elements, and so on. During his lifetime Mendeleev was upset by the discovery of noble gas elements, for which he could not define a place in his table. Later, when Ramsay suggested a new group for the elements, he rejoiced by calling it a 'glorious confirmation of the general applicability of the periodic system'.

After scrutiny of the impact of computational methods like Hartree–Fock and DFT, the author concludes in Chapter 9: 'From its humble beginning . . . the periodic table has grown to embody more than 100 elements . . . The central role of the periodic table in modern chemistry has been consolidated. . .'. In the midst of the progress heralded by the nuclear atom and quantum theory (chapters 6, 7 and 9), Chapter 8 is a welcome historical interlude of special interest to chemists. It recounts how men like Lewis, Langmuir, Bury and others arrived at electronic configurations of the elements intuitively on the basis of chemical properties. Thus Lewis tells us how in 1902, he deciphered the inner structure of atoms by combining the 'new theory of the electron' with the ideas 'implied in the periodic classification'.

The last chapter is of composite nature incorporating astrophysics, nucleosynthesis, certain chemical relationships (diagonal, actinoid, etc.) and more. Here or elsewhere in the book, I had expected to find short discussions on issues such as periodic table vis-à-vis elements of life, and periodic table vis-à-vis the Nobel Prize. Towards the end of this chapter a few forms of the periodic table are examined. The author recommends adoption of a system which places helium in the same group as the alkaline earth metals. He expects chemists to resist this. Indeed no practising chemist will ever go with it, because it supersedes chemistry with $(n + l)$. It is a surprise that the author after valiantly refuting untenable reductionism like 'chemistry is nothing but physics deep down' throughout the book, makes this choice. But then this is not a book of recommendations.

I have enjoyed reading and re-reading most of this book. The author has used a well-spun historical fabric of story-like texture enriched with hues of quotations, anecdotes and philosophical comments (some may be too long) to weave an authentic and flowing account of the ascent of the periodic table. I warmly recommend the book to all interested in the history of the science of elements and compounds, and in the genesis of scientific ideas that rise to become icons.

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> A famous mathematician of the twentieth century once lamented, 'The algebraic topologist has practically ceased to communicate with the point-set topologist!' This remark is characteristic of our time and culture, in which knowledge has become fractured into thousands of specialties and subspecialties.
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> (From the preface to *Geminos's Introduction to the Phenomena: A Translation and Study of a Hellenistic Survey of Astronomy*, Evans, J. and Lennart Berggren, J., Princeton University Press, Princeton, 2006).

Traditional chemistry has long since fallen into such specializations as physical, inorganic and organic chemistry; specialists in one branch of chemistry no longer understand the language of another. In recent times, even physical chemistry, the quantitative, microscopic and mechanistic study of chemical changes, has been rapidly moving in that direction. It seems that the day is not far off – if it is not already here – when a spectroscopist using nanometre wavelengths of light would not be able to understand the work of another spectroscopist using micrometre or millimetre wavelengths. One can lament such a situation, but little can be done about it. Modern physical chemistry now touches all the states of matter, consisting of atoms and molecules in widely diverse systems ranging from individual, isolated species to complex biological systems, and materials of solid state and soft condensed matter. The researcher has tools that give unprecedented time and energy resolutions as well as highly sophisticated theories for better understanding of systems. In such a scenario, publications such as the *Annual Review of Physical Chemistry* (*ARPC*) should play a significant role in helping researchers keep abreast of the latest developments in the fields of super-specialties.

This volume of the *ARPC*, which opens with an autobiographical essay by the well-known physical chemist Stuart A. Rice, contains 29 chapters dealing with the most recent advances in the wide variety of research that can be broadly classified under physical chemistry. The breadth of the subjects reviewed in this book can be judged by noting that the topics include kinetics and evolution of biological systems such as proteins and enzymes, chemistry of materials such as quasi-crystals, metal films, nanostructures, surfaces, and soft matter, ultrafast dynamics of elementary photoprocesses, and theoretical advances for studying the dynamics of excited states. Each chapter, written by experts who have made significant contributions in their fields, contains a wealth of information citing, on average, about one hundred references.

The review by V. Sundström on femtobiology describes recent studies on photosynthesis and photoreceptors. While the left–right asymmetry of directed electron transfer in photosynthetic reaction centres continues to elude satisfactory explanation, the role of carotenoid molecules (Car) has been studied closely. As direct $S_0 \rightarrow S_1$ photoexcitation is symmetry forbidden in naturally occurring carotenoids, in the light-harvesting complexes they undergo $S_0 \rightarrow S_2$ photoexcitation, followed by fast energy transfer from the S_2 and S_1 states of carotenoids to chlorophylls (Chl). Carotenoids acting as non-photochemical quenchers have also received considerable attention. In order to protect the system from high-intensity photon flux, the carotenoids have been shown to quench excited chlorophylls by the energy transfer mechanism.

The latest work indicates that this process could be followed by a charge separation giving a Car^+–Chl^- type radical pair. Among the photoreceptors, rhodopsins with their extremely fast (200–500 fs) *cis–trans* isomerization, continue to be investigated in order to elucidate their ultra-fast dynamics. The early mechanism of a two-step model involving a barrierless transition from S_1 to S_0 is replaced by a three-step model in which the excited S_1 state has a barrier along the isomerization coordinate. Studies involving time-resolved vibrational spectra showed that the vibrational modes around the C=C bond undergoing isomerization could play an important role in the dynamics.

The year 2008 is significant in that the Large Hadron Collider at CERN, Geneva, is being used to look for the Higgs boson in what has been described as 'the greatest experiment in the world'. The advances in the standard model of particle physics in the last half century have been through a series of symmetry breaking in fundamental interactions. In atomic and molecular systems, certain types of symmetry breaking are not unusual. As approximations are often made in the Hamiltonian of these many-body systems, some symmetries which are present at a certain level of the Hamiltonian may disappear when the Hamiltonian is made more accurate. The parity symmetry between a pair of chiral molecules is, however, intrinsic in the sense that no matter how accurate the Hamiltonian is, the mirror-image relationship between the pair would always hold. But if nature does not conserve this symmetry – or the parity is violated – for molecules, its consequence should be observable. In the last two decades, enormous efforts have been made to examine parity violation in chiral molecules. The groups of M. Quack (ETH, Zurich) and Ch. Chardonnet (University of Paris) have made important contributions in attempts to test parity violations in chiral molecules. Both groups approach the problem by noting that if the parity is indeed violated, a pair of chiral molecules should have different energies. We can appreciate the difficulty of experimentally testing this when we note that the difference in the energy is expected to be exceedingly small. The estimated value is about 100 atto-electron volt (10^{-18} eV) for a simple molecule like CHFClBr. The chapter by Quack *et al.* on parity violation gives a lucid and pedagogic description of this very fundamental aspect of interactions in molecules.

The role of X-rays in chemistry is normally associated with structure determination in crystals. However, with the availability of coherent X-rays from synchrotron sources and free electron lasers, efforts are being made to apply X-ray diffraction techniques to amorphous systems, many of which are biological and non-crystallizable in nature. The chapter by J. Miao *et al.* describes the advances made in this decade for imaging non-crystalline material, including cells and protein complexes.

These days when the gap between the expertise in theoretical chemistry and experimental chemistry is steadily widening, the autobiography of Rice is highly relevant and inspiring. His life – its evolution as a physical chemist/chemical physicist, as he describes it – shows how excellent theoretical understanding and fine experiments go hand in hand in making lasting contributions to science.

Finally a few words about the format of this book. Starting from the previous volume, the formatting of the *ARPC* has changed considerably. Extra margins have been added to incorporate sidebar definitions, short figure captions, and significance of selected references. However, barely 5% of the extra margins have been used for such purposes. Some of the sidebar definitions are even superfluous (e.g. ET (electron transfer), IR (infrared), AFM (atomic force microscope), PES (potential energy surface), HF (Hartree–Fock), etc.) for the intended readership. I feel that the extra margin is quite unnecessary; it merely adds to the size and bulk of the book.

In summary, I feel that this book should be useful to postdoctoral and regular researchers contemplating a change of research field, who want to get a taste of recent advances in highly specialized subdivisions of physical chemistry. As many chapters are not written in a pedagogical style, I am not sure if most aspiring graduate students would find the book accessible.

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Einstein's Nobel Prize – A Glimpse Behind Closed Doors – The Archival Evidence. Aant Elzinga. Watson Publishing International, Sagamore Beach, 2006, 228 pp. Price: US$ 39.95.

Norwegian historian of science R. M. Friedman[1] wrote a brief story on the Nobel Prize for physics for the renowned physicist Albert Einstein. In this book Aant Elzinga from Sweden gives thorough details. The leitmotiv of the book is: Why did some members of the Nobel Committee persistently oppose the award, while the nominators often proposed Einstein name for his work on the theory of relativity?

In 1921, the Nobel Prize for physics was reserved. It was awarded to Einstein in 1922 'for his services to Theoretical Physics, and especially for his discovery of the law of the photoelectric effect', as we learn in the 'Introduction'. In the present book the reader finds something completely different. Einstein neither attended the Nobel Prize ceremony, nor delivered a lecture (in Stockholm) on the topic for which he was awarded the Prize. He received the medal in April 1923, as there was dispute due to his nationality. Both the Germans and Swiss claimed him as 'their' man. In the end the Prize was delivered to Einstein by the Swedish ambassador to Germany.

Before starting with the Nobel Prize, Elzinga gives a brief review of Einstein's life, scientific papers from the year 1905 and his position in the international community. The 'real story' of Einstein's Nobel Prize starts with Chapter 5 entitled 'Into the mangle of Nobel'. Here the author gives the educational and research background of the Committee's members. Until 1914 Einstein was nominated ten times, mainly for his work on the theory of relativity (for all the years from 1910 to 1923, details such as nominators, and for what they had nominated Einstein are given in the Appendix, pp. 211–217). Elzinga shows that in 1914 the Committee reported that Einstein's theory of relativity was '. . . empirically deficient, even on the point of being speculative or rather a matter of philosophy rather than science' (p. 84, 85). Between 1915 and 1919, Einstein was nominated 15 times for his work on the theory of relativity, light quanta, and Brownian motion. We learn that the Committee discredited the theory of relativity under one pretext or the other. Either it had