "perfect index" by *Library Journal*) permitting quick access to specific terms. Thus information can be located in four different ways, viz., through its alphabetical position in the appropriate volume, the analytical or topical index, and the study guides. By using the indices and cross-references one can gain a reasonable, basic education in almost any scientific or technical field.

The encyclopedia can be updated annually by the *McGraw-Hill Yearbook of Science & Technology,* which is cross-referenced to the parent set and features the same extensive illustrations and bibliographies (The *2003 Yearbook,* scheduled for publication in December 2002—450 pp, $175.00—contains

170 articles with up-to-date coverage in forefront areas such as biotechnology, cosmology, environmental science and technology, information technology, molecular medicine, telecommunications, and theoretical physics).

This series still remains *the* preeminent, essential reference source for accurate information in any area of science or technology. According to Curtis G. Benjamin, former President of the McGraw-Hill Book Company, in his preface to the first edition, "And this principle stamps the basic purpose of the work: To provide the widest possible range of articles that will be understandable and useful to any person of modest technical training who wants to obtain information outside his particular field of specialization." This philosophy has continued to guide the editorial development of all subsequent editions, including this latest edition.

Of course, the encyclopedia's cost will probably limit its purchase to libraries and laboratories, and therefore students, teachers, scholars, and laypersons may wish to buy the one-volume *McGraw-Hill Concise Encyclopedia of Science & Technology,* 4th edition, abridged from the encyclopedia's 8th edition (Sybil P. Parker, ed., 2450 pp, $150.00, 1998) or, for industrial chemistry, the one-volume *Kirk-Othmer Concise Encyclopedia of Chemical Technology,* 4th edition (Mary Howe-Grant, ed., Wiley-Interscience, New York, 2001. xxxvi + 2196 pp, paperback. $295.00.)

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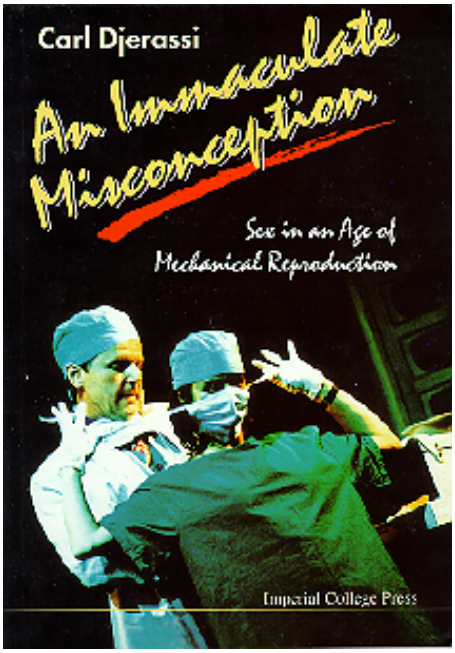
An Immaculate Misconception: Sex in an Age of Mechanical Reproduction. By Carl Djerassi. Imperial College Press, London, 2000; Distributed by World Scientific Publishing Co., Singapore; River Edge, NJ; London, England. Illustrations. xviii + 134 pp, 15.0 × 21.5 cm. $19.00; £13.00, paperback. ISBN 1-86094-248-2 (Order from sales@wspc.com).

Carl Djerassi is well known to readers of *The Chemical Educator* for his pioneering research (more than 1200 scientific publications and seven monographs) and as the recipient of numerous awards. He is one of the few American scientists to have received both the National Medal of Science (1973) for the first oral contraceptive, leading to his designation as "Father of the Pill" (Djerassi, an avowed feminist, prefers the appellation "Mother of the Pill") [1], and the National Medal of Technology (1993) for promoting new approaches to insect control. The holder of 18 honorary degrees, he received the first Wolf Prize in Chemistry, the U.S. National Academy of Sciences's first Award for the Industrial Application of Science, and the Priestley Medal, the American Chemical Society's highest award (1992). He is also founder of the Djerassi Resident Artists Colony, an avid art collector, and Professor Emeritus of Chemistry at Stanford University. Most pertinent here, Djerassi, after a half-century of dual research careers in industry and academe, like chemist-spectroscopist-novelist C. P. Snow, has embarked on a third career—creative writing, which we have followed with a mixture of growing interest, admiration, and anticipation [2].

Djerassi's non-research writings include individual and collected short stories [3], poetry [4], autobiography [5, 6], essays [7], a television and videocassette program [8], a novel



[9], and a tetralogy of novels [10–13], which exemplify what he calls "science-in fiction" to differentiate it from the better known science fiction. In this genre, which he uses to "make comprehensible [to nonscientists] the culture and behavior of scientists—uncommon in contemporary fiction," most of his characters, fictional as well as real, are scientists, and "everything [Djerassi specifies] does or could exist."

Cantor's Dilemma [10], the first novel, dealt with the themes of trust, ambition, the mentor–protégé relationship, and women in science. *The Bourbaki Gambit* [11], the second novel, a fictionalized account of the development of the Nobel Chemistry Prize-winning polymerase chain reaction (PCR), dealt with scientists' passionate desire for recognition by their peers, the inherent collegiality of science, and the "graying" of Western science as prominent scientists age and face the prospect of retirement.

Menachem's Seed [12], the third and shortest novel, moves from the familiar turf of laboratory and home portrayed in the first two novels to encompass venues of international policy—the fictional Kirchberg Conferences on Science and World Affairs, based on the Pugwash Conferences, where jet-setting scientists, including Djerassi himself, gather to discuss the global implications of their discoveries. Although involved in the earlier novels, here sex—more precisely, human male reproduction—intracytoplasmic sperm injection (ICSI, pronounced "icksee"), the revolutionary technique developed by André C. Van Steirteghem and co-workers at the University of Brussels [14] occupies center stage (In his more than four decades of research and teaching Djerassi has devoted himself to reproductive biology with emphasis on female contraception). Sex is also involved in the last novel of his tetralogy, *NO* [13], a title that stands for both the simple negative expletive and the chemical formula for nitric oxide, which plays a key role in penile erection. In *NO* all the characters from the first three novels reappear.

In his tetralogy of "science-in-fiction" novels Djerassi successfully depicted the human side of scientists and the personal conflicts that they face in their quest for scientific knowledge, personal recognition, and financial rewards as well as simultaneously describing with a high degree of accuracy

some exciting current biomedical developments. Not content to rest on his laurels, however, he has embarked on a projected trilogy of stage plays to explore an even rarer genre that he calls "science-in-theatre."

The world premiere of Djerassi's first play in this genre, a one-act version of *ICSI: An Immaculate Misconception*, based on the third novel of his tetralogy, *Menachem's Seed*, produced and directed by William Archer, took place on August 6, 1998 at the Edinburgh Festival Fringe at the C-too Theatre, Edinburgh, Scotland and ran through August 31, 1998. A live video of an actual insertion of a single sperm into an egg was incorporated into the play. The two-act version, produced by David Babani, was staged at the New End Theatre, Hampstead, London from March 16–April 17, 1999 [15]. It was broadcast by BBC Radio on its World Service in May 2000 as "Play of the Week." A special performance of the Edinburgh Fringe production with the Edinburgh cast, sponsored by N. V. Organon, the Dutch pharmaceutical company of Oss, The Netherlands, was staged on October 6, 1998 at the Yerba Buena Center for the Arts in San Francisco on the occasion of the World Congress on Fertility and Sterility in conjunction with the International Congress on Reproductive Medicine. The first regular American production was staged from April 1–May 2, 1999 at the Eureka Theater, San Francisco, California [16]. The play has also been translated into six foreign languages [17, 18].

Djerassi explains his motivation for "science-in-fiction" and "science-in-theatre" in general and for his first play in particular,

> I would like to smuggle important scientific ideas and concepts and problems into the mind of the general public that generally doesn't pay very much attention to them. To me the most interesting, most important current problem is the impending separation of sex and fertilization—sex in bed, fertilization under the microscope….I would like you to watch this play, *An Immaculate Misconception*. When you finish watching it, I believe that not only will you know quite clearly what ICSI is, but you'll never forget it. And then you'll also learn about the very serious ethical, moral, and practical consequences of that very dramatic invention [16].

Menachem's Seed, the book on which *An Immaculate Misconception* is based, abounded with many minor well-developed characters, who interacted in a web of captivating complications, constant surprises, and engrossing plot twists that made the book a real "page-turner." For dramatic purposes, Djerassi has selected four of these characters for his play: Dr. Melanie Laidlaw, "American reproductive biologist, late 30s, slender, athletic, with good looking legs;" Menachem Dvir, "Israeli nuclear engineer, 45 to 50, muscular and (preferably) hirsute, speaks excellent English, but with very distinct Israeli accent;" Dr. Felix Frankenthaler, "American clinician and infertility specialist (late 30s to early 50s)," a relatively minor character in the novel; and Adam Dvir, "young teenager (17-year old in prologue, 13-year in epilogue)."

In the novel Menachem and Melanie became romantically involved and made love in a variety of locales. Menachem was a married man rendered "infertile" by exposure to radiation, but Melanie, the childless fictional inventor of ICSI devised an ingenious scheme to steal his sperm (the "Menachem's Seed" of the title).

In the prologue to the play that takes place in the year 2014, Adam pensively states that he was the first ICSI baby. (In the decade since its inception 50,000 to 100,000 ICSI babies have been born). The action of the play takes place between May 1997 and December 1998.

In Scene 1, which is omitted in the video version, in a "post-coital discourse" at a scientific congress Melanie and Menachem discuss their marriages and sex lives, which enlightens the audience about their relationship. Most of the action occurs in Melanie's laboratory, where, with the aid of a microscope, she performs ICSI (intracytoplasmic sperm injection)—the revolutionary fertilization technique of the early '90s involving injection from a pipette of a *single* sperm into an egg, which is shown in illustrations in the book and even more vividly in the stage performance or video. She tests the procedure on herself, using her own egg and sperm "misappropriated" from Menachem without his knowledge or consent. In this way she hopes to accomplish simultaneously two desires—to test her ICSI procedure and to bear a child by Menachem, a man whom she admires and who is afflicted with oligospermia (A functionally infertile man has an insufficient number of sperm to fertilize an egg in the usual way but provides an ideal test case for ICSI, which requires only *one* sperm).

Melanie invites her clinical colleague, Dr. Frankenthaler, into her laboratory, telling him that she is ready to perform the first injection and eventually disclosing that she has chosen to use her own egg for the experiment. The two debate the possible implications of the work beyond simply treating male fertility. After Melanie has injected Menachem's sperm and after Frankenthaler learns from her that the irradiated, oligospermic Menachem is the sperm source, Frankenthaler, fearing that the resulting child might be abnormal, performs a second injection, using his own sperm during Melanie's half-hour absence (The two collaborators decided that each of them should perform two injections on two eggs and then each choose one embryo to implant, thus increasing the chance for a successful outcome of the new technique).

Seven months later, when the obviously pregnant Melanie confesses to Menachem that she had "acquired" his sperm in a condom that she had preserved in a Dewar flask of liquid nitrogen and that he is the father of her expected ICSI baby, he is furious ("Godamn it, you *stole* it! And for what? An experiment? Or real fatherhood?"). When Melanie tells him that she wanted *his* baby, the two are reconciled, but when Menachem, learns that Frankenthaler performed one of the injections in Melanie's absence, he begs her, "as an early Father's Day present," to ask Frankenthaler whose sperm Frankenthaler used. After she realizes that Frankenthaler used his sperm to perform his injection, she removes his name as coauthor of the article, "First successful pregnancy after intracytoplasmic injection of single spermatozoon into an oocyte. A new treatment for male infertility," and replaces it with a mere acknowledgment of his "technical assistance."

Melanie has her baby, appropriately named Adam, and she and Frankenthaler are extremely angry with each other and make blackmail-like threats and counter-threats. Unless she restores his name as coauthor he threatens to write a letter to the editor disclosing how she breached medical ethics by obtaining Menachem's sperm without his consent, and she threatens to disclose that he *raped* her egg without her consent, resulting in a mutual-deterrent standoff. Because Menachem divorced his wife and married Melanie (This does not occur in

the novel), the child is legally his. Although Menachem considers himself the father, he requests a DNA test to establish Adam's paternity because he is not an ordinary child but the first ICSI baby. In the epilogue (year 2011) 13-year-old Bar Mitzvah boy Adam examines two envelopes—a white one containing a letter written by his mother almost 13 years ago and one containing the results of the DNA tests. His face shows "a mixture of expressions: relief, shock, puzzlement….then BLACKOUT." Thus the play begins and ends with the child—the being who is sometimes overlooked in the parents' pursuit of their goal of overcoming infertility.

Djerassi does not disclose who is Adam's father—Menachem or Frankenthaler. He may have ended the play on this equivocal note to emphasize his belief that the issues raised by cutting-edge modern science and technology have no simple answers. Among these ethical, moral, and social issues and consequences are:

• Does a woman have a right to appropriate without his consent the discarded sperm of a man who believes himself to be infertile in order to achieve pregnancy via today's "miracle" techniques, that is, can she steal something that the owner considers worthless?

• Because only one sperm is selected to impregnate the egg, sex predetermination becomes possible. If you desire a boy choose a Y-sperm; if you want a girl, choose an X-sperm. Since in many cultures, boys are valued above girls, will this unduly alter the "natural" male–female ratio, and should this selection be encouraged or even allowed?

• ICSI permits childbearing beyond menopause so a woman can become a mother at an advanced age, when she may lack the stamina, energy, and other requirements needed to raise a child. Should this be permitted? Because men can "naturally" father children at an advanced age, does this merely grant women what men have enjoyed in the reproductive realm?

In Djerassi's words, spoken at the end of the play,

> These are all gray issues. There are no black and white answers. And there is the question I really would like to ask the spectators to ask themselves. And the answers, in my opinion, cannot be provided by scientists, cannot even be provided by governments. I think the answer can be provided by individuals, based on reasonable information. And one of the attempts—perhaps the main attempt—of my play, aside from amusing you, is to actually inform you so that you are better informed to make complicated decisions about enormously complicated and ethically charged problems [16].

We are extremely pleased to observe that the progress that Djerassi has made in his fiction writing has carried over to his play writing. The dialogue flows easily and naturally, the plot is complex and absorbing, and the characters, although flawed, are interesting. We give *An Immaculate Misconception*, an enjoyable, engrossing, and above all, provocative and thought-provoking play, an enthusiastic two thumbs up [19].

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16. A VHS videotape of an April 7, 2000 performance at the Alcazar Theatre, San Francisco, directed by Libby Pratt and with commentary by Djerassi (ISBN 1-892045-08-7; 74 min, $27.00, NTSC; $30.00, PAL) is available from Globalstage Productions, Inc., 1210 Union Street, San Francisco, CA 94109 (telephone: 1-888-324-5623; email: info@globalstage.net; web site: http://www.globalstage.net). Cast: Eryn Maybruck (Melanie Laidlaw), Eric Wolfson (Menachem Dvir), Matthew Dingess (Felix Frankthaler), and Edwin Day (Adam Dvir). This version differs slightly from the published version and omits four of the play's 11 scenes (Scenes 1, 3, 4, and 10) and all six of the "email interludes" that occur at the ends of Scenes 1–4 and 10 and before the beginning of Scene 7.
17. A two-act German version, translated by Bettina Arlt, titled Unbefleckt: Sex im Zeitalter der Reproduzierbarkeit, premiered at the Jugendstiltheater am Steinhof, in Djerassi's birthplace, Vienna, on May 29, 1999 and ran from June 2–5, 1999. It was subsequently performed at the Theater am Tanzbrunnen, Cologne at the Bio-Gen-Tec Forum NRW-2000 on February 29, 2000; at the Deutsches Museum in Munich on June 7–9, 2000; and was broadcast by Westdeutscher Rundfunk, Cologne (WDR-3) on May 16, 2001 and repeated on October 17, 2001. It was published in 2000 (Haffmans Verlag, Zürich, Switzerland; 113 pp; paperback; ISBN 3-251-00481-6; DM 20.00). A Swedish version, Obefläckad, translated by Lolo Ambie (paperback, ISBN 91-89388-06-2), was performed at the Teater Västernorrland in Sundsvall, Sweden on September 8, 2000; repeated at the Royal Dramatic Theatre in Stockholm on September

10, 2000; and broadcast on Swedish Radio on December 22, 2001. A French version, Une Immaculée Miss Conception, was performed at the Théâtre du Grütli in Geneva, Switzerland from April 12–May 5, 2002, and a Bulgarian version, Neprochno e Netochno, at the Satire theater, Sofia, Bulgaria from September 28, 2001–May, 2002. It was also translated into Spanish and Portuguese.

18. Djerassi has also written a completely new variant of the play solely for classroom use, titled ICSI (Sex in an Age of Mechanical Reproduction), "a pedagogic wordplay for two voices with audiovisuals." Intended in lieu of a conventional 50-minute lecture, it presents the information contained in An Immaculate Misconception in the form of a TV interview of Frankenthaler by an entirely new character, Isabel Youngblood, "host of TV 'Dissection,' young, smart and not too subtle critic of science and technology; stylishly dressed in pantsuit." This version "premiered" on February 19, 2002 at a Human Biology class at Stanford University before 200 students. The role of Frankenthaler was read by Djerassi himself, and the role of Youngblood was read by a female Stanford instructor. Deutscher Theaterverlag (Postfach 10 02 61, D-69442 Weinheim, Germany; e-mail: theater@dtver.de; web site: http://www.dtver.de), which specializes in plays for schools and distributes them widely to German schools, has published in one paperback both the English version and the German translation, ICSI—Sex im Zeitalter der technischen Reproduzierbarkeit, together with a CD-ROM containing the audiovisuals (10 slides and a one-minute video) for distribution in German high schools (Gymnasien) beginning with the Fall 2002 semester (HS297, DM 16.00; E 8.18).

19. Together with 1981 Nobel chemistry laureate and fellow Priestley medalist Roald Hoffmann, Djerassi has written a second play, Oxygen, dealing with questions of priority between Scheele, Lavoisier, and Priestley faced by the Nobel Committee as it seeks to award its first "retro-Nobel Prize" in celebration of its centennial year 2000. It was published in book form (Wiley-VCH: Weinheim, Germany; New York, 2001; vii + 119 pp; $14.95; £9.99), which we intend to review in The Chemical Educator. Djerassi's third play, a two-act venture, Calculus, dealing with the famous Newton-Leibniz priority struggle, premiered at the Aurora Theatre in Berkeley, California on May 13, 2002. For further details on Djerassi's "science-in-fiction" and "science-in-theatre" as well as excerpts from his novels and plays visit his web site: http://www.djerassi.com.

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An Online Resource for Analytical Chemistry and Quantitative Analysis Courses.

Over the past five to ten years, the use of the World Wide Web as a resource for chemistry classes has increased significantly with a particular focus on writing assignments, Web assignments, tutorials, and supplementary material [1–8]. This supplementary material covers a wide range, from traditional HTML Web pages and Real or QuickTime videos to interactive Java scripts [4–7]. The vast majority of resources present on the Internet appear to be structured for general chemistry courses, reflecting the number of courses of this type that are offered. Online items for courses of this nature typically outnumber resources for upper-level chemistry courses such as quantitative analysis or analytical chemistry as these typically have significantly lower enrollments, although there are some Web pages for these upper-level chemistry courses, as well as for physical chemistry and biochemistry [9–12]. Online items for upper-level courses are also usually difficult to find, even with the success of modern search engines, so a database has been developed for course material related to quantitative analysis and analytical chemistry.

The Quantitative Analysis Springboard (http://onsager.bd.psu.edu/~spudich/Quant.html) has been in existence for the past three years as a resource for the analytical chemistry community. Currently, there are 35 faculty members from various higher-education institutions who have consented to have links to personal online material for their quantitative analysis or analytical chemistry courses.

This database was developed initially in an attempt to increase personal knowledge so that modern and up-to-date material could be presented in the quantitative analysis lecture and laboratory at Penn State, Erie. In particular, as a new faculty member who had just finished a Ph.D., it was difficult to re-organize and develop this course in a department at an undergraduate institution due to limited experiences as a graduate student assistant. In gathering and organizing material, it became clear that information such as syllabi, laboratory handouts, old examinations, etc., could be valuable to both new and seasoned faculty members teaching this type of course. New faculty can obtain information on course structure and look at current presentation as opposed to referring to material from when they took the course (if they ever took such a course).

This Springboard can also be utilized by faculty who have been teaching the course for years, but would like to modify and possibly update the material presented. It can also be used to compare examinations, quizzes, assignments, notes, and laboratories offered. For all, the number of resources on what is currently available increases dramatically. At smaller institutions, one person may cover several disciplines within chemistry, and having a resource available online can be valuable and encourage interaction with different schools. In particular, contacting people with similar interests or experience with a particular laboratory becomes much easier via email. Lastly, students can utilize this page to find information that can complement material presented in class. Do not hesitate to contact the author (tms23@psu.edu) if you are interested in adding information to the Springboard.

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