



# RARE-EARTH INFORMATION CENTER NEWS

INSTITUTE FOR PHYSICAL RESEARCH AND TECHNOLOGY  
IOWA STATE UNIVERSITY / AMES, IOWA

Volume XXII

September 1, 1987

No. 3

## RE—BYC 1787—1987

Necessity is the  
Mother of Invention

by Werner Fischer

*Editor's Note: Professor Fischer has been engaged in the field of rare earth chemistry for nearly 60 years. He mentions in his cover letter that he can remember when rare earths were "rare" and how he saw the situation change as liquid-liquid extraction was applied to the separation of these elements.*

In 1913, Moseley showed that there are 15 lanthanides, but since separation of these elements was a time-consuming task, only a few of them were produced commercially. W. Prandtl employed more than 4,000 crystallizations and precipitations to prepare pure  $\text{Er}_2\text{O}_3$ . O. Hönigschmid and W. Kapfenberger used 25g of this erbia to determine the atomic weight of Er. Any chemist wanting to work with rare earths was forced to hunt for remnants or used samples that had been prepared by experts such as Auer von Welsbach, Urbain, etc. Experimentation with such priceless rarities was a nerve-racking task.

During the early 1930s, I was in charge of a small group of graduate students. Our financial resources were barely adequate to buy a few test tubes. We decided to examine the basic chemistry of the separation and enrichment of single elements. Studying the literature, we were surprised to find that the separation of inorganic materials by partition between two immiscible solvents had been described for only a few cases. The method appeared to offer a number of fundamental advantages, such as, no slow steps, no adsorption effects, room temperature operation, and convenient and automatic repetition of single simple steps. Even substances with similar distribution coefficients could be handled effec-

## Buckley Award

Professor Robert J. Birgeneau of the Massachusetts Institute of Technology (MIT) was awarded the Oliver E. Buckley Condensed Matter Physics Prize at the March 17, 1987,



session of the American Physical Society. The citation read, "For his use of neutron and x-ray scattering experiments to determine the phases and phase transitions of low dimensional systems."

Professor Birgeneau's Ph.D. thesis (Yale University 1966) was on magnetic interactions in rare earth insulators. He has studied phase transition behavior and Jahn-Teller effects in  $\text{PrAlO}_3$  and mixed valence phenomena in  $\text{SmS}$  and  $\text{Ce}_2\text{Th}_{1-x}$ . Most recently he has combined his interests in low dimensional systems and rare earths in studies of magnetic order, lattice dynamics and critical phenomena in single crystal  $\text{La}_2\text{SrCuO}_4$ .

tively. We therefore decided to apply the separation by liquid-liquid extraction to the trivalent rare earths, assuming we could find suitable conditions. If this could be achieved, the preparation of pure rare earths and their exploration would be greatly facilitated.

In 1937 we found that, indeed, it is possible to separate rare earths by liquid-liquid extraction using many systems. Let me mention only two examples.

1. A 25-stage separation process employing partition of a 90/10 mixture of  $\text{Gd}(\text{NO}_3)_3$  and  $\text{Sm}(\text{NO}_3)_3$  between an aqueous  $\text{LiNO}_3$  solution and diethyl ether resulted in 99.5% pure  $\text{Gd}_2\text{O}_3$  and 90% pure  $\text{Sm}_2\text{O}_3$ .
2. The use of thiocyanate substan-

(Continued on page 6)

## Amsterdam/Sofia/Munich

In July 1987, the editor of *RIC News* had the pleasure of presenting an address at the 31st IUPAC (International Union of Pure and Applied Chemistry) Congress in Sofia, Bulgaria. While in Europe, I also visited several European universities.

### University of Amsterdam

My host at the Natuurkundig Laboratorium of the University of Amsterdam was Professor Peter deChâtel. This laboratory is one of the world's leaders in rare earth/actinide magnetism, spin fluctuators, valence fluctuations, and heavy fermions. Unfortunately, both Professors F. deBoer and J. Franse were out of town, but I had fruitful talks with their associates. I also visited the laboratories of L. W. Roeland and A. Menovsky. Roeland is doing high field magnetism using a pulsed magnet that can generate fields of up to 40 T (400 KOe), which can be controlled for up to 0.1 s. This enables them to make magnetization and deHaas-van Alphen measurements. For the latter, single crystals are needed and Menovsky is an expert crystal grower. He has about 15 different apparatus to grow crystals by almost any known technique and supplies his co-workers with a variety of heavy fermions, spin fluctuators, magnetic materials, etc.

### 31st IUPAC Congress

The 31st Congress of the International Union of Pure and Applied Chemistry (IUPAC) was held from July 13-18, 1987 in Sofia, Bulgaria. The program was organized in nine major sections on (1) analytical chemistry, (2) education, (3) chemical engineering, (4) industrial chemistry, (5) inorganic chemistry, (6) organic chemistry, (7) physical chem-

(Continued on page 6)

## CONFERENCE CALENDAR

3rd Intl. Conference on Neodymium-Iron-Boron Magnets  
San Diego, California, U.S.A.  
October 18-20, 1987  
\*This Issue

Intl. Conference on High-Temperature Superconductors and Materials and Mechanisms of Superconductivity (HTSC-M'S)  
Interlaken, Switzerland  
February 29-March 4, 1988  
*RIC News*, XXII, [2] 2 (1987)

1st Intl. School on Excited States of Transition Elements  
Ksiaz Castle, Wroclaw, Poland  
June 20-25, 1988  
\*This Issue

6th Intl. Conference on Crystal Field Effects and Heavy Fermion Physics  
Frankfurt, West Germany  
July 18-21, 1988  
*RIC News*, XXII, [2] 2 (1987)

18th Rare Earth Research Conference (RERC)  
Interlaken, Lake Geneva, Wisconsin, U.S.A.  
September 11-15, 1988  
\*This Issue and *RIC News*, XXI, [3] 1 (1986)

TMS-AIME Rare Earth Symposium  
Las Vegas, Nevada, U.S.A.  
February 27-March 3, 1989  
*RIC News*, XXII, [2] 2 (1987)

\*New Listing

## MEETINGS

### Excited States Of Transition Elements

The Institute for Low Temperature and Structure Research and the Committee of Spectroscopy, Polish Academy of Science, are organizing the 1st International School on Excited States of Transition Elements, which will be held June 20-25, 1988, at Ksiaz Castle in Wroclaw, Poland.

This school is for scientists in the luminescence and laser fields. Recent advances in spectroscopy and theoretical modeling relevant to the interpretation of luminescence and laser phenomena in solid-state materials will be presented. A full range of matrices (e.g., halides, oxides, garnets, spinels, glasses) and of possible activators (transition metal, rare earth, and actinide ions) will be considered. Twenty-six invited speakers from 14 countries are already scheduled.

The deadline for preliminary registration is October 31, 1987, and March 2, 1988, for one-page abstracts. The registration fee is 18,000 zloty for participants from socialist countries and Poland, and US\$250.00 for partici-

(Continued in next column)

## HALIDE GLASSES

A group of 35 experts from 14 countries gathered in Vilamoura, Portugal, for the NATO Advanced Research Workshop on Halide Glasses for Infrared Fiberoptics from March 31 to April 4, 1986. The proceedings, published by Martinus Nijhoff Publishers in a 412-page book entitled *Halide Glasses for Infrared Fiberoptics*, were edited by R. M. Almeida.

The 1987 book contains a paper on the history of halide glasses, and sections on raw materials and purity, structure, thermal and mechanical behavior, optical properties of glasses and fibers, fiber fabrication, fiber systems, and other vitreous halides. The book presents a review of the state-of-the-art in the field of halide glasses in bulk and fiber form, with special emphasis on the preparation and properties of fluorozirconate glasses and fibers. It also identifies new directions on research and critically assesses the potential of halide glasses for infrared fiberoptics.

The book may be ordered from its distributor Kluwer Academic Publishers at the following addresses: Canada and United States—P.O. Box 358, Accord-station, Hingham, Mass. 02018-0358, U.S.A. (\$85.50); Ireland and United Kingdom—MTP Press Ltd., Falcon House, Queen Square, Lancaster LA1 1RN, UK (67.95£); and all others—P.O. Box 322, 3300 AH Dordrecht, The Netherlands (Dfl. 195.00).

(Continued from previous column)  
pants from other countries. The fee includes accommodations, meals, and a sight-seeing trip.

For more information, write to Professor W. Strek, Institute of Low Temperature and Structure Research, Polish Academy of Science, P.O. Box 937, 50-950 Wroclaw, Poland.

### Nd-Fe-B Magnets

The Third International Conference on Neodymium-Iron-Boron Magnets is being organized by the Gorham Advanced Materials Institute. It is to be held October 18-20, 1987, in San Diego, California, U.S.A. The thrust of the conference is to explore new directions, trends, and opportunities in the use and manufacture of NdFeB magnets. For more information, contact Ms. Carolyn Davidson, P.O. Box 250, Gorham, Maine, 04038-0250, U.S.A. Telephone (207) 892-5445; Telex 95 0012; Fax (207) 892-2210.

## Mailing Service

As some of our readers have noted, we have made some changes in mailing the *RIC News*. In Europe, the newsletter is now being mailed by Rhone-Poulenc Minerale Fine from France. We wish to thank Th. Goldschmidt AG for their excellent service in the past and extend our deepest appreciation to Rhone-Poulenc for taking over the mailing.

RIC also expresses their thanks to The Chinese Society of Rare Earth for agreeing to mail the *RIC News* to our readers in The People's Republic of China. The mailings in India and Japan are being continued by Indian Rare Earths Limited and the Mitsubishi Corporation, respectively, for which we are grateful.

## Superconductivity News

A monthly newsletter, entitled *Superconductivity News*, began publication in July of 1987. The subscription price is \$300 (\$360 for overseas airmail) for 12 issues and it can be ordered from Superconductivity Publications, P.O. Box 71, Iselin, N.J. 08830, U.S.A. News items will not be reiterated from press releases but will come directly from the source. Also included are meeting notices, market surveys, journals, data services, etc. The newsletter will also deal with suppliers of superconducting materials and stocks of companies involved.

## Nonmagnetic Kondo Lattices

A review on nonmagnetic Kondo lattices (NKL), with 215 references, has been published by V. V. Moshchalkov and N. B. Brandt of the M. V. Lomonosov State University located in Moscow, USSR. The review, entitled "Nonmagnetic Kondo Lattices," was published in *Uspekhi Fiz Nauk*, 149, 585-634 (1986) and translated into English in *Soviet Physics Uspekhi*, 29, 725-754 (1986).

The authors present a discussion of the present state of experimental and theoretical investigations of a new class of metallic systems based on f-shell elements. Among the compounds discussed are CeCu<sub>2</sub>Si<sub>2</sub>, CeAl<sub>3</sub>, CeCu<sub>6</sub>, and their lanthanum substituted (Ce<sub>x</sub>La<sub>1-x</sub>) analogs. The basic aim of the review is an analysis of the anomalous low-temperature properties of NKL.

(Continued on page 6)

## 18th Rare Earth Research Conference

The conference will be held September 11-15, 1988, at Interlaken, a hotel-conference center in the lake region, near Lake Geneva, Wisconsin, about 65 miles northwest of Chicago.

Rare earth oxide superconductors and the impact of major new facilities such as advanced photon light sources will be among the subjects highlighted in a program that will emphasize both current efforts and new directions in rare earth (and 5f-element) research. Topics for discussion will include coordination chemistry (organometallic, coordination complexes, separations, and bioinorganic), geochemistry, solid state chemistry and physics, spectroscopy (optical, luminescence, and x-ray), magnetic, thermal, and transport properties, intermetallics, thermodynamics, neutron scattering, surfaces and interface phenomena, catalysis, metallurgy, industrial processes, and applications.

The conference program will feature organized symposia as well as poster sessions that will provide an overview of both rare earth research and technology. The strong interdisciplinary and international character of this unique conference will continue to be fostered in a program that will include both invited and contributed papers.

The 5th Frank H. Spedding Award for excellence in research and leadership in rare earth science and technology will be presented at this meeting. Information on making nominations for this award is found on the reverse side of this page.

William T. Carnall  
General Conference Chairman  
Chemistry Division  
Argonne National Laboratory  
9700 S. Cass Avenue  
Argonne, IL 60439 U.S.A.

Lance E. DeLong  
Program Chairman  
Department of Physics and Astronomy  
University of Kentucky  
Lexington, KY 40506 U.S.A.

To assist the program committee and to ensure that you receive future notices, return the informational form provided below by November 1, 1987.

(detach)

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### 18th Rare Earth Research Conference

Interlaken, Lake Geneva, Wisconsin

September 11-15, 1988

Send this form before November 1, 1987 to:

Dale D. Ensor, 18th RERC Secretary  
Chemistry Department  
Tennessee Technological University  
Box 5055, Cookeville, TN 38505 U.S.A.

For information only.

Plan to attend  Yes  No

Plan to present paper  Yes  No

Total no. in your party

Attended the 17th Conf.  Yes  No

Special interest area(s) \_\_\_\_\_

\_\_\_\_\_

Name \_\_\_\_\_

Address \_\_\_\_\_

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## NOMINATIONS OPEN FOR 5th SPEDDING AWARD

The Frank H. Spedding Award is given in recognition of *distinguished contributions* in the field of rare earth science and/or technology. It is presented by the Rare Earth Research Conference Corporation with financial support of Rhone-Poulenc. The 5th Spedding Award will be presented at the 18th Rare Earth Research Conference in September of 1988 in Lake Geneva, Wisconsin, U.S.A.

Nominations are being sought from the rare earth community, worldwide. An individual can nominate more than one person for the award, or can propose a joint award for leaders in a particular field. Seconding letters are encouraged, particularly if they present significant information not covered by the nominator.

Nomination forms can be obtained from: Professor John E. Greedan, Executive Secretary, Frank H. Spedding Award Committee, Institute for Materials Research and Department of Chemistry, McMaster University, Hamilton, Ontario, L8S 4M1 Canada. The deadline for submission of the nominations is March 1, 1988.

## PREVIOUS RE Conference Proceedings†\*

*Proceedings of the International Conference on Magnetism of Rare-Earths and Actinides*, Bucharest, Romania, September 1-4, 1983. E. Burzo and M. Rogalski, eds. Available from Central Institute of Physics, Information and Documentation Office, Bucharest POB5206, Romania (1983). Price unknown.

*Proceedings of the Seventh International Workshop on Rare Earth-Cobalt Permanent Magnets and Their Applications*, Beijing, People's Republic of China, September 16-18, 1983. X-S. Pan, W-W. Ho, and C-Z. Yu, eds. Available from Export Department, China National Publications, Import and Export Corporation, 137 Chaonei Dajie, Beijing, People's Republic of China. (1983) US\$39.00 Surface Mail and US\$50.00 Airmail.

Sixteenth Rare Earth Research Conference, Tallahassee, Florida, April 18-21, 1983. "Rare Earths 1983." *Journal of Less-Common Metals*, Volumes 93 and 94. J. J. Rhyne, H. B. Silber, and G. J. McCarthy, eds. Elsevier Sequoia S.A., Lausanne, Switzerland (1983). 400 Swiss francs.

Second Rare-Earth Chemistry Symposium, Sao Paulo, Brazil, October 1983. *Rare Earth Chemistry*, G. Vicentini and L. B. Zinner, eds. Academica de Ciencias do Estado de Sao Paulo, Caixa Postal 22.297-CEP 01498, Sao Paulo, Brazil (1983). US\$15.00.

First International Symposium on Rare Earth Spectroscopy, Wroclaw, Poland, September 10-15, 1984. *Rare Earth Spectroscopy*, B. Jezowska-Trzebiatowska, J. Legendziewicz, and W. Strek, eds., World Scientific Publishing Company Pte. Limited, Farrer Road, P.O. Box 128, Singapore 9128, Republic of Singapore (1985). US\$68.00.

*Fundamental and Technological Aspects of Organo-Element Chemistry*. NATO Advanced Study Institute, Acquafredda di Maratea, Italy, September 10-21, 1984. T. J. Marks and I. L. Fragalá, eds. Kluwer Academic Publishers, P.O. Box 989, 3300 AZ Dordrecht, The Netherlands (1985). Dfl 160 (~US\$56.00).

*Nd-Fe Permanent Magnets: Their Present and Future Applications*. Workshop, Brussels, Belgium, October 25, 1984. I. V. Mitchell, ed. Elsevier Applied Science Publishers Ltd, 19 Arbemarle Street, London W1X 3HA, England (1985). US\$53.00.

*Actinide/Lanthanide Separations*. International symposium, Honolulu, Hawaii, U.S.A., December 16-22, 1984. G. R. Choppin, J. D. Navratil, and W. W. Schulz, eds. World Scientific Publishing Company Pte. Limited, Farrer Road, P.O. Box 128, Singapore 9128, Republic of Singapore (1985). US\$42.00.

International Rare Earths Conference, Zurich, Switzerland, March 4-8, 1985. *Journal of the Less-Common Metals*, Volumes 110, 111, and 112. J. C. G. Bunzli, J. E. Greedan, and F. Hullinger, eds. Elsevier Sequoia S.A., P.O. Box 851, 1001 Lausanne 1, Switzerland (1985). US\$268.00.

*Proceedings of the Eighth International Workshop on Rare-Earth Magnets and Their Applications and the Fourth International Symposium on Magnetic Anisotropy and Coercivity in Rare Earth-Transition Metal Alloys*. Dayton, Ohio, U.S.A., May 6-9, 1985. Karl Strnat, ed. Magnetism Laboratory (KL-365), University of Dayton, Dayton, Ohio 45469, U.S.A. (1985) US\$45.00 plus postage.

International Conference on Rare Earth Development and Applications, Beijing, People's Republic of China, September 10-14, 1985. *New Frontiers in Rare Earth Science and Applications*, Volumes I and II, G.-X. Xu and J.-M. Xiao, eds. Science Press, 137 Chaoyangmennei Street, Beijing, People's Republic of China or Academic Press Incorporated, Orlando, Florida 32887, U.S.A. (1985). US\$180.00.

Seventeenth Rare Earth Research Conference, Hamilton, Ontario, Canada, June 9-12, 1986. "Rare Earths 1986." *Journal of the Less Common Metals* volumes 126 (1986) and 127 (1987). H. B. Silber, L. R. Morss, and L. E. DeLong, eds. Elsevier Sequoia S.A., P.O. Box 564, 1001 Lausanne, Switzerland. US\$351.00.

†Published since 1982. For information on earlier conferences see *RIC News* XX [1] 4 (1985) or contact RIC.

\*Note: Prices may change from those quoted here.

## RENÉ PAUTHENET

Professor René Pauthenet passed away April 19, 1987, at the age of 61. He was born in Jura, France, on August 22, 1925. He obtained his engineering diploma in 1948 from the Institut Polytechnique de Grenoble (I.N.P.G.) and began his professional career at the French National Center of Scientific Research (C.N.R.S.). He was awarded the title of doctor of engineering in 1951 and in 1957 the French "Docteur d'Etat". The later was for his work on rare-earth iron garnets, which incidentally were prepared by his wife, the former Claude Moesch, a chemist in the laboratory of Erwin Felix Bertaut before her marriage to Pauthenet. For his work on the garnets he was awarded the 1970 Grand Award of the French Academy of Sciences which he shared with E. F. Bertaut and F. Forrat.

René Pauthenet was promoted to full professor in 1961, named director of the National School of Electrical Engineering in 1971, and became vice chairperson of I.N.P.G. in 1976. He was instrumental in the establishment of the Service National des Champs Intenses and was its first director, serving until 1980. He is the author of many publications on the magnetic properties and structures of compounds of oxides, sulfides, and alloys of 3d transition elements with rare earths and actinides. Since 1985 he had been chairperson of C.E.A.M., the Concerted Action on Permanent Magnets Program of the European Economical Community.

### RIC News

(USPS 464-960)

Vol. XXII, No 3 September 1, 1987

Published  
quarterly in March, June  
September and December  
by

Rare-earth Information Center  
Institute for Physical  
Research and Technology  
Iowa State University  
Ames, Iowa 50011-3020  
Second-class postage  
paid at Ames, Iowa

**Postmaster:** Send address changes to  
RIC News, Rare-earth Information Center,  
Institute for Physical  
Research and Technology  
Iowa State University  
Ames, Iowa 50011-3020  
Telephone: (515) 294-2272  
Telex: 269 266  
Telecopier: (515) 294-3226  
(Xerox 295) Group 1, 2, or 3  
K. A. Gschneidner, Jr. . . . Editor  
Jennings Capellen . . . Staff Writer

## \$\$\$ 1988 \$\$\$

Fiscal 1988 is off to an encouraging start. We have received support from 38 companies, including five new additions to our family. Molycorp, Incorporated, and the Ronson Metals Corporation became the first companies to have supported the RIC for 20 years.

The 38 companies pledging their support this first quarter, with the number of years they have been sponsors in parentheses, are listed below.

Aran Isles Chemicals Incorporated,  
U.S.A. (4)  
Arnold Engineering Company,  
U.S.A. (3)  
A/T Products Corporation,  
U.S.A. (8)  
Baotou Research Institute of Rare  
Earth, People's Republic of  
China (3)  
CERAC Incorporated, U.S.A. (12)  
The Chinese Society of Rare Earth,  
People's Republic of China (3)  
Crucible Materials Corporation,  
U.S.A. (14)  
Daesung Industrial Company,  
Limited, South Korea (1)  
Denison Mines Limited,  
Canada (16)  
Ferro Corporation, U.S.A. (12)  
Gesellschaft für Elektrometallurgie,  
West Germany (3)  
Globe Metallurgical Incorporated,  
U.S.A. (4)  
Haynes International Incorporated,  
U.S.A. (5)  
Hermann C. Starck Incorporated,  
U.S.A. (2)  
Iron Ore Company of Canada,  
Canada (4)  
Lanthanide Research Corporation,  
U.S.A. (4)  
Lawrence Livermore Laboratory,  
U.S.A. (2)  
Magnetics Research International  
Corporation, U.S.A. (1)  
Meldform Metals, Eurometals  
Division, U.S.A. (1)  
Molycorp Incorporated, UNOCAL,  
U.S.A. (20)  
Nippon Yttrium Company, Limited,  
Japan (9)  
NUCLEMON-Nuclebrás de Mon-  
azita e Associados Limited, Brazil  
(14)  
Oxford Speaker Company,  
U.S.A. (1)  
Parkans International  
Incorporated, U.S.A. (2)  
Permag Corporation, U.S.A. (2)

(Continued in next column)

## Business News A/S MEGON

A/S MEGON has a new managing director and a new address. Mr. Per-Arne Holmberg was named to replace retiring Orvar Braaten. Mr. Braaten was instrumental 18 years ago in the formation of the company. Mr. Holmberg was previously general manager of Elkem A/S, Electronic Materials. The new address is A/S MEGON, P.O. Box 4360, Torshov, N-0402 Oslo 4, Norway

## Magnetic Licensee

Delco Remy Division of General Motors has issued the first license for manufacture of Nd-Fe-B magnets. The limited license will allow IG Technologies of Vaplaraiso, Indiana, to produce and sell magnets utilizing its existing sintering technology with neodymium compositions covered by GM's existing and pending patents.

## In the Race

The Chemical and Metals Department, Dow Chemical Company of Midland, Michigan, has developed a sand-cast magnesium engine block. The alloy, originally developed for aerospace applications, contains rare earths to increase the strength and performance at the high operating temperatures encountered. The three liter, four cylinder engine is 95 pounds lighter than a modified cast iron engine of the same power.

(Continued from previous column)  
Quantex Corporation, U.S.A. (1)  
Reactor Experiments Incorporated,  
U.S.A. (18)  
Rhone-Poulenc Minerale Fine,  
France (19)  
Ronson Metals Corporation,  
U.S.A. (20)  
Santoku Metal Industry Company,  
Limited, Japan (18)  
Sassoon Metals & Chemicals Incorporated,  
U.S.A. (3)  
Sherritt Gordon Mines Limited, Canada (4)  
Sumitomo Light Metal Industries,  
Incorporated, Japan (4)  
Thomas & Skinner Incorporated,  
U.S.A. (3)  
Treibacher Chemische Werke AG,  
Austria (16)  
USR Optonix Incorporated,  
U.S.A. (17)  
Wheeler Associates, U.S.A. (2)  
Yue Long Chemical Plant, People's  
Republic of China (7)

**Amsterdam**

(Continued from page 1)

istry, (8) polymers, and (9) clinical chemistry.

There were generally two plenary lectures, one after the other, each morning for all attendees. These were followed by two invited papers in each of the nine sections. After lunch, three more invited papers were presented in each section. This was followed by a two-hour period that allowed the participants to view the 1,176 posters presented on four afternoons.

About 2,000 scientists from some 40 countries attended the congress with roughly 1,200 attending from Bulgaria. The other 40 percent of the participants were divided approximately equally between Soviet block and Western countries.

Because there was no mechanism for easily adding post-deadline papers, there was not a great deal presented on the new rare earth-copper oxide superconductors. C. N. R. Rao, outgoing president of IUPAC, in his plenary lecture, talked about the work they were doing at his institute (Indian Institute of Science, Bangalore, India) on these new superconductors. One poster was presented by E. Pollert (Institute of Physics, Prague, Czechoslovakia) on their work on  $\text{YBa}_2\text{Cu}_3\text{O}_{7-x}$ . About 5 percent of the papers presented at Sofia dealt with rare earths.

**University of Munich**

My host at the University of Munich was Professor J. Schilling. Our discussions centered on the pressure dependence of the magnetization of  $\text{Sc}_3\text{In}$  (an itinerant ferromagnet that orders magnetically at 6 K at ambient pressure), the high temperature rare earth-copper oxide superconductors, and studies on heavy fermion materials. They have recently reported on the low temperature heat capacity of the heaviest known fermion  $\text{Ce}(\text{Cu}_{0.9}\text{Ag}_{0.1})_6$ .

**Technical University of Munich and the W. Meissner Low Temperature Laboratory**

I visited both the Technical University and the Meissner Low Temperature Laboratory, both located outside of Munich in Garching and about a quarter of a mile apart. At the Technical University, Dr. J. Völkl and I discussed our joint research program on hydrogen diffusion in

(Continued in next column)

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metals using the Gorsky effect. Our work on single crystal thin sheets of Lu metal showed that within experimental error the diffusion along the  $a$ -axis is the same as along the  $c$ -axis. This result is surprising because one would have expected that the diffusion along the  $c$ -axis to be faster than along the  $a$ -axis because of the channel of octahedral holes in the  $c$ -direction of a hcp metal. A model that involves jumps via tetrahedral holes and accounts for the similar diffusion rates was proposed by J. Völkl.

At the Meissner Low Temperature Laboratory I visited Drs. K. Neumair and K. Andres (the director of the laboratory). Our conversations included the effect of H on the low temperature heat capacity (50 mK to 2 K) of Y metal, the rare earth-copper oxide superconductors, and heavy fermion materials.

**RE-BYC**

(Continued from page 1)

tially enhanced the separation of the heavy lanthanides and the separation of scandium from all other rare earths.

Our investigations were interrupted by World War II and the destruction of our laboratories. In the meantime, the separation of rare earths by ion exchange was developed by Spedding, et al. in the United States. The separation by partition, however, did not receive much attention between 1940 and 1951 with only a few reports giving more examples but adding nothing basically new. The breakthrough came with the use of tributyl phosphate and the ensuing years saw a flood of publications dealing with the liquid-liquid extraction of rare earths. As a result, pure rare earth materials became readily available and our knowledge of their

(Continued in next column)

Rare-earth Information Center  
Institute for Physical Research and Technology  
Iowa State University  
Ames, Iowa 50011-3020

(Continued from previous column)  
chemical and physical properties have expanded rapidly.**LETTER-TO-THE-EDITOR**

Dear Sir:

I am writing with regard to your designation of 1787 as the year in which rare earths were discovered [*RIC News*, **XXI**, [4] 1-2 (1986)]. The reason I raise this matter is that I have come across at least four different sources which cite 1788 as the year in which Karl Arrhenius discovered his new mineral, ytterbite. (He then lists four references).

I bring this matter up only through curiosity; a year here or there in two centuries is hardly crucial!

Yours Sincerely,  
Chris H. Evans  
Dept. of Orthopaedic Surgery  
University of Pittsburgh  
Pittsburgh, PA 15261

**Editor's Note:**

I can add at least one more reference to your list citing 1788, but I have five references that cite 1787 as the year of discovery. However, the answer to this dilemma is quite simple: the discovery was made in the summer of 1787, but it was not published until 1788 [K. Arrhenius, *Svenska Akad. Handl.* page 217 (1788)]. (The references alluded to are available from the RIC if you are interested.)

**Kondo Lattices**

(Continued from page 2)

In this class of NKL the low-temperature density of electron states at the Fermi level is 100-1,000 times larger than in normal metals. As a consequence, this generates a narrow Abiksov-Suhl resonance with a gigantic amplitude near the Fermi level. The authors believe that the overwhelming majority of "heavy fermion systems" are in fact NKL and they point out the nontrivial nature of superconductivity in these materials.