

The Authors

Hans Plesner Jakobsen

was born in 1949 and studied at the University of Aarhus, obtaining the degree of cand.scient. in mathematics in 1974. In 1976 he acquired the Ph.D. from Massachusetts Institute of Technology, Cambridge, Mass., on a thesis with the title: *Conformal Harmonic Analysis and Intertwining Differential Operators*. His Ph.D. advisor was I. E. Segal. He was then employed 1976-79 as an Assistant Professor at Brandeis University, Waltham, Mass., and returned to Denmark 1979, where, during the period 1979-1982, he held various Danish University fellowships. In 1983 he became a Niels Bohr Fellow, but already in 1984 he obtained an associate professorship at the Mathematical Institute at the University of Copenhagen.

Through his thesis Plesner Jakobsen has initiated an investigation of the unitarizability of highest weight modules, of covariant differential operators, and of applications of these concepts into mathematical physics. Major results include a full description of the set of unitary holomorphic (positive energy) representations on hermitian symmetric spaces as well as a description of all homomorphisms between generalized Verma modules originating or terminating in scalar modules.

Specific results about wave and Dirac operators in relation to the conformal group have been obtained in joint work with M. Vergne. Further results for this group as well as applications towards modular forms have been reached in collaboration with M. Harris. In recent work with K. Kac, results concerning the unitarizability of modules over Kac-Moody algebras have also been established.

He has given invited talks at international meetings and is a referee for scientific journals and for the National Science Foundation (USA).

Lars Døvling Andersen

was born in 1950 and studied at the University of Aarhus, obtaining his degree of cand.scient. in 1975. He pursued his studies in England at the University of Reading and got his Ph.D. in 1979; his thesis was entitled *Latin Squares and Their Generalizations*; later, he spent a period at the Department of Mathematics at the University of Toronto.

In periods, Andersen has been teaching at Aarhus University and the Technical University of Denmark (Danmarks tekniske Højskole, DTH); as a Niels Bohr Fellow he was in 1984 affiliated to Aalborg University Centre, where he has now been appointed Assistant Professor as from February, 1986.

Andersen's main mathematical interests are graph theory and combinatorics, and he has been particularly interested in various ways of colouring the edges of a graph and in completing and embedding partial latin squares and partial Steiner triple systems, as well as in the interrelation between these topics. His thesis contains contributions to all of these areas. Earlier papers on edge-colourings of graphs include new bounds on the chromatic index and on the cover-index of a graph.

More recently, in collaboration with A. J. W. Hilton and C. A. Rodger, he has solved the embedding problem for partial latin squares with prescribed diagonal, and with A. J. W. Hilton he has proved a strengthening of the famous Evans conjecture characterizing all non-completable partial latin squares of side n with at most n cells occupied (this result is improved further in the present volume). With E. Mendelsohn, Andersen has given a construction for latin squares of side n without proper subsquares for all n not of the form $2^a 3^b$.

He has been active as lecturer and organizer of international meetings within his field of research.

Jens Kirkeskov Knude

was born in 1946 and studied at the University of Copenhagen, where he obtained his cand.scient. degree in 1975. After his degree he continued as a stipendiate at the University Observatory until 1981. In 1980 he obtained the Dr. of Science degree from the University of Copenhagen on a thesis with the title *Properties of the Local Interstellar Medium as Deducted from uvby β Photometry of A and F Stars in 84 Small Volumes*. After a short employment at the University of Aarhus he became a Research Fellow of the Danish Space Board until 1983, when he obtained a Niels Bohr Fellowship. In 1985 he became Assistant Professor at the University of Copenhagen.

Jens Knude's field of research is observational astronomy and he has spent long periods at the astronomical observatories at la Silla in Chile, Kitt Peak in Arizona, Mitzpeh Ramon in Israel, la Palma on the Canary Islands, and most lately as a Niels Bohr Fellow at San Pedro Martir in Mexico. Through these observations he has obtained data for the study of the existence, distribution, and physical properties of local interstellar

material. Among the objectives are the search for dust features with linear dimensions smaller than 1 pc and particularly the dust distribution in the obvious windows to the universe, the galactic poles.

The dust structures are discovered by means of coherent color excesses resulting from observations of stars in fine networks. Any clear understanding of the spatial distribution of the local matter has not been obtained so far. On the contrary new data, for about 9000 lines of sight, indicate that the local material is dispersed in a more complex manner than anticipated.

Thomas Døssing

was born in 1947, and studied at the University of Copenhagen, where he obtained the cand. scient. degree in 1974. From 1975 he held a candidate stipendium at the Niels Bohr Institute until he (1977-78) obtained a Max-Planck-Institute stipendium to work at the Max-Planck-Institut für Kernphysik in Heidelberg. After his lic.scient. (Ph.D.) thesis from 1978, which dealt with angular distributions and correlations in statistical nuclear gamma-decay, he was employed as a Nordita fellow 1979-82 and as a Staff Scientist at Lawrence Berkeley Laboratory, University of California 1982-83. He became a Niels Bohr Fellow from September 1983, but stayed at Lawrence Berkeley Laboratory until August 1984.

The main theme of Døssing's scientific work has been the study of rapidly rotating nuclei, and especially nuclear states for which the angular momentum is aligned with the symmetry axis of the density distribution. The cascades of particles emitted from rotating nuclei was the subject of his thesis from 1978 and this subject was followed up in 1981 by a general formulation of angular correlations in direct nuclear reactions.

One of the ways in which nuclei attain a high angular momentum is through strongly damped nuclear reactions. In 1978 Døssing showed in collaboration with Carlos Dasso and Hans Christian Pauli that the Hartree-Fock approximation to this problem was inadequate to describe the observed spread in mass distribution in such reactions. In a fruitful collaboration with Jørgen Randrup in Berkeley he very successfully used a nucleon transfer transport theory to account for the dynamical evolution of the angular momentum in damped nuclear reactions which has led to new insight in the relaxation phenomena in these reactions.

During the ten years from 1975-1985 he has been invited speaker at more than ten international conferences and summer schools, and has published seven scientific papers during his time as a Niels Bohr Fellow.

Irene Shim

was born in 1945 and studied at the University of Copenhagen and later at the Technical University of Denmark (Danmarks tekniske Højskole, DTH), obtaining the degree lic.techn. (Ph.D.) in 1977. The title of her dissertation was *The Electronic Interaction between Two Nickel Atoms and the Underlying Theory*, and her supervisor was Professor Jens Peder Dahl. Her work has mainly been concentrated on employing the most sophisticated quantum chemistry methods presently available to elucidate the electronic structure and the nature of bonding in coordinatively unsaturated molecules containing transition metal. The work performed on the transition metal dimers has revealed unusual chemical bonds that cannot be described appropriately in the molecular orbital picture. The bonding in such molecules is mostly due to a delocalized molecular orbital formed by the outermost s orbitals. The d orbitals split in energy due to the lowering of symmetry. The split d orbitals give rise to a large number of low-lying electronic states. Recently, the basic results obtained by Irene Shim have been confirmed by experimental work of other scientists.

After she had obtained the degree Dr. Shim worked for two years as a post-doctoral fellow on a grant from the Danish National Science Council.

After a short employment at the Royal Danish School of Pharmacy she went to Texas A & M University as a post-doctoral research associate, and from 1983 she has been visiting Associate Professor at the university. In september 1983 she was given a Niels Bohr Fellowship and she has since been working at Chemical Laboratory B, Technical University of Denmark, and at Texas A & M University.

During her recent work she has utilized the results obtained earlier for the transition metal dimers to gain deeper understanding of the nature of magnetism. In addition the calculational work performed on the coordinatively unsaturated transition metal carbides and nitrides provide basic results that are important for the understanding of catalysis. Thus, the investigations performed have led to detailed descriptions of chemical bonds that are formed or broken in the course of catalytic processes.

Dr. Shim has presented her results at numerous international meetings in the field of theoretical chemistry.

Hans Lomholt Skriver

was born in 1944, studied at the Technical University of Denmark (Danmarks tekniske Højskole, DTH) and obtained the degree of cand. polyt. in physics in 1970. In 1973 he acquired the lic.techn. (Ph.D.) at the DTH

based on the thesis *The Electronic Structure of the Ordered Brass Alloys β' -CuZn and β' -AgZn as Determined by the APW Method*, and in 1985 he defended a doctoral thesis *One-electron Theory of Metals* to the University of Copenhagen. He has been employed at Physics Laboratory I, DTH, from 1970-1964. In 1974-75 he worked at Division of Physics, National Research Council of Canada, Ottawa. He was guest scientist at Kamerlingh Onnes Laboratory, Leiden, Holland during the years 1975-1976. Since then he has worked at the Physics Department, Risø National Laboratory, Roskilde – interrupted by longer visits to the Max-Planck-Institut für Festkörperforschung. During a period his work was supported by NORDITA, and since 1983 he has been a Niels Bohr Fellow.

Skriver's theoretical work on solid state physics has always been centred on the application of one-electron theory to metals and alloys based on coded computations. In this study he has made much progress during the past fifteen years, and his work is highly appreciated internationally.

His collaboration with the experimentalist J.-P. Jan led to successful calculations of band structures and interpretations of dHvA measurements for many metals and ordered alloys.

Since his return to Risø he has worked in close collaboration with O. K. Andersen, at the DTH., now in Stuttgart, as well as with B. Johansson, Aarhus and Uppsala. He has studied the properties of the actinides in great detail, as well as the rare earths. He has calculated the structural energy differences for about forty metals and has been able to determine theoretically which crystal structure a given metal will take on at normal conditions.

In recent years he has given some twenty invited talks at international conferences.

Claus Schelde Jacobsen

was born in 1949, and studied at the Technical University of Denmark (Danmarks Tekniske Højskole, DTH), obtaining the degree of cand. polyt. in electrical engineering in 1973. Since that time he has been employed as assistant at Physics Laboratory III, DTH. until he became a Niels Bohr Fellow in 1983. He worked at the Department of Physics, University of Pennsylvania, on leave of absence from DTH during the years 1973-1974. In 1976 he acquired the degree of Ph.D. (lic.techn.); his thesis was *Infrared Properties of the Organic Conductor TTF-TCNQ*.

Jacobsen has made many valuable contributions to the pioneering

work on the development of new synthetic metals and superconductors commenced during his stay in Pennsylvania. In order to study the basic electronic structure of organic solids he has in particular applied infrared and optical spectroscopy, and investigated transport properties. This work was performed with support from the Danish Natural Science Research Council and the NATO Research Grants Programme.

He has given elementary courses in atomic and nuclear physics and statistical mechanics, and has taken part in organisation of scientific collaboration within solid state physics. He was awarded Fabrikant Gorm-Petersens Mindelegat in 1981 and the ESSO-Prize in 1985.

Hans Uffe Petersen

was born in 1948. He obtained his degree of cand.polyt. in chemical engineering at the Technical University of Denmark (Danmarks tekniske Højskole, DTH) in 1972. He then moved to the Institut de Biologie Physico-Chimique, Paris, 1973-1978, where he worked in the Department of Biochemistry under the supervision of Dr. Marianne Grunberg-Manago. He became doctor of natural sciences (Docteur ès-Sciences d'État) from the University of Paris in 1980.

He returned to Denmark in 1979 to work as a research biochemist in the Institute of Chemistry, Department of Biostructural Chemistry, University of Aarhus, headed by professor Brian F. C. Clark. His scientific work has concentrated on the molecular mechanism of protein biosynthesis and especially the function of tRNA and translation factors in the initiating steps. In prokaryotic, but not in eukaryotic cell cytoplasm, the initiator methionyl-tRNA is formylated. He has proposed a specific role for this modification in the translation of polycistronic messenger RNAs. This is part of the work for which he received the French degree of Doctor of Sciences at the University of Paris in 1980. The title of the thesis is *Contribution à l'étude du rôle du met-tRNA_f^{Met} initiateur et sa formylation dans l'initiation de la traduction chez E. coli*. Most recently Petersen has studied the structural regions within the initiator tRNA which are involved in interactions with proteins during the initiation of translation. The results reveal specificities in the interactions of fMet-tRNA_f^{Met} as compared to elongator tRNAs and also suggest which parts of the initiator tRNA molecule are binding to the proteins in each of the reactions prior to the formation of the first peptide bond.

Hans Uffe Petersen has been working as visiting scientist in many different laboratories, some of which are: Max-Planck-Institut für Molekulare Genetik, Berlin (prof. Olaf Pongs), 1975, Institut Laue-Langevin,

Grenoble (prof. Bernard Jacrot), 1976 and 1980, Institut de Biologie Moleculaire et Cellulaire, Strasbourg (prof. Jean Pierre Ebel), 1980, Department of Biological Chemistry, Medical School, University of California, Davis (prof. John W. B. Hershey), 1981, and 1982, Department of Biochemistry, Institut de Biologie Physico-Chimique, Paris (dr. Marianne Grunberg-Manago), 1984-85. He has organized several international meetings.

Jon Steen Petersen

was born in 1947. He obtained his cand.scient. degree in 1973 at the University of Aarhus.

He worked 1973-78 in the Geology Department of the University of Aarhus as a university stipendiate and assistant teacher, 1978-1981 he was a Research Council stipendiate, 1981-1983 Assistant Professor at the University of Oslo, and since 1983 he has been a Niels Bohr Fellow.

1975-1976 was spent at Université de Paris VII, Institut de Physique de Globe, and at Centre d'Etudes Atomique, Lab. P. Sue, Saclay, 1976-77 at the Mineralogical Museums, the University of Oslo, and 1984-85 at the NASA-Johnson Space Center, Solar System Exploration Division & Experimental Planetology Branch, Houston, Texas. He has worked for Norsk Hydro A/S and B.P. Minerals Exp. in mineral exploration in Norway (phosphates, nepheline, molybdenum, gold) and for Dansk Geoteknik with engineering geological problems involved in dam construction at Jos, Nigeria.

Jon Steen Petersen's research work has covered various aspects of the petrology of igneous and metamorphic rocks. The main themes have been: structural geology and metamorphic petrology of high-grade gneiss complexes; rift zone magmatism and tectonics; geochemistry and petrology of magmatic differentiation processes; and crystallization kinetics and experimental petrology. Most of the field studies have been carried out in the Precambrian basement of Southern Norway and in the igneous rocks of the Permian Oslo Province. His research has provided new information on the *mise en place* of the plutonic rocks of the Oslo Province which has been of fundamental importance for all subsequent studies in this Province. He has for instance demonstrated that the large masses of larvikite are composite multiphase intrusions. The petrogenetic studies in zoned plutonic rock complexes, especially in the Oslo Province, by means of whole-rock, major and trace element geochemistry as well as mineralogical studies by NAA and microprobe analysis of individual minerals have resulted in a better understanding of the chem-

ical segregation during crystallization. These results suggest that element distribution is governed by dynamic magma processes rather than by equilibrium phase-relations, and have promoted the experimental studies of such processes in relevant synthetic and natural systems. The concept of macrosegregation is a result of these studies and has initiated experimental studies that emphasize its potential to important petrogenetic problems.

Petersen has participated in many international conferences, in part as invited speaker, in the Nordic countries and other European countries, and USA.

Jens Konnerup-Madsen

was born in 1948. He obtained his cand. scient. degree in geology at the University of Aarhus in 1976 and his lic.scient. (Ph.D.) at the University of Copenhagen in 1980.

1973-74 was spent at Université de Nancy I, France, supported by a grant from the French government. During this period Madsen was introduced to the study of fluid inclusions in minerals by Drs. Bernard Poty and Jacques Touret.

1977-1983 he was a Research Council stipendiate at the Institute of Petrology, University of Copenhagen. 1977-80 he studied fluid inclusions in certain minerals from the Gardar Province in Greenland, a subject which was treated in his lic.scient. thesis, entitled *Fluid Inclusions in Minerals from Igneous Rocks Belonging to the Precambrian Continental Gardar Rift Province, South Greenland: the Alkaline Ilimaussaq Intrusion and the Alkali Acidic Igneous Complexes*. This line of studies was 1981-83 expanded to cover volatile components of deep crustal and upper mantle origin as revealed by fluid inclusions and stable isotopes, and since 1984 as a Niels Bohr Fellow especially the hydrocarbons in the Earth's crust and upper mantle as revealed by fluid inclusions in minerals. In shorter periods he has studied the fluid phase involved in the formations of porphyry Mo-deposits and he has supervised a study of fluid inclusions in sediments in an attempt to use such inclusions in the evaluation of source rocks for oil and natural gas.

The main part of Madsen's research work has been focused on volatiles in deep crustal and upper mantle rocks, as inferred from studies of fluid inclusions trapped during growth of the minerals, and starting with work on deep-seated granitic intrusions and high-grade metamorphic rocks from South Norway. Subsequent work has dealt with igneous rocks from South Greenland and nodules of upper mantle materials in

order to elucidate the role of CO_2 and CH_4 , and other hydrocarbons, in lower crustal and upper mantle magmatic processes, the carbon-bearing gases being of non-biogenic origin.

One of the results of these studies is, that although hydrocarbons are often observed also in mantle derived rocks, the hydrocarbons are generally though not always of a relatively late origin and owe their existence to reactions between CO_2 and H_2O , both of which species appear to be the dominant gases in the upper mantle. Hence the studies do not support the idea of any major degassing of the methane from deep levels.

Jens Konnerup-Madsen has been responsible for graduate and post-graduate teaching in petrology, fluid inclusion analyses, etc. at the Institute of Petrology. – He has participated in a number of international conferences, in part as invited speaker.