Rare-earth Information Center NEWS

Ames Laboratory
Institute for Physical Research and Technology
Iowa State University / Ames, Iowa 50011-3020 / U.S.A.

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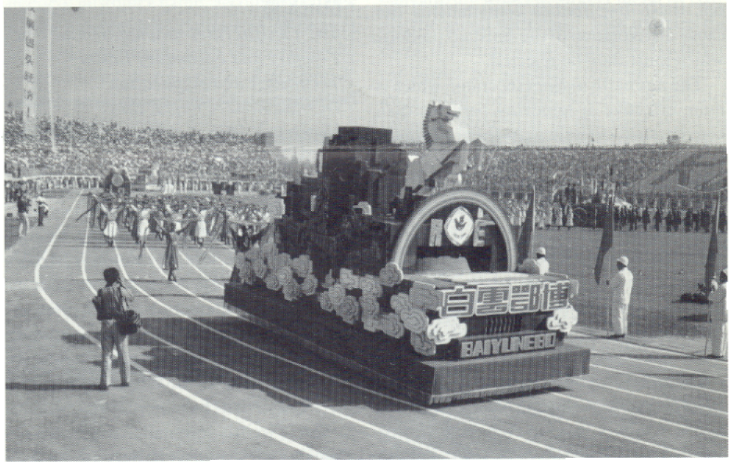
Chinese RE Celebration

Baotou Festival

The '94 Baotou International Symposium on Rare Earth Science and Technology ('94BISREST) was one of several simultaneous meetings being held in late August (28-31) under the umbrella meeting of the First International Meeting on "Rare Earth Science, Technology, Trade and Cooperation" in Baotou, Inner Mongolia, People's Republic of China, commonly called the "Baotou Festival". This meeting was planned to coincide with the bicentennial anniversary of the isolation of the first rare earth element, yttrium in the form of Y_2O_3, from the rare earth mineral first discovered in 1787 at the feldspar quarry on the isle of Ytterby, Sweden. The Baotou Festival was held to promote Baotou's rich rare earth resources to the financial, industrial, scientific and technological communities throughout the world to speed up the development and broaden the horizons of rare earth applications. In addition to these meetings, there was an exhibit and fair concerning the application of rare earth materials produced in China.

The term Baotou Festival was most appropriately manifested in the opening ceremony which took place at the Municipal Stadium Sunday morning. In addition to the usual speeches by local and regional officials, a two-hour pageant took place involving marching bands and units, floats, drill teams, dance and gymnastics groups, a 20-gun salute, a flash card display (which changed several times during the program, and was carried out by the spectators sitting in the southeast side of the stadium), and a finale in which 4000 pigeons and an equal number of helium filled balloons were released into the air — a performance equivalent to the opening ceremony of the World Olympic Games, see photo. Of the 22 motorized floats, 18 of them carried a symbol of one of the rare earth elements (17) or the letters "RE". All of this extravaganza was developed for the promotion of rare earths,



A float (with the letters "RE") and a dance team performing at the Baotou Festival. Note: the letters on the float behind the dance team are "La" (barely visible), and also the letter "R" made up by flash cards is visible at the upper right. Photograph was made available by courtesy of Dr. Peizhang Li, Director, Office of the Symposium on Rare Earth Science and Technology, Baotou, Inner Mongolia, People's Republic of China.

of which about 40% of the world's known reserves lie in a deposit about 170 km (100 miles) from Baotou at the Baiyunebo Mine, which is also a major iron ore mine in China. The awareness of the rare earths by the common person in the city of Baotou is probably orders of magnitude higher than that in any city in the world. About 50,000 persons filled the stadium to view this ceremony put on by several thousands of performers.

Later, in the middle of the afternoon, the opening ceremony for the '94BISREST meeting took place with speeches from the heads of the four major sponsoring organizations: Chuan Dian Zhou, Chairman of the Board of the Chinese Society of Rare Earths; Qun Bi, Deputy Minister of the Ministry of Metallurgy; Fengi Wang, Mayor of Baotou City; and Guo An Zeng, President of Baotou Steel and Rare Earth Company. Also Karl A. Gschneidner, Jr., Director of the Rare-earth Information Center, spoke a few words on behalf of the foreign guests and visitors.

The main technical program, and scientific and technical exchanges took place over the following two and a half days. Of the oral presentations, 5 papers were devoted to applications, 8 on extractive metallurgy and separation processes, 4 on magnetic materials, 3 on high temperature superconductors, and 6 on miscellaneous topics. In addition, there were 5 poster presentations. The papers will be published in the Chinese

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RE Magnetic Separator

Pfaltzgraff Co., a manufacturer of ceramic dinnerware and gift items, employs rare earth permanent magnets in its ceramic production process to extract ferrous fines in the dry clay line. The York, Pennsylvania plant uses a rare earth permanent magnet magnetic separator manufactured by Eriez Magnetics, Erie, Pennsylvania, to clean up the raw clay material before it even enters the production line. If left in the clay material, these fine ferrous contaminants can cause discoloration of the finished product, which must then be rejected.

The rare earth magnet separator, which is more effective at removing particles than conventional ceramic permanent magnets, is also self cleaning, say Pfalzgraff Co. officials. The self-cleaning feature not only acts to reduce the amount of fines in the dry clay, but also helps in eliminating a potential safety hazard. The investment for this new system was realized when, after only six months of operation, the company saved over $150,000 US as the plant's product reject rate decreased.

For more information on this, or other Eriez magnetic products contact: Eriez Magnetics, Ashbury Road at Airport, P.O. Box 10608, Erie, PA 16514-9883, USA; Tel:814 835 6000; Fax: 814 838 4960. ▲

NdFeB permanent Magnets 95

The ninth international conference on NdFeB permanent magnets will be held February 26-28, 1995 in San Diego, California, USA. The conference will bring together NdFeB magnetic materials producers, molders, users, and raw materials suppliers to discuss the issues facing the industry. For a complete conference brochure and other information, contact: Ms. Julie Grant, Gorham/Intertech Consulting, 411 US Route One, Portland, ME 04105 USA; Tel:207 781 9800; Fax: 207 781 2150. ▲

25^{iémes} Journées des Actinides

The *25^{iémes} Journées des Actinides* will be held April 7-11, 1995 at L'Aquila, Italy. The conference is devoted to the physics and chemistry of actinides and will include a one day workshop on lanthanides.

For more information contact the secretary: Università dell'Aquila, Dipartimento di Fisica, Via Vetoio, 67010-1'Aquila, Italy; Tel:39 862 433 031; Fax:39 862 433 033; E-mail:jouac@vxscaq.aquila.infn.it. ▲

Conference Calendar

*** A NEWS STORY THIS ISSUE**

February '95
NdFeB Permanent Magnets 95
San Diego, California, USA
February 26-28, 1995
*This issue

March '95
The Twelfth International Seminar on Primary and Secondary Battery Technology and Application
Deerfield Beach, Florida, USA
March 6-9, 1995
*This issue

April '95
25^{iémes} Journées des Actinides
L'Aquila, Italy
April 7-11, 1995
*This issue

August '95
The Third International Conference on Rare Earths Development & Application
Baotou, Inner Mongolia, China
August 21-25, 1995
RIC News, **XXIX**, [1] 3 (1994)

September '95
European Magnetic Materials and Applications Conference (EMMA 95)
Wein, Austria
September 4-8, 1995
RIC News, **XXIX**, [1] 3 (1994)

International Conference on Strongly Correlated Electron Systems (SCES'95)
Goa, India
September 27-30, 1995
RIC News, **XXIX**, [3] 2 (1994)

Battery Seminar and Workshop

The Twelfth International Seminar on Primary and Secondary Battery Technology and Application is a four-day seminar and workshop to be held March 6-9, 1995 at Deerfield Beach, Florida, USA. The seminar will cover all of the important aspects of battery research, manufacturing and application. The meeting will focus on new technologies as well as recent developments in the rechargeable battery field. The seminar will provide a comprehensive view of the total primary and secondary battery industrial activities that are well established, as well as those still in research and development. Of special interest will be those battery systems being designed for electric vehicles.

The seminar will bring together individuals and groups from around the world interested in the manufacture, sale and use of primary and secondary batteries. Included will be a unique working forum for a review and discussion of the present status, significant new developments, and the future outlook of the field in general. Seminar organizers plan to cover all of the important battery systems and applications.

For registration information and brochures contact: Florida Educational Seminars, Inc., 1900 Glades Road, Suite 358, Boca Raton, FL 33431 USA; Tel: 407 338 8727; Fax: 407

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Congratulations!

Mr. Dudley Kingsnorth, Project Manage of the Mt. Weld Rare Earths Project ir Western Australia, has been appointed a: Chief Executive Officer of the recently developed Western Australia New Materi als Technology Centre (WANMTC) WANMTC will promote better material: technology through education, consultin and research & development project man agement services. This new service wil ensure that the industry of Western Austra lia remains competitive in the world market This goal will be reached by improvin materials selection and fabrication for cur rent projects, as well as identifying nev opportunities for Western Australia'a min eral industry.

In addition to becoming CEO o WANMTC, Mr. Kingsnorth will remair Project Manager of Mt. Weld. The Mt Weld Rare Earths Project is owned anc operated by Ashton Mining Limited. RIC congratulates Mr. Kingsnorth on his nev appointment and wishes him success ir Western Australia's new endeavor. ▲

Battery Seminar*/Continued* ➲

338 6887. For technical program detail: contact: Dr. S.P. Wolsky, Ansum Enter prises, Inc., 1900 Cocoanut Road, Boc: Raton, FL 33432 USA; Tel: 407 391 3544 Fax: 407 750 1367. ▲

Celebration/*Continued from page 1*

English edition of the Chinese *J. of Rare Earths*. There were about 60 attendees, 13 of which were from foreign countries — France (3), Holland (1), Italy (2), Japan (1), Korea (1), Russia (2), and the United States (3).

The invited papers included: an introductory overview with emphasis on the young and emerging, and the potential future applications by K. A. Gschneidner, Jr. (Ames Laboratory and Rare-earth Information Center, Ames, IA, USA); high-tech applications in Japan by R. Ohmachi (Santoku Metal Industry Co., Kobe, Japan); Rhône-Poulenc's involvement in the rare earth markets by J. D. Matthews (Rhône-Poulenc, Courbevoie, France); NdFeB permanent magnet markets by B. Hart (Mount Kisco, New York, USA); computer modeling of separation processes by M. Casarci (ENEA, Inn-numa, Italy); solvent extraction in China by C. H. Yan (Peking University, Beijing China); double sulfate conversion process by V. A. Kosynkin (All-Union Research Institute of Chemical Technology, Moscow, Russia); magnetostrictive Terfenol-D by O. D. Mc Masters (ETREMA Products, Inc., Ames, IA, USA); and sol-gel process for preparing high-T_c ceramic superconductors by R. Vatteroni (ENEA, Inn-numa, Italy). Included in the magnetic materials papers by B. Hart and O. D. McMasters are summaries of the worldwide patent situation regarding NdFeB permanent magnets and the Terfenol-D magnetorestrictive material, respectively.

Some of the new and interesting items that were presented at the Symposium were the use of NdFeB magnets in oil well pipes to reduce the viscosity of the oil up to as much as 50% as it comes out of the ground — called "dewaxing" by the Chinese and accounts for nearly a quarter of their consumption of these permanent magnet materials in China. Another new development by the Chinese is a new NdFeB material which has a zero temperature coefficient, which the Chinese are using to replace alinco damping magnets in watt-hour meters. Several papers contained useful statistical data of various rare earth markets. The development of computer codes to optimize solvent exchange circuits in separating rare earths was also discussed.

Baotou Rare Earth Research Institute

While in Baotou, the conferees visited the Baotou Rare Earth Research Institute

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In response to our clients' needs and to better facilitate the users of RIC and financial supporters alike, we are implementing an easier method of payment for our services. RIC is now able to accept VISA and Mastercharge credit cards. If you or your company wish to pay for our services or contribute to the support of RIC by this method, the following information will be needed: customer name, account or charge number, and card expiration date. All charges are used to defray the costs of operating the center and publication of the *RIC News*. ▲

Celebration/*Continued*

(BRERI), which is the largest rare earth research institute in the world with about 1000 persons employed at BRERI, about half of which are technical personnel. BRERI is headed by Mrs. Yulin Hu. Most of the research is of applied nature and concerns extractive metallurgy, separation processes, metal production, permanent magnets and terfenol magnetostrictive materials, alloying additives, phosphors, agricultural applications, and analytical chemistry.

China Rare Earth Information Center

The China Rare Earth Information Center (CREIC) is a part of BRERI. They have modelled their Center after the Rare-earth Information Center, at Iowa State University, and set-up two literature retrieval systems, one is in English and the other is in Chinese. They have about 5000 documents in the literature data base. CREIC publishes a four page quarterly newsletter (in English) which is devoted exclusively to rare earth news from China. About 15 persons work in the Center, some of whom only work about half time for CREIC.

Rare Earth Exhibit and Fair

In conjunction with the Baotou Festival, there was a large exhibit which displayed the Chinese achievements in rare earth scientific research and applications of the rare earths. There were 100 display units, 70 from the local area (Inner Mongolia) and 30 from other provinces of China. All of the major Chinese rare earth producers had displays, and several of the major universities, and technical and research institutes also had exhibits. These ranged over the complete spectrum of rare earth applications and production. Unfortunately, the time was limited to visit such a large fair, and the conferees only saw a part of it. ▲

Galfan Specifier's Manual

The Galfan Technical Resource Center of the International Lead-Zinc Research Organization Inc. (ILZRO) has released *Galfan Specifier's Manual*. The manual provides detailed information on how to buy, fabricate, specify, and use products coated with Galfan.

Galfan is an improved version of galvanizing that is used in the protection of metals. Galvanizing works to protect metal by coating the metal with zinc. This protects the metal in primarily two ways: first, as a physical barrier by keeping corrosive elements away from the steel; second, it provides cathodic protection of the base metal by acting as a sacrificial anode to the steel if the surface is scratched or cut. Galfan has been proven to greatly improve barrier protection of zinc because it contains 95% zinc and 5% aluminum and mischmetal. The addition of aluminum and mischmetal to zinc improves ductility and other physical properties that allow Galfan-coated metals to be drawn, roll formed, bent, profiled and painted without the cracking that occurs in normally galvanized metals.

The *Galfan Specifier's Manual* contains five sections that explain the development, performance, specifications, forms and processes, and fabrication of Galfan. The manual also includes a directory of those companies who have been granted a license to use the technology for producing the alloy or using it to galvanize steel. The cost to receive the 198-page manual is $35.00 US from the Galfan Technical Resource Center, P.O. Box 12036, Research Triangle Park, NC 27709-2036; Tel: 919 361 4647; Fax: 919 361 1957. ▲

Major Event Attendees

As noted in the two articles about the editor's trips to Europe and China, there were two major celebrations of the 200th anniversary of the discovery of yttrium - the visit to the Ytterby mine site and the Baotou festival. In addition to the editor's involvement in both events, as far as we are aware, the only other persons to witness these two events were: Prof. V. D. Kosynkin (All-Union Research Institute of Chemical Technology, Moscow); Prof. Chunhua Yan and Assoc. Prof. Song Gao (both from Peking University, Beijing). As we all agreed, for a rare earther, it was a fantastic, once-in-a lifetime experience, never to be forgotten. *If we missed anyone, let us know.* ▲

Europe's Hot! With RE's?

In mid-summer the editor attended two conferences in Europe out of about a half dozen meetings being held in Europe which had a significant rare earth component + one could have spent almost the whole summer attending conferences. It was a hot, dry summer by European standards with temperatures in the low 30°C's (80°F's), except for a few days in Helsinki where the temperature only reached the upper 20°C's (below 80°F). However, for someone from the Midwest USA, the temperatures were about normal. The two conferences were the First Workshop on Comparative Science of *f*-Elements ($4f \leftrightarrow 5f$) and the Second International Conference on *f*-Elements (ICFE-2).

Karl Gschneidner, Jr., (Director, RIC) at the Ytterby mine site. The small wooden sign says "Welcome Karl G. & R.E. Conference. Ames Lab. 21 May". The inscription on the plaque reads "ASM International HAS DESIGNATED YTTERBY MINE AN HISTORICAL LANDMARK. Four periodic elements – Yttrium, Terbium, Erbium and Ytterbium – were isolated from the black stone gadolinite mined here, and were named after the Ytterby Mine. 1989" (Photograph was made available courtesy of Dr. Patrick Maestro, Rhône-Poulenc Recherches, Aubersvilliers, France).

First Workshop on Comparative Science of *f*-Elements

The $4f \leftrightarrow 5f$ Workshop was held July 28-30, 1994 in the Black Forest area of Germany, about 20 km (12 m) southeast of Baden-Baden. It was a small conference with about 35 scientists taking part. The participants included a broad spectrum of scientific disciplines – chemists, physicists and material scientists, including both theorists and experimentalists. There were 16 oral presentations over four half-day sessions and 7 posters. The topics covered were: systematics of metals and compounds (both inorganic and metallic) at atmospheric pressure and also at high pressure; band structure and first principle calculations primarily of the metals; magnetic and superconducting behaviors of heavy fermion materials; magnetic properties of compounds; Mössbauer spectroscopy of Np intermetallic compounds; solution chemistry; bulk and surface electronic states; and x-ray absorption spectroscopy. Most of the papers will be published in the *J. Alloys & Compds.*

Second International Conference on f-Elements

ICFE-2 was held August 1-6, 1994 at the University of Helsinki, Helsinki, Finland. ICFE-2 primarily dealt with the rare earth elements, but a few papers were concerned with the actinides, or both lanthanides and actinides. The topics covered were (the number of oral presentations are given in parentheses): theory and spectroscopy (17), solid state chemistry and physics (12), solution chemistry (12), coordination chemistry (10), organic and organometallic chemistry (5), metallurgy and magnetic materials (11), biomedical applications/toxicology and biological effects of *f*-elements (10), materials for optical and electronic applications (12), advances in superconducting materials (8), geochemical and environmental chemistry (3), catalysts and other applications (1), and history (3). About 210 scientists from 29 countries attended the Conference. Plenary lectures were presented by J.-C. Krupa, Institut de Physique Nucleaire, Orsay, France, on "The Optical Excitation of f Electrons in Lanthanide and Actinide Compounds"; P. Wachter, Laboratorium für Festkörperphysik, Zürich, Switzerland, on "The Discovery of Excitonium"; P. Maestro, Rhône-Poulenc Recherches, Aubervilliers, France on "Industrial Application of Rare Earths: Which Way for the End of the Century?"; G. R. Choppin, Florida State University, Tallahassee, Florida, USA on "Factors in Complexation Kinetics of Ln (III) and Aminopolydentate Ligands"; and I. Hemmilä, Wallac Oy, Turku, Finland on "Luminescent Lanthanide Chelates - a Way to More Sensitive Diagnostic Methods". In addition, there were 27 session lectures, plus many contributed oral presentations and posters. At times, there were three parallel sessions over the four days. In the mid-afternoon of the fourth day the attendees gathered on the cruise ship M/s Mariella, which ferries people, cars and trucks back and forth between Helsinki and Stockholm – a 15-hour overnight trip, for the continuation of the Conference. In the early evening, we heard three short lectures of historical interest to rare earthers - the scientific career of Johan Gadolin, Swedish rare earth scientists, and Carl Auer von Welsbach – the first rare earth industrialist.

After docking on Friday, August 5 at 9:00 in Stockholm, the conferees made a tour on five buses to the historical feldspar mine on the island of Ytterby (near Stockholm, Sweden), the site where Lt. Carl Axel Arrhenius found the first rare earth mineral (now called gadolinite) in 1787. It was from this mineral which the Finnish chemist, Johan Gadolin, isolated the first rare earth element, yttrium as Y_2O_3 in 1794. The Conference was held in Helsinki because of the 200-year anniversary of this discovery. Most of the papers presented at ICFE-2 will be published in *J. Alloys & Compds.*

The visit to the beautiful isle of Ytterby by the ICFE-2 attendees probably set an all time record, which will be difficult to beat in the future, for the number of persons to visit the site on one day – about 200 of the 250

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Actinides Under Pressure

The fourth Workshop on Actinides under Pressure was organized by the European Institute for Transuranium Elements, and held in Karlsruhe, Germany, October 12-13, 1992. Thirty-five scientists from Europe, U.S.A. and Israel attended the Workshop, and 16 papers were published in the proceedings, with 7 of those papers dealing with rare earths. The rare earth papers which appear in the proceedings, *Actinides Under Pressure*, include: Onset of *f*-Bonding in Light Actinide and Lanthanide Metals at Ultrahigh Pressures, by Y.K. Vohra; Systematics and Anomalies in the Equation of States for the Lanthanide and Actinide Elements, W.B. Holzapfel; High Pressure μSR Studies: Gd Metal, K. Mutzbauer *et al.*; Pressure Studies of 4*f* and 5*f* Intermetallics with Strong Electronic Correlations, J.D. Thompson; Chalcogenides and Pnictides of Cerium and Uranium Under High Pressure, J.M. Léger; Developments and New Possibilities in High Pressure Powder Diffraction with Synchrotron Radiation. Results for Cerium Metal and U_6Fe, J. Staun Olsen et al.; and Volume Dependence of *f*-electron Structure in Intermetallic Compounds of Eu and Np from Mössbauer High Pressure Studies, W. Potzel et al. Most of the papers deal with metals and metallic compounds. X-ray diffraction was the most frequently applied high-pressure method used in determining the reported results.

The advent, and availability of, diamond anvil cells has made experimentation on compounds and metals in the megabar-pressure range possible. Recent research points out that element 99, Es, is intriguing because it is not only the first divalent actinide metal, but it may be more susceptible to undergoing a metallic valence change un-

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Europe/*Continued from page 4* ➪

attendees and accompanying persons made the ~ 1 kilometer (~ 1/2 mile) treak from the buses to the mine site. While there, we were greeted by a sign (see photo) which had been placed behind the ASM International plaque by some unknown person. After returning from ICFE-2 to Ames and after considerable thought, the editor finally figured out who the greeters were - none other than his colleague from the Iowa State Physics and Astronomy Department – Prof. Bruce Harmon, and Bruce's accomplice Prof. Göran Grimvall, Royal Institute of Technology, who was Bruce's host in Stockholm. ▲

Electron Correlations

The book, *Electron Correlations in Molecules and Solids*, was written to bridge the gap between two active fields of research, quantum chemistry and solid-state theory. Although many aspects of electron correlations are similar in molecules and solids, the theoretical developments in the two fields have diverged to such an extent that today they often do not even share a common language. One obstacle has been the fact that the methods applied in quantum chemistry for the treatment of correlations in small molecules cannot be carried over to solids, in particular when electrons are delocalized. This book attempts to show through recently developed methods how to overcome these difficulties.

The book is divided into two parts. The first seven chapters concentrate on the various methods and techniques which are used to treat electron correlations in molecules and solids and the remaining chapters deal mainly with application of the formulae. These range from atoms and molecules to semiconductors and metals, with special emphasis on transition metals. The last three chapters are devoted to strongly correlated electron systems, including the topics of heavy fermion systems and the new high-temperature superconductors.

After a brief introduction, the book includes the following chapters: The Independent-Electron Approximation, Density Functional Theory, Quantum-Chemical Approach to Electron Correlations, The Pro-

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Actinides/*Continued from previous column* ➪

der pressure than the divalent lanthanide metals, Eu or Yb.

The proceedings include a subject index, a list of participants, and a brief Summary and Conclusions section by five scientists in the field. These experts not only critique the published papers in the proceedings, but also provide insight on the oral presentations given at the Workshop. After reading this section, one gets the impression that although important results have been attained, further work needs to be accomplished in this field of study. The Fourth Workshop on Actinides under Pressure is published as *Physica B*, 190, [1], 1-114 (1993) and is available for Dfl. 398.00 ($221.00 US) by contacting Elsevier Science Publishers B.V., P.O. Box 103, 1000 AC Amsterdam, The Netherlands; Tel: 20 5862 544; Fax: 20 5862 431; Telex: 10704 espom nl. ▲

Honored

Fathi Habashi, professor of extractive metallurgy at Laval University, Quebec, Canada was recently bestowed the honorary doctor of science degree from the Saint Petersburg Mining Institute in Russia. Dr. Habashi has conducted work in the field of extractive metallurgy of the rare earths, on analytical studies of rare earth ores, and on the history of rare earth mining.

Dr. David C. Jiles, Senior Physicist at Iowa State University, USA, was recently named a fellow of the Institute of Electrical and Electronics Engineers. Dr. Jiles is best known to rare earthers from his studies on the magnetoelastic and magnetoacoustic properties of terfenol, and other rare earth compounds. ▲

Electron Correlations/*Continued from previous column* ➪

jection Technique and Use of Local Operators, Excited States, Finite-Temperature-Techniques, Correlations in Atoms and Molecules, Semiconductors and Insulators, Homogeneous Metallic Systems, Transition Metals, Strongly Correlated Electrons, Heavy-Fermion Systems, and Superconductivity and the High-T_c Materials.

Rare earth researchers and theoreticians will glean helpful insight from Chapter 13, *Heavy-Fermion Systems*, which includes discussion of 4*f* or 5*f* electron behavior in a variety of cerium, ytterbium, and uranium compounds. The Fermi surface for $CeRu_2Si_2$ is calculated, and is compared to the results obtained from de Haas-van Alphen measurements. The related fields of quantum chemistry and solid-state theory should be considered together, and this book stresses common features as well as links between the two. However, less emphasis is given to aspects of electron correlations that are found in other textbooks.

Electron Correlations in Molecules and Solids was written by Professor Peter Fulde and published in 1991. The 422-page book contains 127 figures and includes a subject index. The paperback version of *Electron Correlations in Molecules and Solids* is available for $52.00 US by contacting the publisher, Springer-Verlag GmbH & Co. KG, Postfach 10 52 80, Tiergartenstrasse 17, D-6900 Heidelberg 1, Germany; Tel:62 21 487-0; Fax:62 21 41 39 82. ▲

Promethium-147 is an important constituent of self-luminous paints.

LETTERS TO THE EDITOR

13 September 94

Dear Karl,

Are you sure about the date of the lanthanide series determination [*RIC News*, 29 [3], p. 3 (September 1994)]? Seems early. Laue did his first diffraction experiment in 1912. The Braggs, father and son, determined Bragg's law a year or 2 or 3 later.

Sincerely,

Prof. H. P. Leighly, Jr.
Department of Metallurgy
and Engineering
University of Missouri-Rolla
Rolla, Missouri 65401

EDITOR'S REPLY

Dear Phil:

The date is more or less right, see below. The filler said "X-ray spectra". We were not referring to x-ray diffraction.

The work we were alluding to was that of H.G.J. Moseley who, based on the relationship between the x-ray spectra (characteristic lines) and the atomic number, showed that there were only 14 lanthanides. His paper was published in 1914 in Phil. Mag. 27, 703-713. The 1912 date was given by Spedding in his "Prologue" to the HANDBOOK ON THE PHYSICS AND CHEMISTRY OF RARE EARTHS, volume 1, p. xvii (1978). Moseley was probably working on this problem and he may well have measured the lanthanides in 1912, but only until he published his results, would the rest of the world know there were only 14 lanthanides. To be on the safe side we will refer to 1914 from now on, since that date is well documented.

Sincerely yours,

K. A. Gschneidner, Jr.
Director, RIC

Fish Tags

In Canada and the United States, fisheries manage and assess each crop of juvenile salmon by physical means such as fin clipping and using coded wire tags. The shortfalls with this system are: 1) only a small sample of the total batch of fish can be marked, 2) it is extremely labor intensive, and 3) each fish to be marked must be handled. A much more efficient method of

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1994 EHPRG Award

Dr. Thomas Tröster

Dr. Thomas Tröster, physicist at the University of Paderborn, Germany, received the 1994 award of the European High Pressure Research Group (EHPRG). The annual award is given to young scientists for work concerning any field of high pressure research.

Dr. Tröster was selected for this award for his studies of crystal field effects on Pr^{3+}, Nd^{3+} and U^{3+} in different ionic host crystals. The comparison of his experimental results with different theoretical models reveals the extent the various models succeed or fail in the description of crystal field effects such as the nephelauxetic effect. Dr. Tröster works with Prof. Holzapfel at the University of Paderborn, where he earned his Doctor of Science Degree earlier this year. ▲

***Fish Tags**/Continued from previous column* ➪

marking these young fish would be by chemical means, if it were to found to be safe, inexpensive, and long-lasting. The chemical agent must also not cause any unusual behavior patterns in the marked fish, have any adverse effects on metabolism, be able to be applied quickly and easily, and the fish must not be able to be distinguished from unmarked fish by predators.

B.C. Ennevor and R.M. Beames in *Can. J. Fish. Aquat. Sci.*, Vol. 50, 1039-44 (1993) marking juvenile coho salmon fry and smolts by the addition of lanthanide acetates to the water supply. The scientists discovered that lanthanides are absorbed from the water and deposited in the bony tissues and scales of the fish.. Previous work on the toxicity of lanthanides on animals has concentrated on mammals, but relatively little work has been done with fish. In addition to not occurring naturally in fish, the advantages of using lanthanides for marking fish over other chemical agents is that they are safe to handle, nonradioactive (except for promethium) and are preferentially deposited in bony tissues and scales.

Lanthanum and samarium acetate was applied to river water containing coho fry at concentrations of 100 µg/L for 6 weeks, resulting in retention at detectable levels in

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Terfenol Hearing Aid

In addition to its many applications, the giant magnetostrictive properties of Terbium-Dysprosium-Iron alloy, TERFENOL, is now showing promise in restoring people's hearing. The ability of teeth and bones in the body to pick up and resonate sound waves to auditory nerves is being harnessed for hearing aid technology. Researchers and engineers at the University of Maryland and Bethesda, Maryland-based Audiodontics, Inc. have designed a hearing aid that attaches to the teeth rather than the ear. Developers say that it could benefit people who are unable to use conventional hearing aids because of ear infections or bone growth.

The key element in the new hearing aid is the magnetostrictive alloy TERFENOL-D® from ETREMA Products, Inc. of Ames, Iowa. The Intraoral Audio Transducer System (IATS) includes a tiny external microphone/transmitter that sends signals to a receiver mounted in an orthodontic device that is attached to the wearer's palate. The transducer is half the size of a normal tooth and converts radio signals that are picked up by the receiver into vibrations that travel through the skull to the inner ear. A battery and receiver sit on the roof of the mouth out of view. Bone-conduction hearing aids have been studied for years, but the recent developments in rare earth-based TERFENOL make this new technology possible. ▲

***Fish Tags**/Continued from previous column* ➪

bony tissues after $10^1/_2$ months. All lanthanides used were in the trivalent acetate ambient river water as concentrated solutions. After the completion of labelling, bony tissues were extracted and analyzed for lanthanide accumulation. It appeared that lanthanum was absorbed more efficiently than samarium, and the vertebra, otoliths, and scales contained more of these two elements than other parts of the fish.

Two other concerns regarding this procedure in marking fish were also answered: ingestion and absorption of lanthanides in the fish by human consumption; and environmental factors. Since bones, otoliths and scales of the fish contained lanthanides, human contamination by these substances would not occur. Environmental contamination is another concern, but analyses of river water pre-treatment and post-treatment yielded no difference in detectable levels of lanthanides. ▲

Baotou Steel & RE Company (USA) Office

The Baotou Steel & Rare Earth Co. (U.S.A.) Office is a subsidiary of the Baotou Steel and Rare Earth Co., People's Republic of China, and is also known as Boagang (U.S.A.) Office. Boagang owns the Baiyunebo rare earth mine in Mongolia, China which is the largest rare earth deposit in the world. The company operates factories that produce the following products: bastnasite concentrate, rare earth carbonates, chlorides, fluorides, oxides, nitrates, hydrates, Ce-rich rare earth hydrates, acetates, oxalates, rare earth metals, Nd-Fe alloy, mischmetal, silicide ferroalloys and other rare earth products.

For more information on the company's products, services and prices, contact: Weiji Cui, Baotou Steel & Rare Earth Co. (U.S.A.) Office, 520 El Camino Real, Suite 200, San Mateo, CA 94402; Tel: 415 343 6644; Fax: 415 343 6266. ▲

ISMO '91 Proceedings

The Proceedings of the 2nd International Symposium on Magneto-Optics, held September 10-13, 1991 in Kharkov, Ukraine, appears in print under the title of *Advances in Magneto-Optics II*. The Proceedings are published in English as *Fizika Nizkikh Temperatur* (Low Temperature Physics), Volume 18, Supplement, No. S1, (1992).

The Proceedings contain 117 papers in three chapters, written by scientists from 14

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Treibacher Realignment

On August 15, 1994, Treibacher Chemische Werke AG, was realigned into three legally independent companies. The operations of the company are now represented by Treibacher Industrie AG, its subsidiary Treibacher Auermet Produktionsges. mbH, and Treibacher Schleifmittel AG. Treibacher Industrie AG is based in Treibach, Austria, and consists of the following divisions: *Alloymet* with ferro alloys, premelts and metal compounds, *Powdermet* with hard metal powders, and *Aktivsauerstoff* with sodium perborate and sodium percarbonate. Treibacher Auermet Produktionsges. mbH, also located in Treibach, produces flints, mischmetal, hydrogen storage alloys, glass polishing agents, catalyst powders, powders for high performance ceramics and other rare earth compounds. Treibacher Schleifmittel AG, which is based in Villach, Austria, produces fused aluminum oxide for grinding wheels and belts, loose grain, refractories, ceramics and concrete floors. ▲

ISMO '91*/Continued from previous column* ⇨

countries. The title of each chapter and the topics covered in each include Chapter 1- Fundamental Magneto-Optics: New Aspects; High Temperature Superconductivity; Parity Violation in Atomic Systems; Dielectrics; Metals; and Semiconductors; Chapter 2- Optics in Magnets: Spectroscopy; Domain Systems; Multilayers; Amorphous Magnets; Ferrofluids; and Photoinduced Phenomena; Chapter 3- Magneto-Optics in Applications: Magneto-Optical Materials; Magneto Optics in Experiments; Magneto-Optical Recording; Magneto-Optical Device Elements; and New Ways. Rare earthers working or studying the field of magneto-optics will find plenty of interesting reading material as rare earths are important in producing magneto-optical and superconductor devices. Nearly half of the papers contain experimental results on rare earths in superconductors and magneto-optical materials.

The 470-page volume was edited by V.V. Eremenko and A.B. Beznosov, and was published by the B. Verkin Institute for Low Temperature Physics and Engineering of the Academy of Sciences of Ukraine; Tel: 7 0572 321 223; Fax: 7 0572 322 370; Telex: 311039 SPACE SU; E-mail: ilt%ilt.kharkov.ua@relay.ussr.eu.net. ▲

Herbert B. Callen (1919-1993)

Herbert B. Callen, professor emeritus of physics at the University of Pennsylvania, passed away on May 22, 1993 from complications of Alzheimer's disease. Callen is recognized internationally as one of the founders of the modern theory of irreversible thermodynamics and statistical mechanics.

Dr. Callen earned his AB degree in 1941 and AM degree in 1942 from Temple University, both in physics. After working on the Manhattan Project (1944-45) and on missile telemetry for the Navy (1945), he completed his PhD. Dr. Callen was interested in magnetostriction and thermal expansion in rare earth materials and ferromagnets, and then worked on spin structures magnetic phase stability and magnetic transitions of europium selenide. Dr. Callen was known as an inspirational thinker and was renowned for his intellectual integrity and clarity of presentation in teaching. ▲

Rollin J. Parker (1920-1994)

Rollin J. Parker, an internationally known expert of permanent magnetism and magnetic materials died Tuesday, September 13, 1994. He has over 35 United States patents issued in his name, many of which are utilized in various consumer products such as stereo speakers and household appliances.

A native of Essex Junction, Vermont, he earned his bachelor's degree in electrical engineering from the University of Vermont and a master's degree in materials science from Michigan State University.

He was a 30-year employee of General Electric Co. and, from 1973 to his retirement in 1985, was manager of advanced design and development for Hitachi Magnetics Corp. In 1985 he founded Parker Associates, a private consulting firm specializing in the markets and applications of magnetic materials. Mr. Parker was a co-author of the 1962 book "*Permanent Magnets and Their Application*" and author of the 1990 book "*Advances in Permanent Magnetism*", both published by John Wiley & Sons of New York. Mr. Parker was well known to rare earth-permanent magnet researchers and producers by his expert counseling and writings on the market potential and commercial applications of rare earth permanent magnets. ▲

Harrison Howe Award

Richard E. Smalley of Rice University, Houston, Texas, has been awarded the 1994 Harrison Howe Award. The award recognizes Smalley's creativity and breadth of research in chemical physics.

Smalley received a B.S. degree from the University of Michigan and a Ph.D. degree from Princeton University in 1973. Before going to Princeton to continue his studies, he worked for four years as a research chemist with Shell. Later, while doing postdoctoral research at the University of Chicago, Smalley pioneered supersonic beam laser spectroscopy, one of the most powerful techniques in chemical physics.

Famous for the discovery and characterization of C_{60} (buckminster fullerene), Dr. Smalley and his group are probably best known to rare earthers as the first to generate fullerenes with metals trapped inside. His current research is focused on the production of extremely strong continuous carbon fibers that are essentially giant single fullerene molecules. ▲

$ HELP! $

RIC needs new supporters to help offset the loss of several large contributions from companies that have dropped their rare earth activities or have down-sized their operations. The minimum Corporate membership is $300.00 per year, and includes subscription to our monthly newsletter *RIC Insight*, and free literature searches and a yearly listing in the *RIC News*, unless you wish to remain anonymous. *RIC Insight* emphasizes the latest technical and industrial developments as they might impact the rare earth industry.

If your company is unable to support RIC, you may wish to consider an individual membership to help us publish and distribute the *RIC News* to over 12,000 persons worldwide. The minimum level of support for an individual is $100.00 per year and it entitles a person to the same benefits as a corporate member (see above).

Your contribution can be made by check or by credit card (Mastercard or Visa). If paying by check, make payable to the "RIC Newsletter Fund", and send to the Rare-earth Information Center, Institute for Physical Research and Technology, Iowa State University, Ames, IA 50011-3020, USA. The check should be made payable through a US bank in dollars.

Continued in next two columns ➪

Supporters 1995

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Since the September issue of the RIC News went to press, RIC has received support from 8 new family members, and renewed support from 21 other organizations. The supporters from the second quarter of fiscal year 1995 who wish to be listed, according to their appropriate category, and with the number of years that they have contributed to the Center in parenthesis, are listed below.

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