this found a place in this book, and as a result the book, of course, turned out to be quite inhomogeneous. This is what usually happens when the theme of a conference is too broad.

The book has four parts: 1) thin films and superlattices (14 papers); 2) the theory of clean surfaces and chemisorption (13 papers); 3) spectroscopic methods of investigating surfaces (12 papers); 4) structure and determination of properties of surfaces (10 papers).

The first part begins with a long article by M. Cardona devoted to vibrational modes in semiconductor superlattices. The author, however, does not repeat previous reviews but instead examines in detail the key questions, for example, selection rules and their relaxation in superlattices as a result of the lowering of crystal symmetry; the confinement of optical phonons in definite layers of the superlattice etc. The other articles of this section are of a more particular nature, they are devoted to structural, electronic and optical properties of thin films, primarily of CdTe and also of silicon and silicon dioxide. In one of the most significant papers of this section adsorbates of metals on surfaces are examined. It is shown that even incomplete monotonic metallic layers adsorbed on a surface lead to noticeable effects on Raman scattering and optical absorption.

The second section begins with the theoretical article by G. Blyholder concerning the calculations of geometrical and electronic properties of adsorbed atoms and molecules with the aid of the theory of molecular orbitals. A brief review is given of the calculation of the structure of clusters of transition metals on different surfaces. Practically all the papers of this section are either of a theoretical or a review nature; they are brief presentations of models or results of calculations of the interaction of adsorbates with surfaces, primarily metallic ones. New models are presented of order-disorder phase transitions in a layer of hydrogen atoms adsorbed on nickel and metal-dielectric transitions in a system of atoms of a metal on the surface of a dielectric.

The third section contains almost exclusively experimental papers. The section begins with a general article by G. Doyen, D. Drakova, and F. von Trentini on the theoretical bases of the methods of electron spectroscopies of atoms adsorbed on a surface. A model Hamiltonian is proposed for different spectroscopic methods with the aid of which spectra of emitted electrons are calculated. Surfaces of alkali (which satisfy the conditions of the model particularly well) and transition metals are examined.

A brief discussion is given of the problems of applying spectroscopic methods at their modern level, the apparatus and electron sources for such methods, and results are presented of particular experiments using specific materials.

Of quite a different character is the article by J. Kuppers devoted to the catalytic action of metallic surfaces. Modern spectroscopic methods, as a rule, are inapplicable to the investigation of a surface involved in a real chemical process. The author models the competition of the processes of adsorption, desorption and decomposition of simple molecules near the surface in a high vacuum. Experimental data on the absorption of $C_2H_2$, $H_2O$, $NH_3$, CO on the surface are also presented.

The fourth section includes quite different articles devoted to the investigation of the structure of adsorbed layers and of the surface itself, the application of different experimental methods, the properties of grain boundaries in a polycrystalline material, etc. Among these there are three long articles. The paper by G. M. Lamble and D. King describes an experimental investigation of structures of layers of Cl and Cs adsorbed on the (111) surface of Ag. It is shown that adsorbates of opposite sign form quite different structures. The article by K. Wandelt analyzes the special features of the use of the method of electron photoemission for the investigation of inhomogeneous surfaces. Curious information is contained in the article of C. R. Brundle "Investigations of surfaces and their technological applications carried out by IBM". The article certainly has an advertising and popular character, but it does give an idea of the breadth of investigations of their directions and applications. For illustration the author provides two particular examples of practical applications of investigations which appear to be highly academic.

On the whole the collection of articles reflects the modern state of physics of surfaces, gives an idea of the breadth of the research front, contains a number of papers which are of interest for specialists.

## Magnetic properties of free radicals

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*Landolt-Börnstein. Numerical Data and Functional Relations in Science and Technology.* New Series.—Group II: Atomic and Molecular Physics. V.17: Magnetic Properties of Free Radicals. Ed. H. Fischer, Springer-Verlag, Berlin; Heidelberg; New York; London; Paris; Tokyo, 1987. pp. 551.

Volume 17 of this well-known scientific-technical encyclopedia is completely devoted to the magnetic properties of free radicals, with the radicals here denoting paramagnetic particles (chemically stable or unstable shortlived ones)—atoms, fragments of molecules, ion-radicals, complexes of transition metals with paramagnetic ligands, polyradicals

with several unpaired electrons. The volume contains the following magnetic properties of these particles: $g$ factor (in the predominant majority of cases its isotropic part, but in the case of many radicals also the principal components of the $g$ tensor), the hyperfine and the Fermi interaction constants (the isotropic part or, if this is available, the principal components of the tensor), the components of the dipole interaction of the tensor or the parameters of spitting in zero field $D$ and $E$ (for biradicals), the energy of exchange interaction $J$ (for bi- and triradicals). The greater part of these parameters has been obtained by methods of EPR, NMR, electron-nuclear double resonance and electron-electron double resonance. Results obtained by optical detection of magnetic resonance, by the methods of laser magnetic resonance, by muon spin resonance, by spectroscopy of atomic beams, by chemically induced nuclear polarization, and also with the aid of static magnetic susceptibility (for stable radicals) have also been actively utilized.

Already two subvolumes have appeared: 17a devoted to inorganic radicals, two-ion radicals and radical complexes, and 17b, devoted to inconjugated carbon-centered radicals. Subsequent subvolumes will be devoted to element-organic radicals, polyradicals etc.

This new series and its volume 17 are a major supplement to volumes II/1 and II/9a–9d2 published in 1965 and 1977–1980. This supplement summarizes information on magnetic properties of radicals which became available during the period 1975–1985, i.e., at a time subsequent to the publication of volumes II/9a-9d2.

This new volume of the encyclopedia is useful for physicists, chemists and biophysicists, working on the problems of photophysics and photochemistry, molecular mechanisms of photosynthesis, mechanochemistry of solids, radiation physics and chemistry, etc., i.e., the problem of physics and chemistry of all processes in which radicals play an essential role.

## Magnetic properties of 3d-, 4d-, and 5d-elements and their alloys and compounds

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*Landolt-Börnstein. Numerical Data and Functional Relationships in Science and Technology.* New Series. Editors-in-Chief: K. H. Hellwege and O. Madelung.—Group III: Crystal and Solid State Physics, Vol. 19: Magnetic Properties of Metals. Subvol. a: 3d, 4d, and 5d Elements, Alloys and Compounds. Ed. H. P. J. Wijn, Springer-Verlag, Berlin; Heidelberg; New York; London; Paris; Tokyo, 1986. pp. 653.

The current volume 19 of the well-known reference publication "Landolt-Börnstein" is devoted to magnetic properties of metallic materials—pure metals, alloys, and compounds. Since the previous publication in this reference work concerning magnetic properties refers to 1962 (6th edition, V. 2, part 9), it is clear that the present volume has been rewritten practically anew. In assembling this volume the main principle for selecting information was not a detailed description of individual magnetic properties, but a description of different groups of magnetic materials. In the present volume 19, concerned with group III, metals, alloys and compounds are examined the composition of which includes at least one transition element. In a number of cases along with metallic materials semiconductors and even insulators are discussed. In addition to magnetic properties one can find here information also on those nonmagnetic properties of metals on which spin ordering exerts an appreciable influence. The distribution of the material is as follows: volume 19a is devoted to magnetic properties of 3d-, 4d-, and 5d-metals and alloys based on them; volume 19b is devoted to alloys and compounds of d-transition metals with elements of the principal groups of the Mendeleev periodic system of the elements; volume 19c is devoted to 4f- and 4f-metals and their alloys; volume 19d is devoted to magnetic materials utilized in modern technology: magnetically soft and magnetically hard alloys, invars and elinvars, thin films and coatings, and also to metallic glasses.

Volume 19a begins with a chapter on the properties of 3d-metals: paramagnetic (Ti,V), antiferromagnetic (Cr,Mn), and ferromagnetic ones (Fe,Co,Ni). For the first ones only data on the temperature dependence of the magnetic susceptibility are given, while for the second ones information concerning their magnetic structure, susceptibility and magnetic phase diagrams is provided. The most detailed information is presented for ferromagnetic metals. Here one can find data on the crystal structure and elastic properties, on the constants of magnetic anisotropy and magnetostriction, magnetic susceptibility, spin moment and its spatial distribution, on the spectrum of spin waves, on effects associated with the magnitude of the magnetic field near the nucleus, on the value of the $g$ factor, and on ferromagnetic resonance. For example, in the section on the spin moment information is given on the value of the spin moment in Fe, Co, and Ni, on the value of the negative spin polarization in the interstices betwen atoms, and on the nonsphericity of the distribution of spin moment in a cell. Here also can be found neutron data on the value of the spin moment in paramag-