The Geochemical News

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Meetings and Symposia

GEOCHEMICAL SOCIETY 1988 ANNUAL FALL MEETING in conjunction with the Centennial Meeting of the Geological Society of America, Denver, Colorado, October 31 through November 3. Preregistration and hotel reservation deadline October 7 (forms on pp. 5,7). For further information, see GSA News and Information Vol. 10 No. 8, August 1988, or apply to GSA Meetings Department, P.O. Box 9140, Boulder, CO 80301, Telephone 303-447-2020.

MONDAY OCTOBER 31

GEOCHEMISTRY I: GEOCHEMISTRY OF MINERAL DISSOLUTION
2AF, DCC, 1:00 P.M.

S. M. Richardson and D. A. Sverjensky, Presiding

1 William M. Murphy*, Eric H. Oelkers, Peter C. Lichtner: COUPLED SURFACE REACTION AND DIFFUSION OF AQUEOUS SPECIES IN THE CONTROL OF MINERAL DISSOLUTION AND GROWTH RATES IN GEOCHEMICAL PROCESSES [007566] ..... 1:00 P

2 Patrick V. Brady*, John V. Walther: A POSSIBLE MODEL FOR SILICATE MINERAL AND GLASS DISSOLUTION AS A FUNCTION OF pH [026168] ..... 1:15 P

3 Christopher H. Gammons*, Hubert L. Barnes, Chie Soong: PRECIPITATION AND DISSOLUTION KINETICS OF CRISTOBALITE UNDER HYDROTHERMAL CONDITIONS [005160] ..... 1:30 P

4 Alex E. Blum*, Richard A. Yund, Antonio C. Lasaga: THE EFFECT OF DISLOCATION DENSITY ON THE AQUEOUS DISSOLUTION RATE OF QUARTZ [020930] ..... 1:45 P

5 Susan C. Webb*, John V. Walther: DISSOLUTION MECHANISMS OF ANDALUSITE AT 25 DEGREES C [026176] ..... 2:00 P

6 L. Chou*, R. M. Garrels, R. Wollast: RATES OF DISSOLUTION OF CARBONATE MINERALS [027843] ..... 2:15 P

7 Jeremy B. Fein*, John V. Walther: EXPERIMENTAL DETERMINATION OF CALCITE SOLUBILITY IN SUPERCRITICAL NaCl-H2O FLUIDS [026175] ..... 2:30 P

8 D. R. Cole*, S. E. Drummond: SOLUBILITIES OF CALCITE AND DOLOMITE IN HYDROTHERMAL SOLUTIONS [027256] ..... 2:45 P

9 Nicholas M. Rose*, J. G. Liou, Dennis K. Bird: EXPERIMENTAL INVESTIGATION OF REACTIONS BETWEEN ALBITE, PREHNITE, QUARTZ AND AN AQUEOUS SOLUTION AT 300 DEGREES C, 300 BARS: IMPLICATIONS FOR Ca METASOMATISM IN MAFIC INTRUSIONS [027120] ..... 3:00 P

10 Carrick M. Eggleston*, Michael F. Hochella, Roland Hellmann, David A. Crerar: FORMATION OF LEACHED LAYERS DURING ALBITE HYDROLYSIS [027130] ..... 3:15 P

11 D. A. Sverjensky*, J. J. Hemley: ALKALI FELDSPAR-MICA-ALUMINOSILICATE EQUILIBRIA WITH HYDROTHERMAL ALKALI CHLORIDE SOLUTIONS [023322] ..... 3:30 P

12 Kathryn L. Nagy*, Alex E. Blum, Antonio C. Lasaga: PRECIPITATION KINETICS AND SOLUBILITY OF KAOLINITE IN DILUTE AQUEOUS SOLUTIONS AT 80 DEGREES C [026005] ..... 3:45 P

13 David J. Wesolowski*, Donald A. Palmer, S. Edward Drummond: SOLUBILITY OF GIBBSITE AND SPECIATION OF ALUMINUM IN H-Na-K-Cl-OH-ACETATE BRINES IN THE RANGE 6-125 DEGREES C AND 0-5 MOLAL IONIC STRENGTH [022425] ..... 4:00 P

14 Wen Yang*, P. E. Rosenberg, J. A. Kittrick: THE FREE ENERGY OF FORMATION OF SEARLESITE, $NaBSi_2O_5(OH)_2$, AND ITS STABILITY RELATIONS IN THE SYSTEM Na_2O-B_2O_3-SiO_2-H_2O AT 25 DEGREES C [027519] ..... 4:15 P

15 Xiaoyun Cao*, Steven M. Richardson, Catherine K. Richardson: SOLUBILITY OF MOLYBDENITE (MoS_2) IN HYDROTHERMAL SOLUTIONS [007273] ..... 4:30 P

16 M. A. A. Schoonen*, H. L. Barnes: KINETICS OF HYDROTHERMAL PYRITE AND MARCASITE FORMATION FROM SOLUTION [005172] ..... 4:45 P

TUESDAY NOVEMBER 1 **

GEOCHEMISTRY II: GEOCHEMISTRY OF HOT AND COLD RUNNING WATER I. HYDROTHERMAL PROCESSES
2AF, DCC, 8:00 A.M.

Joseph L. Graf and Eric H. Oelkers, Presiding

1 Everett L. Shock*: PREDICTION OF THE HYDROTHERMAL SOLUBILITY OF HYDROCARBONS [023163] ..... 8:00 A

2 Harold C. Helgeson*, Everett L. Shock: ROLE OF OXIDATION/REDUCTION REACTIONS IN THE HYDROTHERMAL TRANSPORT AND DEPOSITION OF PETROLEUM [007586] ..... 8:15 A

3 Joseph L. Graf*: PARTITIONING BEHAVIOR OF RARE EARTH ELEMENTS BETWEEN CALCITE AND AQUEOUS SOLUTIONS AT TEMPERATURES AND SALINITIES SIMILAR TO THOSE FOR ORE FLUIDS IN MISSISSIPPI VALLEY-TYPE ORE DEPOSITS [016728] ..... 8:30 A

4 James T. Wells*, Mark S. Ghiorso: THE INFLUENCE OF REACTION KINETICS AND FLUID FLOW ON THE CONCENTRATION OF SILICA IN HYDROTHERMAL FLUIDS [023645] ..... 8:45 A

5 Eric H. Oelkers*, Harold C. Helgeson: PREDICTION OF DISSOCIATION CONSTANTS AND LIMITING EQUIVALENT CONDUCTANCES OF TRIPLE IONS IN HIGH-TEMPERATURE HYDROTHERMAL SOLUTIONS [025889] ..... 9:00 A

6 Teresa Suter Bowers*: STABLE ISOTOPE SIGNATURES OF WATER-ROCK INTERACTION IN MID-OCEAN RIDGE HYDROTHERMAL SYSTEMS [020544] ..... 9:15 A

7 Ursula M. Graham*, Hiroshi Ohmoto: MINERALOGICAL AND CHEMICAL PROCESSES OF WURTZITE AND SPHALERITE FORMATION IN BLACK SMOKER CHIMNEYS [005178] ..... 9:30 A

8 Anne M. Arquit*, Gary M. McMurtry, Alexander Malahoff: CHARACTERIZATION OF SEDIMENT ZONES ASSOCIATED WITH HYDROTHERMAL SULFIDE DEPOSITION ON THE GALAPAGOS RIFT [010113] ..... 9:45 A

9 Jeffrey C. Alt*: HYDROTHERMAL MIXED-LAYER ILLITE-SMECTITE IN RECENT MASSIVE SULFIDE DEPOSITS FROM THE SEAFLOOR [023194] ..... 10:00 A

10 David D. Lambert*, Ann E. Moran: Sr ISOTOPE AND REE GEOCHEMISTRY OF FLUORITE MINERALIZATION IN TRANS-PECOS, TEXAS: IMPLICATIONS FOR ELEMENT MIGRATION PATHS DURING HYDROTHERMAL ALTERATION [018043] ..... 10:15 A

11 G. Woldegabriel, F. Goff*, G. Heiken: HYDROTHERMAL ALTERATION EVENTS IN THE JEMEZ MOUNTAINS, NEW MEXICO [005962] ..... 10:30 A

12 Christopher J. Eastoe*, John M. Guilbert, Ronald S. Kaufmann: PRELIMINARY EVIDENCE FOR FRACTIONATION OF STABLE CHLORINE ISOTOPES IN MISSISSIPPI VALLEY-TYPE AND PORPHYRY COPPER HYDROTHERMAL SYSTEMS [026857] ..... 10:45 A

13 Fereydoun Ghazban*, Derek C. Ford, Henry P. Schwarcz: IN SITU SULFATE REDUCTION AND DOLOMITE PRECIPITATION AT NANISIVIK BAFFIN ISLAND, CANADA: STABLE ISOTOPE EVIDENCE [023674] ..... 11:00 A

14 Matthew T. Heizler*, T. Mark Harrison, Wilfred A. Elders, Charles T. Herzig: HYDROTHERMAL SYSTEM AND PROVENANCE AGES GIVEN BY $^{40}Ar/^{39}Ar$ RESULTS FROM DRILL CORE SANDSTONES FROM THE SALTON SEA SYSTEM, SOUTHERN CALIFORNIA [007860] ..... 11:15 A

15 Michael McKibben*, Alan Williams: METAL CHLORIDE SPECIATION IN SALINE HYDROTHERMAL FLUIDS [012568] ..... 11:30 A

*denotes speaker. Numbers ([007566] etc.) refer to abstracts in GSA Abstracts with Programs.

**See addendum, p.8: GS Symposium, A TALE OF TWO CRATONS.

TUESDAY NOVEMBER 1

16 **Alan E. Williams*:** FLUID DENSITY DISTRIBUTION IN A STRATIFIED GEOTHERMAL RESERVOIR: SALTON SEA GEOTHERMAL SYSTEM, CALIFORNIA [017086] ..... 11:45 A

GEOCHEMISTRY III: GEOCHEMISTRY OF HOT AND COLD RUNNING WATER II: AQUEOUS SYSTEMS
2AF, DCC, 1:30 P.M.

Peter K. Swart and Walter E. Dean, Presiding

1 **Lucinda Brothers*, Michael H. Engel:** THE EFFECTS OF FLUID FLOW THROUGH POROUS MEDIA ON THE DISTRIBUTION OF ORGANIC COMPOUNDS IN A SYNTHETIC CRUDE OIL [016088] ..... 1:30 P

2 **Philip C. Bennett*, Donald I. Siegel, Barbara Hill:** SILICA MOBILITY IN A WETLAND: EVIDENCE FOR SILICA-ORGANIC COMPLEXATION [021112] ..... 1:45 P

3 **J. L. Schleusener*, H. L. Barnes, S. E. Drummond, D. A. Palmer:** ACTIVATION PARAMETERS AND LOW TEMPERATURE HALF-LIVES FOR THE DECARBOXYLATION OF ACETATE IN SEDIMENTARY BASIN FLUIDS [005159] ..... 2:00 P

4 **Tim K. Lowenstein*, Ronald J. Spencer, Pengxi Zhang:** ORIGIN OF ANCIENT POTASH EVAPORITES: CLUES FROM THE MODERN QAIDAM BASIN, WESTERN CHINA [012928] ..... 2:15 P

5 **Earl F. La Pensee*, Wilfred A. Elders, Spencer S. Shannon:** IMPLICATIONS FOR U TRANSPORT IN GROUNDWATER: TRACE ELEMENT VARIATIONS IN SANDSTONES OF THE SALT WASH MEMBER, MORRISON FORMATION, AROUND THE LA SAL MOUNTAINS, UTAH [012569] ..... 2:30 P

6 **Dan E. Olson*, Robert F. Commeau, Frank T. Manheim:** CHEMICAL STRATIGRAPHIC PROFILES OF FERROMANGANESE CRUSTS FROM THE BLAKE PLATEAU OFF THE SOUTHEASTERN U.S. [005434] .... 2:45 P

7 **Peter K. Swart*, S. J. Burns:** RELATIONSHIPS BETWEEN INTERSTITIAL PORE WATER CHEMISTRY AND BASEMENT ROCKS: LEG 115 OF THE OCEAN DRILLING PROJECT [008567] ..... 3:00 P

8 **P. Vrolijk*, S. Chambers, J. Gieskes, J. O'Neil:** HYDROGEOLOGY OF THE BARBADOS SUBDUCTION ZONE - STABLE ISOTOPE RESULTS [026210] ..... 3:15 P

9 **Hugh Abercrombie*, Ian Hutcheon:** FLUID CONTROL OF DIAGENESIS AT SHALLOW DEPTHS: CLEARWATER FORMATION, ALBERTA [027920] ..... 3:30 P

10 **Terri L. Woods*, Robert M. Garrels:** CALCULATED AQUEOUS SOLUTION/SOLID-SOLUTION RELATIONS IN THE LOW TEMPERATURE SYSTEM, CaO-MgO-FeO-CO2-H2O [022381] ..... 3:45 P

11 **E. P. Moldovanyi*, L. M. Walter:** GEOCHEMICAL AND ISOTOPIC HETEROGENEITIES IN FORMATION FLUID CHEMISTRY, SMACKOVER FM., SW ARKANSAS (U.S. GULF COAST) [011190] ..... 4:00 P

12 **T. Kotzer*, T. K. Kyser, M. R. Wilson:** ISOTOPIC EVIDENCE FOR RETROGRADE ILLITE ALTERATION [012185] ..... 4:15 P

13 **D. Chipley*, T. K. Kyser:** BASIN FLUID HISTORY AS RECORDED BY FLUID INCLUSIONS IN HALITE [012186] ..... 4:30 P

14 **Daniel W. Davis*, Tim K. Lowenstein, Ronald J. Spencer:** MELTING BEHAVIOR OF FLUID INCLUSIONS IN LABORATORY-GROWN HALITE CRYSTALS IN THE SYSTEMS NaCl-H2O, NaCl-KCl-H2O, AND NaCl-MgCl2-H2O [005353] ..... 4:45 P

15 **C. L. Knight*, R. J. Bodnar:** CRITICAL SPECIFIC VOLUMES AND ISOCHORES OF AQUEOUS SODIUM CHLORIDE SOLUTIONS [014540] ..... 5:00 P

16 **Xue-lei Chu*, Hiroshi Ohmoto:** THE ROLE OF POLYSULFIDE AND THIOSULFATE IN THE ISOTOPIC EXCHANGE KINETICS BETWEEN AQUEOUS SULFIDE AND SULFATE [005158] ..... 5:15 P

WEDNESDAY NOVEMBER 2

GEOCHEMISTRY IV: HISTORICAL GEOCHEMISTRY/WEDNESDAY SPECIAL
2AF, DCC, 8:00 A.M.

Judith Parrish and George DeVore, Presiding

1 **S. J. Burns*, P. K. Swart, P. A. Baker:** ORIGIN OF CARBONATES PRECIPITATED IN BASEMENT VOLCANIC ROCKS, LEG 115 OCEAN DRILLING PROJECT, NORTHWEST INDIAN OCEAN [027113] ..... 8:00 A

2 **Volker C. Vahrenkamp*, Peter K. Swart:** A NEW DISTRIBUTION COEFFICIENT FOR STRONTIUM INTO DOLOMITES: IMPLICATIONS FOR PLATFORM DOLOMITIZATION [022352] ..... 8:15 A

3 **S. A. Macko*, C. P. G. Pereira:** ORGANIC ISOTOPIC GEOCHEMISTRY AND SEDIMENTOLOGY OF THE EAST-CENTRAL WEDDELL SEA REGION: A PALEOENVIRONMENTAL AND CLIMATIC INTERPRETATION [023984] ..... 8:30 A

4 **Austin Long*, J. L. Betancourt, L. W. Warnecke, R. S. Thompson:** STABLE HYDROGEN ISOTOPIC RATIO VARIATIONS IN PLANT CELLULOSE FROM FOSSIL PACKRAT MIDDENS: PALEOCLIMATIC IMPLICATIONS [026879] ..... 8:45 A

WEDNESDAY NOVEMBER 2

5 **Crayton J. Yapp*:** OXYGEN ISOTOPE GEOCHEMISTRY AND PALEOTEMPERATURES OF THE UPPER ORDOVICIAN NEDA FM IRONSTONE [020150] ... 9:00 A

6 **Judith Totman Parrish*, Scott D. Samson:** POSSIBLE PALEOCLIMATIC CONSTRAINTS ON THE POSITIONS OF LAURENTIA, SOUTHERN BRITAIN, AND BALTICA IN THE ORDOVICIAN [021615] ..... 9:15 A

7 **Linda Bonnell*:** QUANTITY AND ISOTOPIC COMPOSITION OF REDUCED SULFUR IN CRETACEOUS ORGANIC-RICH SHALES [023142] ..... 9:30 A

8 **Mary S. Quinby-Hunt*, Pat Wilde, William B. N. Berry, Charles J. Orth:** THE REDOX-RELATED FACIES OF BLACK SHALES [016835] ..... 9:45 A

9 **Birger Schmitz*, Goran Aberg:** Sr-87/Sr-86 ISOTOPE RATIOS IN FOSSIL FISH DEBRIS AND THE PALEOSALINITY OF ANCIENT FISH HABITATS [023712] ..... 10:00 A

10 **Ellen K. Wright*:** FRASNIAN-FAMENNIAN MASS EXTINCTION: A PARADOX BETWEEN OXYGEN ISOTOPIC DATA AND FAUNAL/SEDIMENTARY EVIDENCE [005045] ..... 10:15 A

11 **Iain Gilmour*, Wendy Wolbach, Edward Anders:** ENVIRONMENTAL CONSEQUENCES OF GLOBAL FIRE AT THE CRETACEOUS-TERTIARY BOUNDARY [026498] ..... 10:30 A

12 **George W. DeVore*:** THE PARTIAL PRESSURES FOR THE O2 MOLECULES IN THE SOLAR NEBULA: THE FORMATIONS OF THE SULFATES AND MAGNETITE IN THE CARBONACEOUS CHONDRITES [025115] ..... 10:45 A

THE GEOCHEMICAL SOCIETY INGERSON LECTURE
Wallace S. Broecker: MILANKOVITCH CYCLES: THE SOLE DRIVER OR MERELY THE MODULATOR AND PACE-MAKER OF THE 100,000-YEAR CLIMATIC CYCLE? . . . 11:00 A

GEOCHEMICAL SOCIETY LUNCHEON AND AWARDS CEREMONY
Hyatt Regency Grand Ballroom, 12 noon to 2 p.m. Tickets ($16) available with preregistration (see p. 5), or at GSA registration desk until noon on Tuesday 1 November.

OGD BEST PAPER AWARD: R. E. Summons and T. G. Powell, Australian Bureau of Mineral Resources, Geology and Geophysics, Canberra

F. W. CLARKE MEDAL: Fred M. Phillips, New Mexico Institute of Mining and Technology

V. M. GOLDSCHMIDT MEDAL and LESTER W. STROCK and FAMILY HONORARIUM: Harold C. Helgeson, University of California, Berkeley

THURSDAY NOVEMBER 3

GEOCHEMICAL SOCIETY SYMPOSIUM: PRODUCTIVITY, ACCUMULATION, AND PRESERVATION OF ORGANIC MATTER: RECENT AND ANCIENT SEDIMENTS
1AF, DCC, 8:00 A.M.

Jean K. Whelan and John W. Farrington, Presiding

1 **Wallace G. Dow*:** REFLECTIONS ON THE CAREER AND TIMES OF JOHN M. HUNT [008997] ..... 8:00 A

2 **J. M. Hayes*:** MECHANISMS OF "PRESERVATION" OF ORGANIC MATTER [008610] ..... 8:20 A

3 **R. I. Haddad*, J. P. Jasper:** THE RELATIVE REACTIVITY OF SEDIMENTARY ORGANIC CARBON AND BIOMARKER COMPOUNDS ON TIMESCALES RANGING FROM 10 TO 100,000 YEARS [009088] ..... 8:40 A

4 **M. A. Arthur*, M. S. Leinen, D. Cwienk, M. Sarnthein:** ORGANIC CARBON ACCUMULATION RATES AND ESTIMATION OF PRIMARY PRODUCTIVITY FROM THE PELAGIC SEDIMENTARY RECORD [008447] ..... 9:00 A

5 **John W. Morse, Linda L. Mays, Kay C. Emeis*:** CONTROLS ON CARBON/SULFUR RELATIONSHIPS IN NEOGENE TO QUATERNARY SEDIMENTS FROM THE BENGUELA UPWELLING AND THE TYRRHENIAN SEA [008994] ..... 9:20 A

6 **R. P. Philp*:** KEROGEN - ORIGIN, FORMATION AND DESTRUCTION [014452] ..... 9:40 A

COFFEE BREAK ..... 10:00 A

7 **Bernd R. T. Simoneit*:** NATURAL HYDROUS PYROLYSIS - PETROLEUM GENERATION IN SUBMARINE HYDROTHERMAL SYSTEMS [014453] ..... 10:20 A

8 **C. S. Martens*, D. B. Albert, J. P. Chanton, G. G. Pauly, E. A. Canuel:** ORGANIC ACIDS AND LIGHT HYDROCARBONS IN HYDROTHERMALLY ALTERED GUAYMAS BASIN SEDIMENTS [021422] ..... 10:40 A

9 **K. E. Peters*, J. M. Moldowan, P. Sundararaman:** EFFECTS OF HYDROUS PYROLYSIS ON BIOMARKER THERMAL MATURITY PARAMETERS: MONTEREY PHOSPHATIC AND SILICEOUS MEMBERS [008998] ..... 11:00 A

10 **David A. Wavrek*, Parke A. Dickey, Colin Barker:** AN UNUSUAL OIL FROM THE MIDDLE MAGDALENA VALLEY, COLOMBIA: A CASE FOR DEGRADATION AND SUBSEQUENT NEOGENESIS [008621] ..... 11:20 A

DISCUSSION ..... 11:40 A

GEOCHEMISTRY V: GEOCHEMISTRY OF SILICIC MAGMAS
2AF, DCC, 8:00 A.M.

G. Lang Farmer and J. Ruiz, Presiding

1 **Joaquin Ruiz*, Sheila J. Roberts:** U-Th-Pb GEOCHEMISTRY OF THE LOWER CRUST [026859] ..... 8:00 A

2 **A. P. LeHuray*, P. Marcet, U. Petersen:** LEAD ISOTOPIC PROVINCES IN THE CENTRAL ANDES [027460] ..... 8:15 A

3 **Stephen M. Wickham*, Mark T. Peters:** FLUID AND MELT TRANSPORT IN ANATECTIC ENVIRONMENTS [026499] ..... 8:30 A

4 **S. S. Sorensen*, J. N. Grossman:** CONSTRAINTS ON METASOMATISM AND PARTIAL MELTING FROM PETROGENETIC MODELLING OF RARE EARTH ELEMENTS: A CASE STUDY FROM THE CATALINA SCHIST, SOUTHERN CALIFORNIA [023375] ..... 8:45 A

5 **Kurt Hollocher*:** PARTIAL MELTING OF TONALITIC GNEISSES DURING REGIONAL METAMORPHISM, BRONSON HILL ANTICLINORIUM, WEST-CENTRAL MASSACHUSETTS [011941] ..... 9:00 A

6 **Sun-Joon Kim*, Yuch-Ning Shieh:** OXYGEN ISOTOPE CHARACTERISTICS OF ANOROGENIC GRANITES FROM THE WOLF RIVER BATHOLITH, WISCONSIN AND NORTHERN WET MOUNTAINS, COLORADO [020652] ..... 9:15 A

7 **G. C. Solomon*, H. P. Taylor, Jr.:** 18O/16O AND 87Sr/86Sr CORRELATIONS IN THE GRANITIC PLUTONS OF THE SIERRA NEVADA BATHOLITH AND THE NORTHERN GREAT BASIN (NGB), NEVADA AND UTAH [014720] ..... 9:30 A

8 **L. W. McKenna*, J. D. Walker, J. Sutter:** PETROGENESIS OF IGNEOUS ROCKS, ULUGH MUZTAGH, TIBET, AND THEIR RELATIONSHIP TO THE TIMING OF CRUSTAL THICKENING IN THE NORTHERN TIBETAN SHIELD [024856] ..... 9:45 A

9 **D. R. Lux*, David Gibson:** THE BRITISH TERTIARY IGNEOUS PROVINCE: 40Ar/39Ar AGES FOR THE MOURNE MOUNTAINS GRANITES [012788] .... 10:00 A

10 **E. A. Atekwana*, J. F. Sutter, D. A. Schwartzman:** PRECISE CRYSTALLIZATION AGES OF QUICKLY-COOLED PLUTONS USING 40Ar/39Ar TECHNIQUES ON HORNBLENDE: AN EXAMPLE FROM LATE PALEOZOIC PLUTONS IN THE APPALACHIAN PIEDMONT [006034] ..... 10:15 A

11 **D. L. Thompson*:** CORRELATION OF DISCORDANT 40Ar/39Ar MINERAL AGE SPECTRA WITH GAS RELEASE PATTERNS: INTERPRETATION OF MULTIPHASE SAMPLES [020975] ..... 10:30 A

12 **G. Lang Farmer*, David E. Broxton:** Nd ISOTOPIC EVOLUTION OF RHYOLITES AT THE TIMBER MOUNTAIN/OASIS VALLEY VOLCANIC CENTER, SW NEVADA [026200] ..... 10:45 A

13 **Scott D. Samson*, P. J. Patchett, J. C. Roddick, R. R. Parrish:** Nd AND Sr ISOTOPIC AND U-Pb AGE CONSTRAINTS ON THE ORIGIN AND TECTONIC SETTING OF ORDOVICIAN BENTONITES IN NORTH AMERICA [026867] ..... 11:00 A

14 **H. P. Taylor, Jr.*, B. Turi, M. Preite-Martinez, P. Di Girolamo, G. Ferrara:** COMPARISON OF 18O/16O AND 87Sr/86Sr IN VOLCANIC ROCKS FROM THE PONTINE ISLANDS, M. ERNICI AND CAMPANIA WITH OTHER AREAS IN ITALY [006967] ... 11:15 A

15 **Ardyth M. Simmons*:** CONTRAST IN TIMING, GEOCHEMISTRY, AND ERUPTIVE STYLE IN THE SHIFT FROM MID-TERTIARY TO EXTENSION-RELATED VOLCANISM IN THE MOHON MOUNTAINS, AZ [011856] ..... 11:30 A

16 **Edward M. Ripley*, Nur I. Taib, James D. Miller, Jr.:** OXYGEN AND CARBON ISOTOPIC INVESTIGATION OF THE DULUTH COMPLEX, MINNESOTA [007953] ..... 11:45 A

GEOCHEMISTRY VI: LAYERED SILICATES AND ZEOLITES/ MINERALOGY/CRYSTALLOGRAPHY II
3AFBE, DCC, 1:00 P.M.

David R. Veblen and James F. Luhr, Presiding

1 **Yen-Hong Shau*, Donald R. Peacor:** A TEM STUDY OF TRIOCTAHEDRAL PHYLLOSILICATES AS ALTERATION PRODUCTS OF OLIVINE IN BASALTS OF DSDP HOLE 504B [006200] ..... 1:00 P

2 **Judith M. Ballantyne*:** A SHEET ZIPPER THEORY OF ILLITIZATION: IMPLICATIONS AND EVIDENCE [020063] ..... 1:15 P

3 **S. U. Aja*, P. E. Rosenberg, J. A. Kittrick:** ILLITE-SMECTITE EQUILIBRIA IN SOLUTIONS: THE EFFECT OF Mg2+ BETWEEN 90 DEGREES AND 250 DEGREES C [010045] ..... 1:30 P

4 **John A. Chermak*, J. Donald Rimstidt:** HYDROTHERMAL INVESTIGATION OF THE TRANSFORMATION OF KAOLINITE TO ILLITE [014549] ..... 1:45 P

5 **Wei-Teh Jiang*, Donald R. Peacor, Eric J. Essene:** COEXISTING MUSCOVITE-PYROPHYLLITE: IMPLICATIONS FOR THE METASTABILITY OF ILLITE IN LOW-GRADE ROCKS [006199] ..... 2:00 P

6 **Barbara Ransom*, Harold C. Helgeson:** SMECTITE DEHYDRATION: A THERMODYNAMIC STUDY WITH IMPLICATIONS FOR THE NATURE OF MIXED-LAYER CLAYS [007562] ..... 2:15 P

THURSDAY NOVEMBER 3

7 **Charles A. Weiss, Jr.*, R. James Kirkpatrick:** 133Cs VARIABLE TEMPERATURE MAS NMR SPECTROSCOPIC STUDY OF EXCHANGE ON LAYER SILICATES [006423] ..... 2:30 P

8 **Richard A. Eggleton*, Stephen Guggenheim:** A NEW MODEL FOR THE STRUCTURE OF BEMENTITE, A MODULATED 1:1 LAYER SILICATE [016566] ..... 2:45 P

9 **David R. Veblen*, Embaie Ferrow, David London, Kathleen S. Goodman:** EXSOLUTION IN MUSCOVITE [026469] ..... 3:00 P

10 **A. Sachi, H. K. Brueckner*:** DETRITAL VERSUS AUTHIGENIC/DIAGENETIC INFLUENCES ON MIXED Rb-Sr "AGES" FROM CHERTS OF THE HAVALLAH SEQUENCE, NEVADA [027466] ..... 3:15 P

11 **James F. Luhr*, T. Kurtis Kyser:** PRIMARY IGNEOUS ANALCIME: THE COLIMA MINETTES [023175] ..... 3:30 P

12 **Stephen B. Rice*:** A MICROANALYTICAL (TEM) STUDY OF THE TRANSFORMATION OF SILICIC GLASS TO ZEOLITES IN MIOCENE TUFFS NEAR LOVELOCK, NEVADA [015765] ..... 3:45 P

13 **Roger G. Burns*, Teresa S. Bowers:** ACTIVITY DIAGRAMS FOR CLINOPTILOLITE: RELEVANCE TO ZEOLITIZED VITRIC TUFFS AT YUCCA MOUNTAIN, NEVADA [023742] ..... 4:00 P

14 **Valerie J. Wood*, Mary S. Hubbard, Roger G. Burns:** CESIUM UPTAKE BY CLINOPTILOLITE CRYSTALS: IMPLICATIONS TO THE IMMOBILIZATION OF RADIONUCLIDES STORED AT YUCCA MOUNTAIN, NEVADA [023744] ..... 4:15 P

15 **Barbara A. Carlos*:** FRACTURE COATING MINERALS IN THE PAINTBRUSH TUFF BELOW THE STATIC WATER LEVEL IN DRILL HOLE J-13, NEAR YUCCA MOUNTAIN, NEVADA [014470] ..... 4:30 P

16 **Nancy Scofield*, Bonnie Blake, J. C. Laul:** SCANNING X-RAY FLUORESCENCE AND SCANNING ELECTRON MICROSCOPY: APPLICATION TO URANIUM-CLAY ASSOCIATION [018426] ..... 4:45 P

POSTER SESSION VII
Hall A, DCC, 1:00 P.M. - 5:00 P.M.

Authors will be present from 2:00 P.M. - 4:00 P.M.

GEOCHEMISTRY II: LOW-TEMPERATURE GEOCHEMISTRY

Simon R. Poulson*, Martin A. A. Schoonen, Antonio C. Lasaga: AB INITIO MOLECULAR ORBITAL (AIMO) CALCULATIONS OF THE GEOMETRIES, ELECTRONIC STRUCTURES, AND IR AND RAMAN SPECTRA OF POLYSULFIDES [005173] ..... Booth 1

Charles S. Oakes*, Robert J. Bodnar, John M. Simonson: PHASE EQUILIBRIA IN THE SYSTEM NaCl-CaCl2-H2O: THE ICE LIQUIDUS [014544] ..... Booth 2

E. K. Peters*, M. Palmer, J. Edmond: THE ISOTOPIC COMPOSITION OF BORON IN NON-METEORIC BRINES OF THE COAST RANGE MOUNTAINS, NORTHERN CALIFORNIA [014663] ..... Booth 3

Roger E. Stoffregen*: AN EXPERIMENTAL STUDY OF ALKALI EXCHANGE BETWEEN ALUNITE AND (Na,K)2SO4-BEARING SOLUTIONS [024906] ..... Booth 4

G. L. Burns*, A. Hajash: THE SOLUBILITY OF NATURAL QUARTZ SAND AT 150 DEGREES C AND 345 BARS: AN EXPERIMENTAL INVESTIGATION IN A FLOW-THROUGH HYDROTHERMAL SYSTEM [025444] ..... Booth 5

Wendy J. Harrison*, W. J. Holzwarth, Lori L. Summa, W. -L. Huang: ALUMINUM CONTENTS OF AUTHIGENIC QUARTZ: A POSSIBLE INDICATOR OF PALEO-FLUID CHEMISTRY? [024896] ..... Booth 6

P. R. Dixon*, J. M. Palin: A LEAD AND OXYGEN ISOTOPE APPROACH TO PROVENANCE STUDIES OF METASEDIMENTARY ROCKS: PRELIMINARY RESULTS FROM THE LONGFORD-DOWN INLIER, IRELAND [020935] ..... Booth 7

Janet L. Rashkes*, James R. Lawrence: DELTA D VALUES OF KAOLINITES IN THE LOWER CRETACEOUS DAKOTA GROUP AND MOWRY SHALE, NORTH-CENTRAL COLORADO: EVIDENCE FOR A TERTIARY EQUILIBRATION EVENT [026939] ..... Booth 8

Julie A. Kupecz*, Lynton S. Land: PRE-MIDDLE ORDOVICIAN DOLOMITIZATION OF THE LOWER ORDOVICIAN ELLENBURGER GROUP, AND ITS POST-MIDDLE ORDOVICIAN MODIFICATION [026273] ... Booth 9

Dianne C. Marozas*: EVALUATION OF METAL RELEASE MECHANISMS AND ASSOCIATED REACTION PROGRESS DURING THE LABORATORY SIMULATION OF IN-SITU LEACHING [009474] ..... Booth 10

Robert A. Zielinski*, Allen L. Meier: THE ASSOCIATION OF URANIUM WITH ORGANIC MATTER IN HOLOCENE PEAT [023777] ..... Booth 11

Bonnie Blackwell*, William M. Last: EVIDENCE FOR RAPID MINERALOGICAL AND ORGANIC DIAGENESIS IN RECENT MAMMALIAN BONES AND TEETH FROM SALINE LAKES IN SASKATCHEWAN AND AUSTRALIA [018980] ..... Booth 12

M. H. Engel*, A. Serban, J. A. Silfer, S. A. Macko, P. Harrigan: APPLICATIONS OF STABLE ISOTOPES FOR DETERMINING THE ORIGIN(S) OF AMINO ACIDS IN FOSSILS [011047] ..... Booth 13

Steve G. Whittaker*, T. Kurtis Kyser, Lisa M. Pratt: DISTRIBUTION OF ALKANES THROUGH A TRANSGRESSIVE-REGRESSIVE CYCLE [027918] ..... Booth 14

THURSDAY NOVEMBER 3

Miguel A. Huerta-Diaz, John W. Morse*: TRACE METAL DIAGENESIS AND PYRITIZATION IN SULFIDIC MARINE SEDIMENTS [010970] ..... Booth 15

Jack Kovach*, James F. Miller: EUSTATIC SEA-LEVEL CHANGES NEAR THE CAMBRIAN-ORDOVICIAN BOUNDARY: DATA FROM Sr ISOTOPE ANALYSIS OF BIOGENIC APATITES [013381] ..... Booth 16

Diane Bellis*, Donald L. Wolberg, David I. Norman: DIFFUSION AND REEQUILIBRATION IN FOSSIL RESINS: IMPLICATIONS FOR THE STUDY OF FLUID INCLUSIONS IN AMBER [017871] ..... Booth 17

SECOND V. M. GOLDSCHMIDT CONFERENCE

HUNT VALLEY, MARYLAND

3, 4 AND 5 MAY, 1990

MARK YOUR CALENDAR

* * *

GENERAL INFORMATION

TRANSPORT

AIR

GSA has again designated The Cain Travel Group of Boulder, Colorado, as the official airline reservation agent for the GSA Centennial Celebration. Meeting participants are encouraged to call Cain's toll-free number to take advantage of discounted fares on selected airlines. United and Delta Airlines have been named official carriers.

Reduced rates are 5% off any available discount fare that generally has restrictions. If you do not meet the requirements for the discount fare, you will be offered 40% off the unrestricted coach fare.

To make a reservation:

- Call 1-800-346-4747 (toll-free outside Colorado), 303-443-2246 (inside Colorado), or collect from Canada. Hours are Monday through Friday, 8:00 a.m. to 5:30 p.m., Mountain Time.
- Call early for best availability and identify yourself as a GSA traveler.
- Be sure that you understand the restrictions on the type of ticket you request.
- Tickets can be paid for by check (payable to Cain Travel), major credit card, or invoice to company. The final payment must reach Cain Travel no later than seven days prior to departure to allow for mailing time.
- All tickets will be mailed via certified mail upon receipt of payment unless requested otherwise.
- After tickets are issued, you are protected from fare increases; if a fare decreases, call Cain Travel for an adjustment.
- Cain Travel will have an on-site Customer Service Desk at Currigan Hall.

GROUND

Denver's Stapleton Airport is 5 miles from Currigan Hall, the Denver Convention Complex, and the downtown area (an approximate 15-minute ride). Transportation options are as follows.

The Airporter
Airport to hotel. Open from 8:00 a.m. to 10:00 p.m., 7 days a week. To purchase a ticket go to the ground transportation counter opposite door 6 in the baggage claim area. Departures are every 15 minutes. Cost: $5.

Hotel to airport. During the week, The Airporter stops at all major downtown hotels every half hour. For service on weekends, call 24 hours in advance for reservations, 393-0621. Cost: $5.

Taxi Cabs
Airport service. Three cab companies service the airport and downtown area; they are regulated, metered vehicles. Charges are $1.25 for the first mile and $1.00 for each additional mile.

Regional Transportation District (RTD)
The city transportation system services downtown and major sight-seeing locations. RTD runs from 5:00 a.m. to 1:00 a.m., 7 days a week. Buses stop every 15 to 30 minutes. Route maps will be posted in all GSA hotel lobbies. Cost: 75¢ per ride (10¢ for senior citizens). For general information, call RTD at 778-6000.

GSA Shuttle
GSA will operate a free shuttle service throughout the meeting. GSA hotel guests will be transported to and from Currigan Hall during meeting hours. The shuttle will also operate during special events at Currigan Hall and the hotels.

This service will be provided each day (Sunday, October 30, through Thursday, November 3) beginning at 6:30 a.m. and continuing at 15-minute intervals through the meeting hours. The service will continue into the evening for the special events.

Look for shuttle schedules posted in GSA hotel lobbies and in registration packets. Each bus will be identified by a "GSA Shuttle Bus" sign in the front window.

Car Rental
Alamo is the official car rental agency for the meeting. Identify yourself as a GSA delegate and get guaranteed, discounted, daily/weekly rates as follows: economy $24/$75; compact $26/$99; intermediate $28/$119; standard (two-door) $29/$149; luxury $31/$179. Add $2 per day for 4-door models. Unlimited mileage. Vehicles returned to any other Alamo location will be subject to drop charges. Call Alamo for advance reservations, (800) 732-3232. Give the GSA Group I.D. No. 34148 and the GSA Rate Plan Code No. G5.

HOUSING

GSA has blocked rooms at eight hotels that are offering special convention rates to GSA meeting attendees. GSA endorses these hotels for quality, cleanliness, and service.

To Make Your Hotel Reservation

BY FRIDAY, OCTOBER 7, fill out the attached Official Housing Request Form and mail it immediately to the address shown on the form. No reservations will be accepted if not submitted on this form.

AFTER FRIDAY, OCTOBER 7, you are responsible for making your own reservation directly with the hotel. Note that (1) many hotels will be filled at that time, and (2) hotels are not required to offer the special GSA rate as shown.

Assignment

Hotel rooms will be assigned on a first-come, first-served basis as they are received by the Housing Bureau. Once your request is received, the bureau will send an acknowledgment to both you and your assigned hotel.

You will then receive a confirmation from the hotel. This is a notice that the hotel received the information from the bureau and that the reservation has been entered into their system.

Room Deposits/ Guarantees

All GSA hotels require a first night's room deposit. Deposits can be made by (1) including a credit card number on the housing form, or (2) sending payment directly to the hotel once you have received your confirmation. The amount of deposit should be the cost of one night's stay at your assigned hotel. Note that the Housing Bureau will accept ONLY credit card numbers. If making payment directly to the hotel, be sure to give them your confirmed reservation number.

Once the hotel receives your deposit, it automatically guarantees your reservation.

The guarantee assures you that no matter what time you arrive on your scheduled arrival day, your room will be held until 6:00 a.m. of the following day.

If you have not guaranteed your reservation, the hotel is not required to hold your room beyond 6:00 p.m. of the scheduled arrival day.

Changes and Cancellations

BEFORE OCTOBER 7, all changes and cancellations to your room reservation must be sent, in writing, to the Housing Bureau.

AFTER OCTOBER 7, all changes and cancellations to your room reservation must be telephoned in to your hotel.

Supply your hotel reservation number at the time of any change or cancellation.

Your notice of cancellation must be received AT LEAST 48 HOURS in advance of your scheduled arrival in order to receive full refund of your first night's room deposit.

NOTE: All rooms are subject to a (current) 11.8% room tax.

PREREGISTRATION FORM

1988 GSA Centennial Celebration ■ October 31–November 3

Preregistration must be RECEIVED by October 7. Payment and form MUST accompany each preregistration request. Unpaid purchase orders NOT accepted as valid registration. Cancellation deadline: October 14. No refunds on cancellations received after this date. Shaded areas are badge information.

Please print ** Copy for your records ** One form per registrant

Name (Last) **(First)**

Institution/Employer **Nickname for badge**

Mailing Address

City **State** **ZIP code**

Country **Business phone** **Home phone**

Guest/Spouse Name (Last) **(First)**

City **State/County**

Circle Member Affiliations: (1) GSA (Member #_____) (2) CF (3) GS (4) GIS (5) MSA (6) NAGT (7) PS (8) SEG (9) AWG (0) SGE (00) SVP

(registration required for participation in all events)

PREREGISTRATION FEES

		Column A Price	Qty	Amount
Professional Member (member affiliation checked above)	(1)	$100	1	$
Member One-Day (circle day: S M T W T)	(2)	$ 58	1	$
Professional Nonmember	(3)	$140	1	$
Nonmember One-Day (circle day: S M T W T)	(4)	$ 78	1	$
Student Member (member affiliation checked above)	(5)	$ 40	1	$
Member One-Day (circle day: S M T W T)	(6)	$ 24	1	$
Student Nonmember	(7)	$ 60	1	$
Nonmember One-Day (circle day: S M T W T)	(8)	$ 34	1	$
Guest (fill in name above for badge)	(9)	$ 35	___	$
Abstracts with Programs (reserved for on-site pickup)	(10)	$ 19	___	$

GUEST ACTIVITIES

			Column A Price	Qty	Amount
Historic Denver Walking Tour	Oct. 31	(11)	$ 5	___	$
Georgetown—Nostalgic Mining Mecca	Oct. 31	(12)	$ 19	___	$
Molly Brown Trunk Showing and Tour	Nov. 1	(13)	$ 30	___	$
Colorado Springs Cache	Nov. 2	(14)	$ 38	___	$
Historic Denver Walking Tour (repeat)	Nov. 2	(15)	$ 5	___	$

SPECIAL EVENTS

			Column A Price	Qty	Amount
GSA Centennial Orchestra	Nov. 1	(16)	$ 5	___	$
5K Run (check T-shirt size: __S __M __L __XL)	Nov. 2	(17)	$ 12	___	$
10K Run (check T-shirt size: __S __M __L __XL)	Nov. 2	(18)	$ 12	___	$
Centennial Birthday Bash	Nov. 2	(19)	$ 19	___	$
			Total Column A		$

TICKETED MEAL FUNCTIONS

			Column B Price	Qty	Amount
Engineering Geology Luncheon	Oct. 31	(20)	$ 16	___	$
History of Geology Luncheon	Oct. 31	(21)	$ 16	___	$
Geophysics Luncheon	Nov. 1	(22)	$ 16	___	$
Geoscience Information Society Luncheon	Nov. 1	(23)	$ 16	___	$
Hydrogeology Luncheon	Nov. 1	(24)	$ 16	___	$
Mineralogical Society Luncheon	Nov. 1	(25)	$ 16	___	$
National Assoc. Geology Teachers Luncheon	Nov. 1	(26)	$ 16	___	$
Paleontological Society Luncheon	Nov. 1	(27)	$ 16	___	$
Sedimentary Geology Breakfast	Nov. 1	(28)	$ 11	___	$
Assoc. Women Geoscientists Breakfast	Nov. 2	(29)	$ 11	___	$
Coal Geology Luncheon	Nov. 2	(30)	$ 16	___	$
Geochemical Society Luncheon	Nov. 2	(31)	$ 16	___	$
Quaternary Geology & Geomorphology Luncheon	Nov. 2	(32)	$ 16	___	$
Society of Economic Geologists Luncheon	Nov. 2	(33)	$ 16	___	$

FIELD TRIPS*

				Price	Qty	Amount
1	Precambrian, SE Wyoming	Oct. 27–30	(34)	$250	1	$
2	Pikes Peak Plutons and Pegmatites	Oct. 28–30	(35)	$275	1	$
3	Early Tertiary Coals, Powder River Basin	Oct. 27–30	(36)	$305	1	$
~~4~~	~~Hayden's Tertiary Lakes-White River Formation~~	~~Oct. 27–30~~	~~(37)~~	~~$195~~	~~1~~	$ Cancelled
5	Geology, Hydrogeology, Nebraska Sandhills	Oct. 28–30	(38)	$247	1	$
6a	Hydrogeology, Paleohydrology (w/ airfare)	Oct. 27–30	(39)	$305	1	$
6b	Hydrogeology, Paleohydrology (w/o airfare)	Oct. 27–30	(40)	$210	1	$
7	Basin and Range to Edge of Plains	Oct. 26–30	(41)	$380	1	$
8	Pennsylvanian-Permian Deposition, Eagle Basin	Oct. 29–30	(42)	$135	1	$
9	Archaeological Geology, High Plains	Oct. 28–30	(43)	$175	1	$
10	Compression and Crustal Wedging, Front Range	Oct. 30	(44)	$ 55	1	$
11	Geomorphology of Canyonlands, Utah	Oct. 28–30	(45)	$190	1	$
12a	Lake Bonneville, Neotectonics (w/ lodging)	Oct. 27–30	(46)	$195	1	$
12b	Lake Bonneville, Neotectonics (w/o lodging)	Oct. 27–30	(47)	$105	1	$
13	Hydrogeology, Mountains and Foothills, Denver	Oct. 30	(48)	$ 67	1	$
14	Vertebrate Paleontology, W. Colorado and Utah	Oct. 26–29	(49)	$230	1	$
15	Landslides and Construction Problems	Oct. 28–29	(50)	$170	1	$
16	Telluride Deposits, Boulder County	Oct. 29	(51)	$ 66	1	$
17	In the Presence of Eternity	Nov. 4	(52)	$ 25	1	$
18a	Deformation Cordilleran Orogenic (w/ arifare)	Nov. 3–6	(53)	$330	1	$
18b	Deformation Cordilleran Orogenic (w/o airfare)	Nov. 3–6	(54)	$230	1	$
19	Proterozoic Glacial-Marine Sedimentation	Nov. 3–5	(55)	$190	1	$
20	Upper Cretaceous Sandstones, Wyoming	Nov. 3–6	(56)	$370	1	$
21	Dinosaur Trackways, Purgatoire Valley	Nov. 3–5	(57)	$220	1	$
22	Cretaceous-Tertiary Boundary, Raton Basin	Nov. 3–5	(58)	$200	1	$
23	Geology and Mineral Resources, Colorado	Nov. 4–5	(59)	$140	1	$
24	Pleistocene Floods, Big Thompson River	Nov. 4	(60)	$ 35	1	$
25	Tectonics & Sedimentation, Phanerozoic Rocks	Oct. 31	(61)	$ 16	1	$
26	Proterozoic Core, Central Front Range	Nov. 1	(62)	$ 16	1	$
27	Dinosaurs Near Denver	Nov. 2	(63)	$ 16	1	$
28	Denver's Geologic Setting	Nov. 3	(64)	$ 16	1	$

SHORT COURSES*

				Price	Qty	Amount
1.	Use of Microcomputers, Structural Geology	Oct. 28–30	(65)	$190	1	$
2.	Ore Deposition Associated with Magmas	Oct. 28–30	(66)	$225	1	$
3.	Geographic Information Systems	Oct. 29	(67)	$194	1	$
4.	Glacial Facies Models	Oct. 29–30	(68)	$146	1	$
5.	Seismic Imaging of the Continental Crust	Oct. 29	(69)	$125	1	$
6.	Hazardous-Waste Site Characterization	Oct. 29–30	(70)	$152	1	$
7.	Quantitative Sedimentary Basin Modeling	Oct. 29–30	(71)	$138	1	$
8.	Seminar in Geoscience Writing	Oct. 30	(72)	$ 88	1	$
9.	Evolution of Reef Communities	Nov. 4	(73)	$138	1	$

☐ Check here if already registered for a short course.

Total Column B $

Total Column A $

Column A + B = Total Remittance $
(full payment must be enclosed)

***Meeting registration not required**

FOR OFFICE USE ONLY

Deposit Date _____ Comment _____

Balance Due $ _____ A/R _____

Refund $ _____ A/P _____

Refund Ck # _____ _____

Refund Date _____ _____

Mail to: '88 GSA Centennial, P.O. Box 9140, Boulder, CO 80301

Remit in U.S. funds, payable to '88 GSA Centennial Celebration or charge:

☐ American Express ☐ Diners Club/Carte Blanche ☐ MasterCard ☐ VISA

Card expires: ___/___ (mo./yr.) card number

Signature _____

(PREREGISTRATION MUST BE RECEIVED BY OCTOBER 7!)

1 DENVER MARRIOTT CITY CENTER—CO-HEADQUARTERS
1701 California Street, Denver, CO 80202
(303) 297-1300 (500-room block)
4 blocks from Currigan Hall

Single: $74 Double: $84

Children under 18 accompanied by parent—Free

Full-service hotel; complete fitness center (indoor swimming pool, whirlpool, saunas, exercise equipment); 2 restaurants; Gallery Bar; cocktail lounge with piano; concierge; laundry and valet service; valet parking, currently $10/day

Check-in: 3 p.m. Check-out: 12 noon
CC: AX, CB, D, DC, MC, V

2 HYATT REGENCY DENVER—CO-HEADQUARTERS
1750 Welton Street, Denver, CO 80202
(303) 295-1200 (400-room block)
4 blocks from Currigan Hall

Single: $74 Double: $84

Children under 18 accompanied by parent—Free

Full-service hotel; 1 block from 16th Street shopping mall; full-service casual and elegant dining; piano bar and terrace lounge; outdoor running track and tennis courts; complete health club facility adjacent; laundry, valet service; garage self-parking, currently $4.50/day; valet parking, currently $9/day

Check-in: 3 p.m. Check-out: 12 noon
CC: AX, CB, D, DC, MC, V

3 BROWN PALACE HOTEL
321 Seventeenth Street, Denver, CO 80202
(303) 297-3111 (230-room block)
7 blocks from Currigan Hall

Single: $85 Double: $100

Children under 18 accompanied by parent—Free

95-year history, distinguished by unerring commitment to excellence; 2 restaurants; 2 lounges; 24-hour room service; valet parking, currently $7.50/day; gift shop; florist; Mobil 4-star and AAA 4-diamond ratings

Check-in: 2 p.m. Check-out: 1 p.m.
CC: AX, CB, DC, MC, V

4 COMFORT INN
401 Seventeenth Street, Denver, CO 80202
(303) 296-0400 (175-room block)
8 blocks from Currigan Hall

Single: $45 Double: $45

Children under 16 accompanied by parent—Free

Free cocktails for 2½ hours every evening; complimentary continental breakfast daily; 24-hour room service; valet and laundry service; valet parking, currently $5/day; free HBO, CNN, ESPN; connected by walkway to Brown Palace

Check-in: 2 p.m. Check-out: 12 noon
CC: AX, CB, D, DC, MC, V

5 EXECUTIVE TOWER INN
1405 Curtis Street, Denver, CO 80202
(303) 571-0300 (250-room block)
1 block from Currigan Hall

Single: $60 Double: $70

Children under 17 accompanied by parent—Free

Restaurant; coffee shop; cocktail lounge; free use of full athletic club (racquetball, squash, tennis, indoor olympic pool, basketball court, steam, sauna, whirlpool, jogging tracks); coin-operated laundromat; indoor self-parking, currently $3/day

Check-in: 2 p.m. Check-out: 12 noon
CC: AX, CB, DC, MC, V

6 HOLIDAY INN DENVER DOWNTOWN
1450 Glenarm Place, Denver, CO 80202
(303) 573-1450 (250-room block)
3½ blocks from Currigan Hall

Single: $55 Double: $65

Children under 18 accompanied by parent—Free

Restaurant; cocktail lounge; room service; valet laundry; free indoor self-parking, valet parking upon request; gift shop; pay movie channels; access to athletic facility at reduced rate

Check-in: 3 p.m. Check-out: 12 noon
CC: AX, CB, D, DC, MC, V

7 RADISSON HOTEL DENVER
1550 Court Place, Denver, CO 80202
(303) 893-3333 (650-room block)
6½ blocks from Currigan Hall

Single: $60 Double: $70

Children under 18 accompanied by parent—Free

Three restaurants and lounges featuring continental cuisine and nightly entertainment; full health club (outdoor heated pool, aerobics classes, exercise and weight equipment, saunas, tanning bed, licensed massage therapist); concierge floor; laundry and valet service; inside parking, currently $1.25–$5.25/day; in-house barber shop; package liquor; gift shops; airline ticket agent; print shop; currency exchange

Check-in: 3 p.m. Check-out: 12 noon
CC: AX, CB, D, DC, MC, V

8 WESTIN HOTEL TABOR CENTER
1672 Lawrence Street, Denver, CO 80202
(303) 572-9100 (150-room block)
4 blocks from Currigan Hall

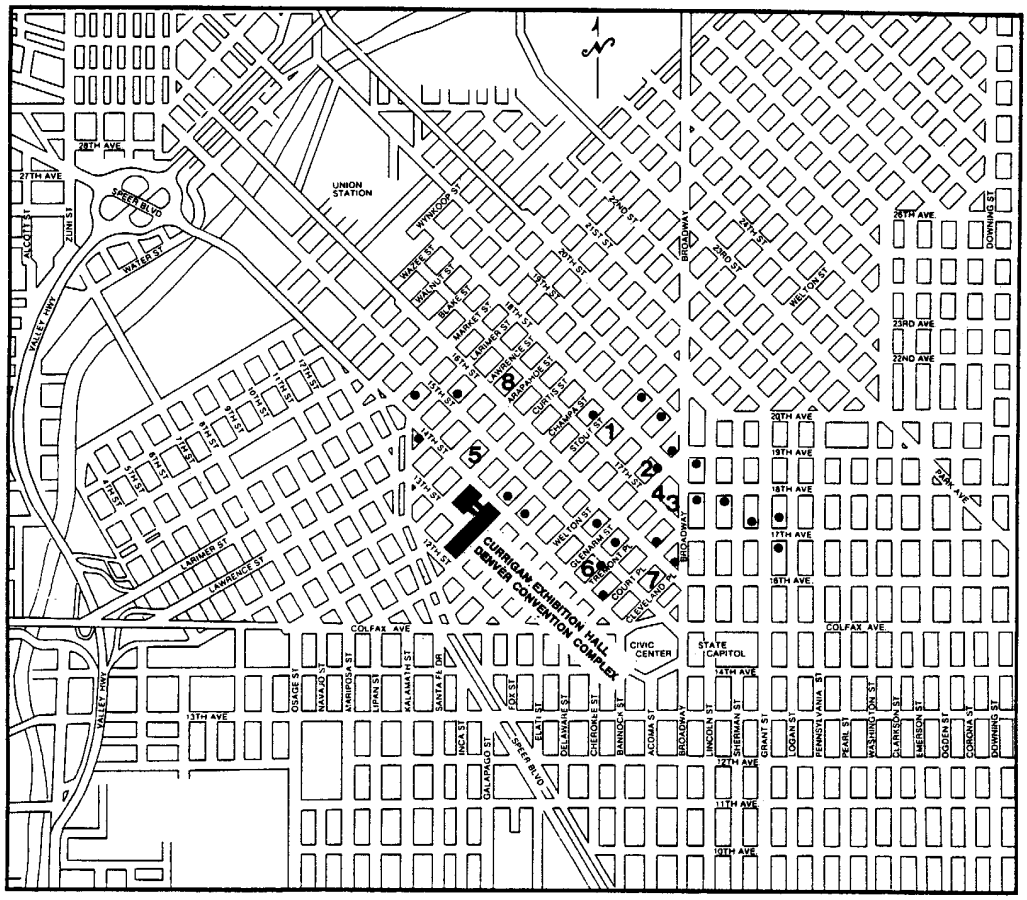
Single: $84 Double: $98

Children under 18 accompanied by parent—Free

Deluxe hotel connected to Tabor Center (featuring 70 shops and restaurants); oversized guest rooms and honor bar/ refrigerator; color TV, complimentary HBO, Spectravision; large working desk area; casual 3-meal restaurant, Augusta 5-star dining room; lobby lounge with live piano entertainment; 24-hour room service; free health club facilities (indoor/outdoor pool, hot tub, saunas, exercise and weight room); underground parking, currently $6/day

Check-in: 3 p.m. Check-out: 1 p.m.
CC: AX, CB, D, DC, MC, V

DOWNTOWN DENVER



1. **DENVER MARRIOTT CITY CENTER**
2. **HYATT REGENCY DENVER**
3. **BROWN PALACE HOTEL**
4. **COMFORT INN**
5. **EXECUTIVE TOWER INN**
6. **HOLIDAY INN DENVER DOWNTOWN**
7. **RADISSON HOTEL DENVER**
8. **WESTIN HOTEL TABOR CENTER**

Dots indicate public parking lots. Rates range from 50¢ minimum charge per ½ hour to $6 maximum charge for all day. Some lots are open 24 hours per day, allowing for overnight parking. Most lots, however, are unattended after 8:00 p.m.

GSA OFFICIAL HOUSING REQUEST FORM

Please complete BY OCTOBER 7 and send to: Denver Convention Bureau/GSA Housing
225 West Colfax Avenue
Denver, CO 80202
(303) 892-1151

(Please print or type all information below)

HOTEL/MOTEL PREFERENCE:

1. _____
2. _____
3. _____
4. _____

Rate requested $ _____

TYPE OF ACCOMMODATION NEEDED:

_____ Single (1 bed, 1 person)
_____ Double (1 bed, 2 persons)
_____ Dbl/Dbl (2 beds, 2 persons)
_____ Triple
_____ Quad

_____ 1 Bedroom Suite
_____ 2 Bedroom Suite

_____ Add rollaway to room

NOTE: All rooms are subject to 11.8% tax.

ARRIVAL DAY/DATE _____ TIME _____ a.m./p.m.

DEPARTURE DAY/DATE _____ TIME _____ a.m./p.m.

NAMES OF OCCUPANTS:

1. _____
2. _____
3. _____
4. _____

GUARANTEED ROOM RESERVATION AUTHORIZATION:

I understand that my reservation will not be held after 6:00 p.m. unless I guarantee my reservation. I also understand that the hotel may bill me for one night's housing if I fail to properly cancel a guaranteed reservation.

_____ Credit card information provided below to guarantee my reservation.

_____ My guarantee will be made directly to the hotel *after* I have received my hotel confirmation.

_____ I will take my chances. No guarantee deposit will be provided.

DO NOT SEND ANY MONIES WITH THIS FORM

Please guarantee my room reservation with the following:

_____ American Express _____ Carte Blanche _____ Diners Club _____ Discover _____ MasterCard _____ VISA

NAME (as listed on credit card) _____

SIGNATURE _____

CARD NUMBER _____ EXP. DATE _____

MAIL CONFIRMATION TO:

Name _____ Telephone ( ) _____

Address _____ City _____

State _____ ZIP _____ Country _____

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ADDENDUM TO FALL MEETING PROGRAM

TUESDAY NOVEMBER 1

SYMPOSIUM: A TALE OF TWO CRATONS: CONTRASTS IN CRUST-MANTLE EVOLUTION
Grand Ballroom, Radisson, 1:30 P.M.

Paul Mueller and J. L. Wooden, Presiding

1 Paul A. Mueller*, Joseph L. Wooden: ARCHEAN CRUSTAL RECYCLING AND THE ORIGIN OF ENRICHED MANTLE: EVIDENCE FROM THE WYOMING PROVINCE [022323] ..... 1:30 P

2 Carol D. Frost*, B. Ronald Frost: THE ANTIQUITY OF THE WYOMING PROVINCE [021318] .... 1:50 P

3 Zell E. Peterman*, Kiyoto Futa: CONTRASTS IN Nd CRUSTAL RESIDENCE AGES BETWEEN THE SUPERIOR AND WYOMING CRATONS [004054] ..... 2:10 P

4 Steven B. Shirey*, Richard W. Carlson: Pb AND Nd ISOTOPIC CONSTRAINTS ON CRUSTAL EVOLUTION IN THE SOUTHERN SUPERIOR PROVINCE AND INFERENCES FOR A HETEROGENEOUS ARCHEAN MANTLE [014134] ..... 2:30 P

5 Ross K. Stevenson*, P. Jonathan Patchett: Hf ISOTOPES AND CONTRASTING EVOLUTION IN SUPERIOR AND WYOMING CRATONS [026863] ..... 2:50 P

6 K. D. Collerson*, I. F. Ermanovics, A. B. Ryan: ARCHEAN AND PROTEROZOIC CRUST - MANTLE EVOLUTION IN THE NORTH ATLANTIC CRATON: LABRADOR AND GREENLAND [014210] ..... 3:10 P

7 S. A. Bowring*, C. E. Isachsen, T. B. Housh, F. A. Podosek: ISOTOPIC EVIDENCE FOR THE EARLY ARCHEAN HISTORY OF SLAVE CRATON, NWT, CANADA [014133] ..... 3:30 P

8 G. R. Tilton*, S.-T. Kwon: CRUST-MANTLE EVOLUTION IN THE SUPERIOR PROVINCE [014135] ... 3:50 P

9 Anthony J. Irving*, Hugh E. O'Brien, I. S. McCallum: GEOCHEMICAL TRAITS OF ANCIENT LITHOSPHERIC MANTLE WITHIN MONTANA/WYOMING ALKALIC MAGMAS AND THEIR XENOLITHS [014145] ... 4:10 P

10 W. P. Leeman*: NATURE OF SUBCONTINENTAL LITHOSPHERIC MANTLE: GEOCHEMICAL EVIDENCE FROM WESTERN U.S. CENOZOIC VOLCANIC ROCKS [014137] ..... 4:30 P

Obituaries

HANS PETER EUGSTER, 1925-1987*

Hans Eugster was born at Landquart, Switzerland, on 19 November 1925, and died in Baltimore, Maryland, 17 December 1987. He studied at the Swiss Federal Institute of Technology in Zurich, graduating in 1948 with the Engineer's Diploma (in geology), and going on to take the D.Sc. degree in 1951. He held a post-doctoral appointment at the Massachusetts Institute of Technology in 1951-1952, then joined the staff of the Geophysical Laboratory, where he remained until 1958. In 1956 Hans began his long association with Johns Hopkins University, first as lecturer in geochemistry, then (1958) associate professor and later (1960) professor. He was chairman of the Department of Earth and Planetary Sciences from 1983 until shortly before his death.

Hans was a resourceful and versatile scientist whose interests ranged from igneous and metamorphic petrology to sedimentary geochemistry. Among his many contributions were the development of buffers for controlling Eh and pH in bombs used for hydrothermal experiments, and important advances in the study of evaporite deposition. In recent years he had become interested in the formation of ore deposits, and he chose this topic for his address to the Geochemical Society as Distinguished Lecturer in 1984. He received many honors, including the Day Medal of the Geological Society of America (1971), the Goldschmidt Medal of the Geochemical Society (1976), and the Roebling Medal of the Mineralogical Society of America (1983). He was a member of the National Academy of Sciences, the American Academy of Arts and Sciences, and numerous scientific societies including the American Geophysical Union (fellow), the Geochemical Society, the Geological Society of America (fellow), and the Mineralogical Society of America (President, 1985).

Hans had an engagingly modest disposition that belied his achievements. Polyglot, widely read, he was an accomplished violinist, painter and potter whose loss will be sadly felt by people in many walks of life. He is survived by his wife, Professor Elaine Koppelman, and three daughters, Erica, Rachel and Sandra.

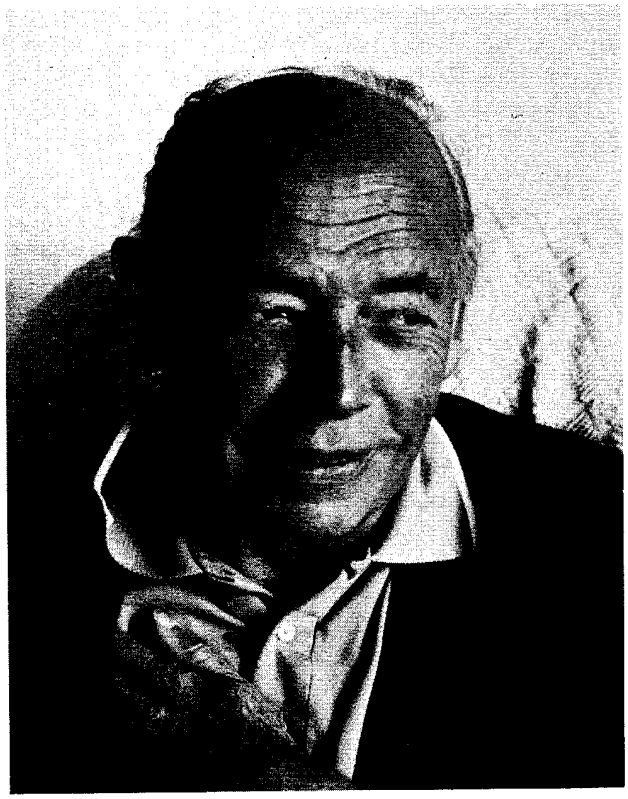
ROBERT MINARD GARRELS, 1916-1988

Bob Garrels was born in Detroit, Michigan, on 24 August 1916, second of three children of John Carlyle Garrels, the distinguished athlete and amateur football player, and his wife Margaret Anne. He died in St Petersburg, Florida, on 8 March 1988, and is survivied by his wife Cynthia, two daughters and a son by a previous marriage, and thirteen grandchildren.

Bob spent some of his early years in Saltville, Virginia, where his father (a chemical engineer)was employed by a chemical company that used the local salt and limestone. It was there he acquired his enduring love of nature and outdoor life, and nourished it with the books of Ernest Thompson Seton (which afterwards remained among his most cherished possessions). In 1928 the family moved to Grosse Ile, Michigan, and Bob entered the high school there. His interest in literature broadened in his high-school years and, not surprisingly, he developed a keenness for athletics that, like Seton's books, would stay always with him. (Aside from bringing him distinction in the field and keeping him fit in later life - he once held the world's high jump

* A full-length memorial will appear in the next issue.

record for men over 57 - this was to lead him into a new field of interest, the physiology of track-and-field sports.) He already showed promise in mathematics and chemistry, and proof of those twin lights of the scientist, ingenuity and skepticism. About this time, a Detroit department store offered a prize for the best guess at the number of turns made in a shopping day by a spinning automobile wheel. Bob won by building a stroboscope to measure the rate, and incidentally showed that this did not remain constant throughout the day. At seventeen, when he entered the University of Michigan, he was hesitating between chemistry and literature as possible careers. He chose neither, having been discouraged by the way chemistry was



taught at the University, and acknowledging to himself that he was not cut out to be a novelist or a writer of belles lettres. Instead he turned to geology, drawn perhaps by memories of Saltville, with its limestone and rock salt that had provided his father with a living, and its Paleozoic and Pleistocene fossils. He took the B.S. degree with honors in 1937, and entered the Graduate School at Northwestern University the same year.

In the Geology Department at Northwestern under Professor C. H. Behre, Bob began work on iron ores in Newfoundland for which he received the M.S. degree in 1939. Meantime, his distaste for chemistry was being cured by Professor F. T. Gucker of the Chemistry Department, and in 1941 he was awarded the Ph.D. degree for a thesis on complexing of lead and chloride ions in aqueous solution. But the person who influenced him the most during those graduate years, and who remained a lifelong friend, perhaps his closest, was Professor Jack Stark, a geologist of intellectual breadth and Socratic shrewdness whose benign but unremitting questions sharpened Bob's own skepticism and began the development of one of the most characteristic strengths of his later work: the ability to define a complex problem in terms that offered simple criteria for testing solutions of it.

Bob remained at Northwestern as a junior member of the geology faculty for three more years, then joined the Military Geology Unit of the U. S. Geological Survey for the duration of the war, returning to Northwestern in 1945. In this "First Northwestern Period" (he was to return twice more), which lasted seven years, he worked on a broad variety of geochemical topics and wrote (among other things) "A Textbook of Geology" (1951) and (with W. C. Krumbein) the now classic paper "Origin and classification of chemical sediments in terms of pH and oxidation-reduction." In 1952 Bob joined the U. S. Geological Survey to direct a unit working on the geochemistry of uranium and vanadium. After the University, where he alone had represented the entire field of geochemistry, this deployment of so many people in a small part of it was, as he put it, "like changing one's view from 10-fold to 1000-fold magnification." He soon tired of administrative work, and moved to Harvard in 1955 as associate professor (later professor) of geology. Here began a period of intense activity with graduate students on low-temperature equilibria, the main outcome of which was two books: "Mineral Equilibria at Low Temperatures and Pressures" (1960), and its successor, written with Charles Christ, "Solutions, Minerals and Equilibria" (1965). This work at Harvard, and the books that came from it,heralded

a new era in low-temperature geochemistry, in which sedimentary and hydrothermal geology would be understood in terms of chemical thermodynamics and stability diagrams constructed from thermodynamic data. Amongst many influential papers published by Bob and his co-workers during this period was "A chemical model for seawater at 25°C and one atmosphere total pressure" (with Mary Thomson), in which the authors showed how complexing and ion pairing could be used to calculate the activities of the principal ions in seawater.

After being appointed department chairman at Harvard, Bob again wearied of administration and before long moved back to Northwestern (1965). In this "Second Northwestern Period," which lasted four years, he collaborated with Fred Mackenzie on the chemical mass balance between rivers and oceans and the silicate-bicarbonate balance of the ocean, and with Hal Helgeson (his former student) on the theory of irreversible reactions in geochemistry. He and Mackenzie became interested in the global sedimentary cycle, and published a paper on it in Science in 1969. This second stay at Northwestern culminated in a seminal book, "Evolution of the Sedimentary Rocks" by Garrels and Mackenzie, published in 1971. This was the first time, since Playfair's "Illustrations of the Huttonian Theory of the Earth" (1802), that a textbook had treated the sedimentary cycle as an actual reality to be reckoned with (rather than an object of lip-service in Geology 101), and the first time ever that its implications for the sedimentary reservoir and the ocean had been followed out to their full extent.

The year 1969 saw another move, this time to Scripps Institution of Oceanography, and 1971 yet another, to the University of Hawaii where Bob had been named Captain James Cook Professor of Oceanography. During this period he collaborated with Fred Mackenzie on further studies of the sedimentary cycle, with Roland Wollast on diffusion of silica in seawater, with the late Ed Perry on the cycles of carbon, sulphur and oxygen, with Cynthia Hunt (whom he had married in 1970) on a new book: "Water, the Web of Life," and with Yves Tardy on free energies of formation of silicates. In 1974 he returned once again to Northwestern, where he and Abe Lerman began making computer models of geochemical cycles (mainly those of carbon, sulphur and phosphorus). Out of this work came the prediction by Garrels, Lerman and Mackenzie (later confirmed by Holser, Lindh, Salzman and others) that there should be a correlation between the isotopic records of carbon and sulphur.

Bob received many honors, both at home and abroad. They include the Day and Penrose Medals of the Geological Society of America (1966, 1978); the Goldschmidt Medal of the Geochemical Society ((1973); the Wollaston Medal of the Geological Society (1981); the Roebling Medal of the Mineralogical Society of America (1981), and honorary doctorates from the Free University of Brussels (1969), the Louis-Pasteur University of Strasbourg (1976), and the University of Michigan (1980). He was President of the Geochemical Society (1962), and a member of the National Academy of Sciences.

In 1980 Bob left Northwestern for the last time, to occupy the St Petersburg Progress Chair in Marine Science at the University of South Florida, where he was to remain until his death. At St Petersburg his scientific activity continued unabated, and two of his most significant contributions came out of this last period of his life: the well-known "BLAG" model (made with Bob Berner and Tony Lasaga of Yale University) of the carbonate-silicate cycle and atmospheric carbon dioxide, and (with his student Lee Kump) a model of the sedimentary redox cycle and atmospheric oxygen. In the winter of 1986-1987 he began to suffer severe back pain, and the following spring this proved due to secondary cancer of the spine. He worked in bed through most of 1987, supervising and collaborating with his graduate students with the same enthusiasm he had always shown when well. There were new and intriguing data on carbonate dissolution kinetics, and a compendium of thermodynamic data on minerals. Indefatigable, Bob returned to his well-loved iron ores and oxygen, publishing a paper in The American Journal of Science, and responding to criticism of it with spirit and good humor. In October there was a remission, and he was able to go with Cynthia to Phoenix, Arizona and present his iron-ore work at a symposium held there in his honor. He was alert and happy, and looked better than

he had done in months. It was a joyful occasion, attended by many of his former students and old friends. Back in St Petersburg he continued in remission until about mid-February, working each morning in his office at the Marine Science Institute, and taking walks in the afternoon. He loved those walks along the palm-lined streets. Besides everything else, he was a student of sidewalk paving stones, knew all the makers' marks and sometimes their life histories as well. The little brass discs sunk in the concrete were as fossils to him, and better: signatures not only of time, but of provenance too. Then, as was inevitable, the disease came back to square its accounts with him. With Cynthia's devoted care, he was able to remain at home. He endured the last dreadful weeks with characteristic stoicism and occasional flashes of wit. One day a visitor remarked on a handsome cane lying on the sofa in his bedroom. "Yes," he said. "It's for my falling-over exercises. It's met with great success."

Urbane and relaxed in company, polymath, a master of English style (he had been overmodest in disqualifying himself for a literary career), Bob perhaps seemed so naturally gifted that his achievements must be effortless. In fact he was intensely concerned about his work, driven to it by an urgency that sometimes bordered on obsession. He had to struggle to master new ideas and techniques. In an autobiographical fragment he recounts how as a graduate student at Northwestern he was led by his chemistry mentor, Professor Gucker, "...into problems that required more chemical training than I possessed, and somehow made [to] understand that it was unthinkable for me not to solve them. So, of course, I did." And so it was throughout his career. He was quick to understand the difficulties of his own graduate students, and sympathetically insistent that they be overcome. No-one could have been kinder or more unassuming. He would spend hours advising total strangers on how best to pursue their educational aims; and as time has shown in more than one case, his advice was sound. He was the warmest and most considerate of friends, and in argument the fairest and most scrupulous of opponents. He had a ready wit, and sometimes enjoyed using it in the service of his less eminent friends. Once he was with some Caltech geologists discussing something Patterson had done with sand. A younger colleague from an obscure college, interested, and wondering whether this was the famous Claire Patterson, asked, "Who's this Patterson?" and drew a frosty rebuff from one of the Caltech men. "Oh," said Bob, "but he didn't ask, 'Who's this Patterson?' He asked, 'Who's this? Patterson?'"

He imparted to each of his students a measure of his own liberality of spirit and rigor of reason, so they all came to resemble each other in some degree across wide differences in age and temperament. Above all, perhaps, he instilled in them something of his love of humanity, great and obscure alike. Many are distinguished scientists now, with graduate students or junior colleagues of their own, and they will pass on to them a share of these same qualities, along with a touch of that indefinable something else that was the aura of Bob Garrels.

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