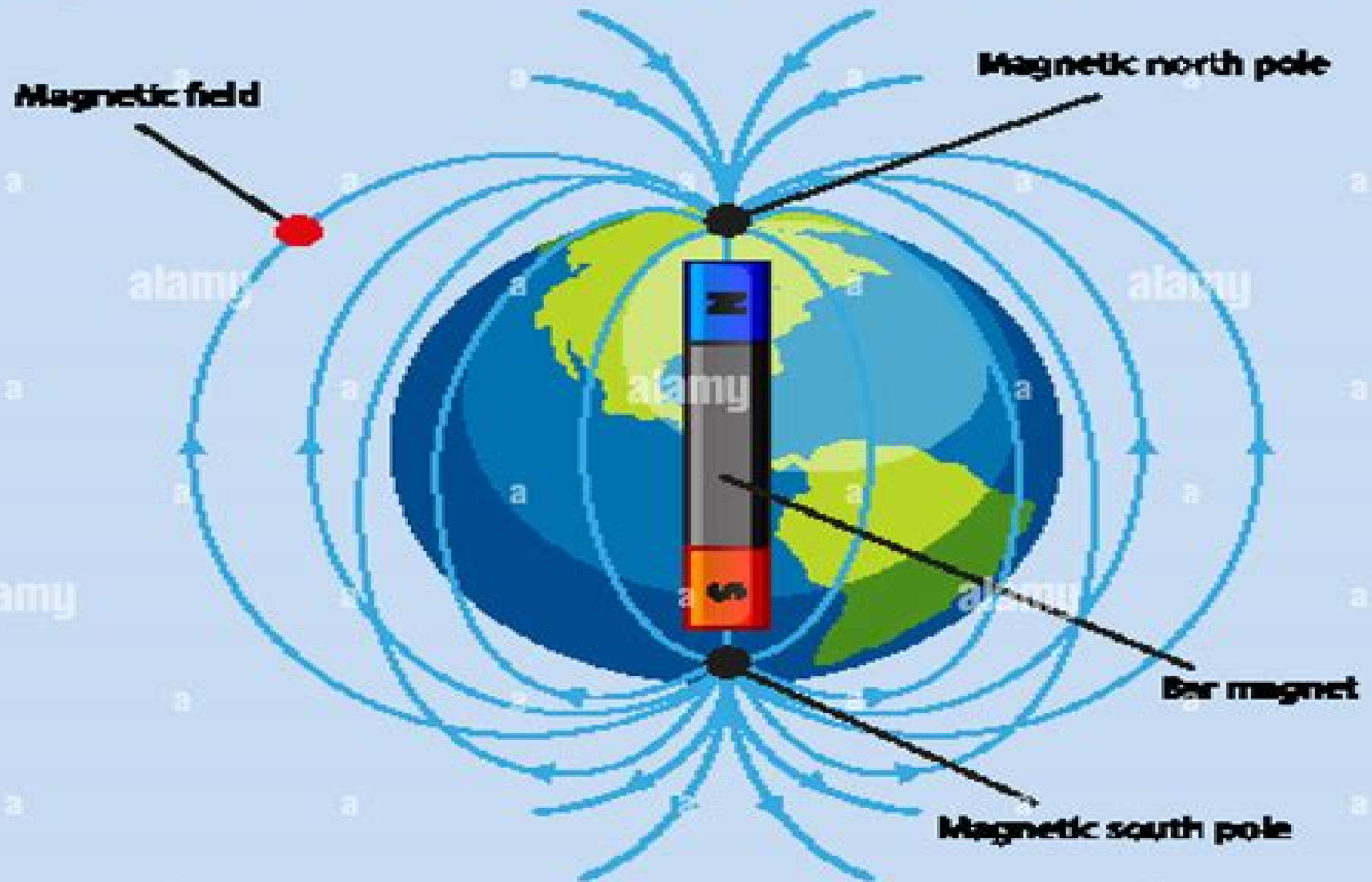


Earth's magnetic field



High Magnetic Fields

**Israel D. Vagner, Peter Wyder, Tsofar
Maniv**



High Magnetic Fields:

High Magnetic Field Science and Its Application in the United States National Research Council, Division on Engineering and Physical Sciences, Board on Physics and Astronomy, Committee to Assess the Current Status and Future Direction of High Magnetic Field Science in the United States, 2013-12-25 The Committee to Assess the Current Status and Future Direction of High Magnetic Field Science in the United States was convened by the National Research Council in response to a request by the National Science Foundation This report answers three questions 1 What is the current state of high field magnet science engineering and technology in the United States and are there any conspicuous needs to be addressed 2 What are the current science drivers and which scientific opportunities and challenges can be anticipated over the next ten years 3 What are the principal existing and planned high magnetic field facilities outside of the United States what roles have U S high field magnet development efforts played in developing those facilities and what potentials exist for further international collaboration in this area A magnetic field is produced by an electrical current in a metal coil This current exerts an expansive force on the coil and a magnetic field is high if it challenges the strength and current carrying capacity of the materials that create the field Although lower magnetic fields can be achieved using commercially available magnets research in the highest achievable fields has been and will continue to be most often performed in large research centers that possess the materials and systems know how for forefront research Only a few high field centers exist around the world in the United States the principal center is the National High Magnetic Field Laboratory NHMFL High Magnetic Field Science and Its Application in the United States considers continued support for a centralized high field facility such as NHFML to be the highest priority This report contains a recommendation for the funding and siting of several new high field nuclear magnetic resonance magnets at user facilities in different regions of the United States Continued advancement in high magnetic field science requires substantial investments in magnets with enhanced capabilities High Magnetic Field Science and Its Application in the United States contains recommendations for the further development of all superconducting hybrid and higher field pulsed magnets that meet ambitious but achievable goals Pulsed High Magnetic Fields Heinz Knoepfel, 1970 *Opportunities in High Magnetic Field Science* National Research Council, Division on Engineering and Physical Sciences, Board on Physics and Astronomy, Solid State Sciences Committee, Committee on Opportunities in High Magnetic Field Science, 2005-07-26 High field magnets those that operate at the limits of the mechanical and or electromagnetic properties of their structural materials are used as research tools in a variety of scientific disciplines The study of high magnetic fields themselves is also important in many areas such as astrophysics Because of their importance in scientific research and the possibility of new breakthroughs the National Science Foundation asked the National Research Council to assess the current state of and future prospects for high field science and technology in the United States This report presents the results of that assessment It focuses on scientific and technological challenges and

opportunities and not on specific program activities The report provides findings and recommendations about important research directions the relative strength of U S efforts compared to other countries and ways in which the program can operate more effectively

High Magnetic Fields Fritz Herlach, 2003-10-06 This three volume book provides a comprehensive review of experiments in very strong magnetic fields that can only be generated with very special magnets The first volume is entirely devoted to the technology of laboratory magnets permanent superconducting high power water cooled and hybrid pulsed magnets both nondestructive and destructive megagauss fields Volumes 2 and 3 contain reviews of the different areas of research where strong magnetic fields are an essential research tool These volumes deal primarily with solid state physics other research areas covered are biological systems chemistry atomic and molecular physics nuclear resonance plasma physics and astrophysics including QED

High Magnetic Fields Hans J. Schneider-Muntau, 1997 High magnetic fields and the industrial applications of this technology are rapidly developing areas This book is based on lectures given at the international workshop High Magnetic Fields Industry Materials and Technology held at the National High Magnetic Field Laboratory in Tallahassee Florida in February 1996 It is however far more than the proceedings of this meeting The lecturers have provided in depth contributions and well focused overview articles on their fields The book includes fifty papers reporting the exciting potential of high magnetic fields for applications such as process control energy storage material processing levitated trains and aneutronic fusion devices It describes the various technologies used to generate the highest magnetic fields with resistive pulsed and superconducting magnets The limitations on the generation of high magnetic fields imposed by presently available materials are shown Finally the important role national laboratories play as user facilities in helping to link basic and applied research with future industrial applications is explained

High Magnetic Fields Claude Berthier, Laurent P. Levy, Gerard Martinez, 2008-01-11 This book is addressed to all scientists interested in the use of high magnetic fields and in the use of high field facilities around the world In particular it will help young scientists and newcomers to the topic to gain a better understanding in areas such as condensed matter physics in which the magnetic field plays a key role either as a parameter controlling the Hamiltonian or as an experimental tool to probe the underlying mechanism This concerns mostly strongly correlated and/or low dimensional systems Rather than covering all these subjects in detail the philosophy here is to give essential physical concepts in some of the most active fields which have been quickly growing in the last ten to twenty years Besides its role as a physical parameter in condensed matter physics a large magnetic field is essential to Electron Paramagnetic Resonance EPR and Nuclear Magnetic Resonance NMR spectroscopies The state of art of high resolution NMR in liquids and solids and high frequency EPR applied to fields like chemistry and biology are also reviewed in this volume The first series of chapters is devoted to the integer and the Fractional Quantum Hall Effects FQHE in two dimensional electron systems C Glattli brushes an historical background and a comprehensive review of transport phenomena in these systems including recent developments on the mesoscopic electronic

transport at the edges of quantum Hall samples chiral Luttinger liquids and fractional excitations R High Magnetic Fields Fritz Herlach, 2003 This three volume book provides a comprehensive review of experiments in very strong magnetic fields that can only be generated with very special magnets The first volume is entirely devoted to the technology of laboratory magnets permanent superconducting high power water cooled and hybrid pulsed magnets both nondestructive and destructive megagauss fields Volumes 2 and 3 contain reviews of the different areas of research where strong magnetic fields are an essential research tool These volumes deal primarily with solid state physics other research areas covered are biological systems chemistry atomic and molecular physics nuclear resonance plasma physics and astrophysics including QED *Physics of Semiconductors in High Magnetic Fields* Noboru Miura, 2007-10-11 This book describes the basic concepts of various physical phenomena in semiconductors and their modulated structures under high magnetic fields The topics cover magneto transport phenomena cyclotron resonance far infrared spectroscopy magneto optical spectroscopy diluted magnetic semiconductors in high magnetic fields as well as the recent advances in the experimental techniques needed for high field experiments Starting from the introductory part describing the basic theoretical background each chapter introduces typical experimental data which were actually obtained in very high magnetic fields mostly in the pulsed field range up to several megagauss 20 100T The book has both the character of a textbook and a monograph For researchers and students with an interest in semiconductor physics or in high magnetic fields it will serve as a useful guide

High Magnetic Fields: Science And Technology (In 3 Volumes) - Vol. 1 Fritz Herlach, Noboru Miura, 2003-10-06 This three volume book provides a comprehensive review of experiments in very strong magnetic fields that can only be generated with very special magnets The first volume is entirely devoted to the technology of laboratory magnets permanent superconducting high power water cooled and hybrid pulsed magnets both nondestructive and destructive megagauss fields Volumes 2 and 3 contain reviews of the different areas of research where strong magnetic fields are an essential research tool These volumes deal primarily with solid state physics other research areas covered are biological systems chemistry atomic and molecular physics nuclear resonance plasma physics and astrophysics including QED *Materials Science in Static High Magnetic Fields* Kazuo Watanabe, Mitsuhiro Motokawa, 2002 Presents the most comprehensive review of the influence of highly intense magnetic fields on materials of various classes **High Magnetic Fields: Science And Technology (In 3 Volumes) - Vol. 2** Fritz Herlach, Noboru Miura, 2003-10-06 This three volume book provides a comprehensive review of experiments in very strong magnetic fields that can only be generated with very special magnets The first volume is entirely devoted to the technology of laboratory magnets permanent superconducting high power water cooled and hybrid pulsed magnets both nondestructive and destructive megagauss fields Volumes 2 and 3 contain reviews of the different areas of research where strong magnetic fields are an essential research tool These volumes deal primarily with solid state physics other research areas covered are biological systems chemistry atomic and molecular physics nuclear

resonance plasma physics and astrophysics including QED High Magnetic Fields: Science And Technology (In 3 Volumes)
- Vol. 3 Fritz Herlach, Noboru Miura, 2006-03-01 This three volume book provides a comprehensive review of experiments in very strong magnetic fields that can only be generated with very special magnets The first volume is entirely devoted to the technology of laboratory magnets permanent superconducting high power water cooled and hybrid pulsed magnets both nondestructive and destructive megagauss fields Volumes 2 and 3 contain reviews of the different areas of research where strong magnetic fields are an essential research tool These volumes deal primarily with solid state physics other research areas covered are biological systems chemistry atomic and molecular physics nuclear resonance plasma physics and astrophysics including QED *Recent Trends in Theory of Physical Phenomena in High Magnetic Fields* Israel D. Vagner, Peter Wyder, Tsofar Maniv, 2012-12-06 A comprehensive collection of papers on theoretical aspects of electronic processes in simple and synthetic metals superconductors bulk and low dimensional semiconductors under extreme conditions such as high magnetic and electric fields low and ultra low temperatures The main emphasis is on low dimensional conductors and superconductors where correlated electrons interacting with magnetic or nonmagnetic impurities phonons photons or nuclear spins result in a variety of new physical phenomena such as quantum oscillations in the superconducting state Condon instability Skyrmions and composite fermions in quantum Hall effect systems and hyperfine field induced mesoscopic and nanoscopic phenomena Several new experimental achievements are reported that promise to delineate future trends in low temperature and high magnetic field physics including the experimental observation of the interplay between superconductivity and nuclear spin ordering at ultra low temperatures new observations of Condon domains in normal metals and an experimental proposal for the realisation of isotopically engineered semiconductor based spin qubit elements for future quantum computation and communication technology Opportunities in High Magnetic Field Science National Research Council, Division on Engineering and Physical Sciences, Board on Physics and Astronomy, Solid State Sciences Committee, Committee on Opportunities in High Magnetic Field Science, 2005-08-26 High field magnets those that operate at the limits of the mechanical and or electromagnetic properties of their structural materials are used as research tools in a variety of scientific disciplines The study of high magnetic fields themselves is also important in many areas such as astrophysics Because of their importance in scientific research and the possibility of new breakthroughs the National Science Foundation asked the National Research Council to assess the current state of and future prospects for high field science and technology in the United States This report presents the results of that assessment It focuses on scientific and technological challenges and opportunities and not on specific program activities The report provides findings and recommendations about important research directions the relative strength of U S efforts compared to other countries and ways in which the program can operate more effectively *High magnetic fields ; 1*, 1961 **The generation of high magnetic fields** David H. Parkinson, 2013-12-19 Physics of Semiconductors in High Magnetic Fields Noboru Miura, 2008 This book

summarizes most of the fundamental physical phenomena which semiconductors and their modulated structures exhibit in high magnetic fields Readers can learn not only the basic theoretical background but also the present state of the art from the most advanced data in this rapidly growing research area The Generation of High Magnetic Fields David H.

Parkinson,Brian E. Mulhall,2014-09-01 **Proceedings of Physical Phenomena at High Magnetic Fields-IV** G.

Boebinger,2002 Physical Phenomena at High Magnetic Fields IV PPHMF IV was the fourth in the series of conferences sponsored by the National High Magnetic Field Laboratory NHMFL The success of PPHMF I II and III held in 1991 1995 and 1998 respectively encouraged the organizers to once again bring together experts in scientific research areas where high magnetic fields play an important role to critically assess the current status of research in these areas and to discuss promising new directions in science as well as applications which are in the forefront of these fields **Physical**

Phenomena At High Magnetic Fields II John Robert Schrieffer,Zachary Fisk,Lev P Gor'kov,David Meltzer,1996-05-25 The purpose of the conference was to bring together experts in research areas of science in which high magnetic fields play an important role to critically assess the current status of research in these areas and to discuss promising new directions in science as well as applications which are at the forefront of these fields The program consisted of talks given by leading experts presenting overviews and critical assessments of certain areas including semiconductors the quantum Hall effect heavy fermions superconductivity organic solids chemical systems and the generation and use of high magnetic fields in basic and applied research

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