

Books

MODELS IN CHEMICAL SCIENCE

An Introduction to General Chemistry

By George S. Hammond, Janet Osteryoung, Thomas H. Crawford, and Harry B. Gray*

W. A. Benjamin, Inc. \$10.95

Reviewed by David H. White
Graduate fellow in chemistry

Models in Chemical Science is a successful attempt to present chemistry at the introductory level as a human intellectual process instead of the authoritative every-question-has-a-right-answer approach common to undergraduate textbooks. The thesis of the authors is that "everyone in science uses models in thinking about experimental data. We scientists tend to focus not on the real thing but on the behavior of our own mental constructs."

Hammond, Osteryoung, Crawford, and Gray believe that reality is always more complex than we can visualize or even fully understand. Thus, we use models, or theories, which are always approximate and tentative, and may have to be revised or discarded as new evidence is found.

This is a concept that few students encounter until they reach advanced studies (if, indeed, they ever encounter it at all) when it comes as a shock to realize that science doesn't provide any sure answers. So this book is welcome, as is any presentation which shows science as a fallible, open-ended, human enterprise instead of a superhuman certainty. Such an orientation encourages a healthy questioning of established ideas and established experts, and is necessary to understand the basic nature of science.

The only mathematical background required for understanding this book is algebra, and mathematical derivations are minimized but not avoided altogether. Difficult topics such as thermodynamics and reaction dynamics are clear and understandable. Organic and inorganic examples are combined to illustrate many concepts in a way that makes them both seem integral parts of the whole of chemistry.

One especially colorful example is used to illustrate a number of concepts in reaction dynamics. Two tennis players, George and Eileen, take 1,000 tennis balls to the court but forget their rackets,

so they make up a game. Starting with 500 balls in each court, each begins picking up and throwing the balls on his side over to the other side as fast as possible. They soon reach a dynamic equilibrium, resembling many chemical reactions.

The book is designed for non-chemistry-major students who have never taken a chemistry course before and will probably never take another, and it serves this purpose well. It de-mystifies science while presenting a solid enough background to understand what chemistry is and to begin to cope with the increasing numbers of chemical problems appearing in the newspapers every day. Regrettably, the discussion of "relevant" topics, such as air pollution and drugs, is rather sketchy and undetailed. However, the authors do a fairly thorough job of presenting the theories that chemists actually use in their work.

Perhaps the book would also be useful as a high school text. Those students bound for scientific majors in college would be well prepared by it to handle the concepts and the more rigorous techniques of a college chemistry course.

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OSCAR MANDEL'S COLLECTED PLAYS, Volume 1

Unicorn Press Clothbound \$7.50
Paperbound 2.95

Reviewed by J. Kent Clark
Professor of English

In some ways, the drama of Oscar Mandel (Caltech professor of English) seems too intelligent, witty, polished, and literate to be contemporary. Its crisp, tight organization, its clear definition of dramatic issues and characters, and its cool satirical edge sometimes seem closer to the world of Molière than to the worlds of Miller, Albee, Beckett, Ionesco, and Pinter—to say nothing of the murky worlds of the *now* theater. It is not neurotic, psychotic, confessional, guilt-ridden, sex-ridden, or absurd; it avoids merely topical "relevance" as it would adolescent acne. Furthermore, the setting of the plays is often remote from the contemporary scene: Homeric Greece, Saxon England, Roman Spain. And even settings that are ostensibly modern have been removed by at least one level of abstraction from naturalistic realism.

Finally, Mandel's plays show a sense of style—the incisive word, the deceptively "inevitable" phrase, and the subtly poetic speech—that is almost unknown in contemporary American drama. This stylistic artistry, it should be added, not only makes the plays delightful to read or hear but also serves in classical fashion to keep the proper dramatic distance between the audience and the characters.

But if the style, the angle of approach, the restraint, the finish, and the organization of Mandel's plays derive from the classical European tradition, the subject matter and the psychological concerns of his drama are the preoccupations of twentieth century humanity: loneliness (cosmic and personal), war, death, moral responsibility, idealism, and general human cussedness. Paradoxically enough, Mandel, with his ironic detachment and his scorn for passionately topical drama, writes plays of wider relevance and more genuinely modern substance than do many relentlessly contemporary playwrights. His *General Audax*, for example, though set in Spain about 140 B.C., has more to say about the issues raised by twentieth century existentialism than Sartre's *Dirty Hands*, which has already

become a preachy period piece of the 1940's. Similarly, Mandel's *Island*, though it never mentions the word "scientist," examines the human problem of the scientist and the military in more philosophical and emotional depth than does *In the Matter of J. Robert Oppenheimer*.

In such plays, of course, Mandel is obliged to pay the price for removing his drama from the naturalistic contemporary scene. He must devote more time and ingenuity to exposition—to setting up situation and character; he must get along without stock audience responses, topical references, and local color; and he must trust his audience to make the connections between timeless dramatic action and current dilemmas. The fact that he can pay this price and still produce effective, moving drama testifies to his skill as a writer and his sensitivity to central modern problems.

Whether comic or serious, or both, Mandel's plays are characterized by a lively energy. Occasionally, in fact, Mandel is too lively and inventive for his own good. His comedies are sometimes so loaded with wit and paradox that they are hard to assimilate at a comfortable speed. The audience is apt to find itself panting behind the turns of phrase, situation, and character motivation. This is particularly true of *A Splitting Headache* and *The Virgin and the Unicorn*. Occasionally, too, his invention lures him into overdeveloped speeches which impede the action for the sake of an elegant or subtle thought. In general, however, he controls his wit, invention, and rhetoric remarkably well, with an instinctive appreciation for dramatic values.

The publication of the first volume of Oscar Mandel's plays reveals a first-rate, mature talent. The second volume, which will be published shortly, should be equally exciting to devotees of modern drama.

THE NAME ABOVE THE TITLE
An Autobiography by Frank Capra
The Macmillan Company \$12.50

Reading Frank Capra's autobiography is just as good as seeing a Capra movie—and that's still pretty good. Like a Capra movie script, it's got everything—action, suspense, spunk, sentiment, honesty, patriotism, vitality, gags, guts, good guys to root for, and bad ones to hope that they get their just deserts.

The book is, naturally, mainly concerned with Capra's 40-year career in motion pictures. (He made about 60 of them.) From the day he bluffed his way into the business in San Francisco and made a one-reel film of Kipling's "Ballad of Fultah Fisher's Boarding House," the story moves at a breakneck pace through Frank's days as gag man for Hal Roach's *Our Gang* comedies, then for Mack Sennett, into directing with Harry Langdon, on to Columbia Pictures and the great days of *Lady for a Day*, *It Happened One Night*, *Mr. Deeds Goes to Town*, *Lost Horizon*, *You Can't Take It with You*, *Mr. Smith Goes to Washington*. There was *Meet John Doe* after that, and *Arsenic and Old Lace*, before World War II, when Frank volunteered his services, was commissioned a lieutenant colonel by the Signal Corps, and—against constant opposition—made the classic series of troop information films, *Why We Fight*. Then came *It's A Wonderful Life* (Capra's favorite of all his pictures) and *State of the Union*, before a couple of Bing Crosby pictures, a Sinatra one, a catastrophic remake of *Lady for a Day*, and Frank's retirement from the New Hollywood.

Capra is 74 now, living in La Quinta. His family emigrated to Los Angeles from Sicily when Frank was 6. Everyone else in the family went to work, but Frank wanted to go to school. He was allowed to do this as long as he paid his own way. So he sold papers, worked as a janitor, played guitar in a bar, got through high school, saved \$700—and entered Caltech in February 1915. (It was Throop Polytechnic Institute then.) The family had a lemon grove in Sierra Madre by this time, and Frank rode back and forth to school on a second-hand motorcycle. He was a waiter in the campus dorm, ran the dormitory laundry agency, and worked (for 25¢ an hour)

for the night engineer at the Pasadena Light & Power plant.

His daily routine should make thoughtful reading for Caltech undergraduates today:

"This was my twenty-four-hour day: up at 3:00 A.M. at ranchhouse, lit small bonfire under motorcycle crankcase to heat up cold oil. Lit acetylene headlight (about as much light as a modern flashlight), then pushed the Flanders down dirt road until single cylinder sputtered into action; leaped on the seat and noisily raced eighteen miles in the dark to the Pasadena Light plant. On rainy nights, the rides were half-drowned ordeals of slips, slides, and muddy spills.

"3:30 to 7:30 A.M.: checked boiler fires, polished miles of metal at the Light plant. Then raced three miles to school to help other four waiters wash breakfast dishes for sixty-five dorm students. Ate breakfast while working.

"8:00 A.M.: ran to my first class. 11:55: ran with four other waiters to serve lunch at dorm; washed dishes, ate lunch while working. 1:00 P.M.: ran back to class.

"5:00 P.M. to 6:00 P.M.: glee-club or football. Then set tables, served dinner, washed dishes, ate dinner.

"7:00 P.M.: jumped on motorcycle, raced fifteen miles to Sierra Madre. Last quarter mile of dirt road was so steep had to jump off and push the Flanders. On a rainy night, it was a wrestling match with a wild steer.

"7:30 P.M.: backed motorcycle into shed, put paper and sticks under crankcase for bonfire in morning.

"7:30 P.M. to 10:00 P.M.: study and homework. 10:00 P.M.: to bed. 3:00 A.M.: up and lit bonfire under crankcase.

"What did this schedule do to my studies? Nothing. I won the Freshman Scholarship Prize: \$250.00 and a trip around the country, and the sincere congratulations of my proud teachers: Dr. Bates (chemistry), Dr. Van Buskirk (mathematics), Dr. Beckman (German), Professor Sorensen (electrical engineering), Professor Clapp (geology), and proudest of all, Professor Judy (English)."

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Books

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EINSTEIN: THE LIFE AND TIMES

By Ronald W. Clark

World Publishing Company \$15.00

The special distinction of this new biography of Einstein seems to be its bulk. There have been plenty of books about Einstein the scientist, Einstein the public figure, or Einstein the man, but this one deals with all three. The result is a massive book of more than 700 pages. Obviously, the book involved an enormous amount of research, and in trying to crowd it all in the author often creates considerable confusion.

Mr. Clark is a British writer who has produced a number of books on scientific subjects—including *The Birth of the Bomb*, and biographies of such British scientists as J. B. S. Haldane, the Huxleys, and Sir Henry Tizard.

As a non-scientist, Mr. Clark makes Einstein's scientific contributions fairly comprehensible to an interested layman—and his accounts should not unduly outrage any physicist readers.

In dealing with Einstein the man, Mr. Clark has to deal with the fact that Einstein always went to great pains to keep his private life just that. ("When a man after long years of searching chances upon a thought which discloses something of the beauty of this mysterious universe," Einstein once said, "he should not therefore be personally celebrated. He is already sufficiently paid by his experience of seeking and finding." And again: "Personally I consider it indecent to delve into people's private affairs and the world would certainly fare better if newspapers cared more for things that really matter instead of dealing with trifles.")

Mr. Clark, then, has to rely pretty much on the printed record, and his comprehensive research uncovers the trifles along with the important events in Einstein's life (including the familiar, and possibly apocryphal, trifle concerning the Einsteins' visit to Mt. Wilson, where Mrs. Einstein was told how the big 100-inch telescope was needed for establishing the structure of the universe. "Well, well," she replied, "my husband does that on the back of an old envelope.").

A considerable portion of this biography is devoted to the public Einstein

and his attempts to deal with such social and political problems as pacifism, Zionism, and the atom bomb. But the particular interest for Caltech readers will probably be in the accounts of Einstein's two visits to the Institute in 1930 and 1932. Even though he does refer to Caltech's predecessor as "Troop College of Technology," and locates the Mt. Wilson Observatory "high in the Sierra above Pasadena," Mr. Clark provides some interesting glimpses of life at Caltech in the early thirties, and an intriguing, gossipy account of some "financial sleight of hand" by R. A. Millikan and Arthur Fleming—which apparently caused Einstein to turn down a permanent position at Caltech.

Unit 1: Introduction to Chemistry and the Nature of Science Nature of Science Goal—Science is based on observations, data, analysis and conclusions. 1. I can distinguish between observable (qualitative) and numeric (quantitative) data. 2. I can construct and analyze data tables and graphs. 4. I can balance chemical reactions and recognize that the number of atoms in a chemical reaction does not change. 5. I can classify reactions as synthesis, decomposition, single replacement, double replacement or combustion. Explain why scientists use models. Explain the limitations of models as scientific representations of reality. Introduction Although all of us have taken science classes throughout the course of our study Topic Introduction to General Chemistry. Motivation for studying chemistry; physical states of chemical matter; classification of matter, physical and chemical properties of pure substances and mixtures; extensive and intensive properties; chemical analysis. Measurements and units; the international system of units; derived units, the reliability of measurements and calculations; significant figures in simple calculations. This module aims to provide an introduction to molecular and cellular biology, and will therefore include key topics in Cell Biology, Biochemistry, Genetics, and Microbiology. The modern human experience places a large emphasis upon the material world. From the day of our birth to the day we die, we are frequently preoccupied with the world around us. Whether struggling to feed ourselves, occupying ourselves with modern inventions, interacting with other people or animals, or simply meditating on the air we breathe, our attention is focused on different aspects of the material world. In fact only a handful of disciplines—certain subsets of religion, philosophy, and abstract An Introduction to Chemistry. by Mark Bishop. A textbook intended for use in beginning chemistry courses that have no chemistry prerequisite. The text was written for students who want to prepare themselves for general college chemistry, for students seeking to satisfy a science requirement for graduation, and for students in health-related or other programs that require an introduction to general chemistry. Get Information. The atoms-first version provides a more complete description of atomic theory, chemical bonding, and chemical calculations early. The chemistry-first version has a early emphasis on descriptions of the structure of matter and the nature of chemical changes, postponing the description of unit conversions and chemical calculations.