EDITOR'S COMMENTS

So many times I hear the question, "What is the Coblentz Society doing for me?" This query is a result of the work of the Society simply going unnoticed. In the past few years the board has tried to set up better communications patterns with its membership. Currently, the Coblentz Newsletter is published twice a year in Applied Spectroscopy in the February and August issues, without fail. Those Coblentz members who are not on the SAS membership list and consequently are not receiving Applied Spectroscopy should be receiving the Newsletter by mail. Publishing the Newsletter in these particular issues allows for actions of the past board meeting to be announced and needed information to be distributed to members so they can respond back to the officers and board members before the next board meeting. Typically the board meetings are held in conjunction with the Pittsburgh Conference in the spring and FACSS Conference in the fall. All of the officers and board members' names, addresses, and telephone numbers are listed in each Newsletter for communication purposes.

This Newsletter is a place not only for the Society to hear from the board but also for the Society to hear from you. Personal articles are not only welcomed but are solicited in every issue. Any topic you wish to have discussed by the board can be presented by simply contacting the president or any other board member prior to the semi-annual board meeting. The board is always looking for members willing to serve on any of our numerous committees, where the bulk of the work of the Society is performed. If you are interested in taking a more active role in participating in the Coblentz Society, please contact President Rod McDowell [(505)667-7071] or President-elect Kathy Kalasinsky [(601)325-3324], as new assignments will be made at the next board meeting during the Pittsburgh Conference.

The Coblentz Society is currently very active in the vibrational spectroscopy community. We continue to sponsor the Coblentz Award, Williams-Wright Award, Bomem-Michelson Award, Lippincott Award, and Coblentz Student Awards. We also support the following conferences through organized symposia and/or financial assistance: Pittsburgh Conference, Ohio State Molecular Symposium, FACSS, Western Spectroscopy Association, and the international FT-IR and Raman Conferences. The Coblentz Society is still active in helping produce standards and specifications for spectral reference data. A concern has been voiced, and we are currently pursuing production aspects of a polystyrene Standard Reference Material for infrared spectrometers. Education is an important topic to the Coblentz Society, and numerous programs have been sponsored. You will see a new program announced later in this Newsletter that will tell you how you can help 4th through 9th graders interested in science, without ever having to leave your desk.

So the answer to the question, "What is the Coblentz Society doing for me?" is: "A whole lot!" And it can be a whole lot more if you volunteer for committee assignment.

KATHY KALASINSKY

PRESIDENT'S MESSAGE

The Society is still in good financial condition, even though the sales of our spectral reference books has dropped. This development was anticipated, and we now are offering our reference spectra in the more usable digitized form. More details can be obtained by writing Clara Craver % Coblentz Society, P.O. Box 9952, Kirkwood, MO 63122 [Phone: (314)962-6704].

The Coblentz Award was presented last June to Keith...
Nelson of M.I.T. at the Ohio State Molecular Symposium. The 1989 Coblentz Award Committee, chaired by Joel Harris, has selected Dr. Geri Richmond of the University of Oregon as the next awardee. On Tuesday afternoon at Columbus, we will hold our annual Coblentz beer party in Royer Commons. All conference attendees are welcome.

I am pleased to announce that the 1989 Williams-Wright Award will go to Bruce Chase, and the Bomem-Michelson Award to Rich Saykally of Berkeley. Both these awards will be presented at PittCon in Atlanta. The Award Symposia are scheduled for Tuesday and Thursday afternoons, respectively. The Coblentz wine and cheese reception will be Tuesday afternoon.

The Lippincott Award will be Coblentz's responsibility in 1989, according to the usual rotation. Bill Blass of the University of Tennessee is Chair, and the award will be presented at FACSS in Chicago next October. The award will be administered by Jo Ann Brown, the new SAS Executive Administrator.

The Society made 30 Student Awards last spring, each recipient getting a congratulatory letter, a certificate, a copy of the Deskbook, and a year's free membership in the Society. A letter of solicitation for this year's student awards has been distributed, and it also includes information on making a nomination for the FACSS Student Award.

Hopefully the ballots are in for the selection of the two new board members and these will be announced at the General Meeting of the Society to be held Tuesday afternoon prior to the Williams-Wright Award Symposium at the Pittsburgh Conference in Atlanta. See you then.

Rod McDowell

SCIENCE-BY-MAIL

I'd like to invite you to participate as a volunteer scientist pen pal for Science-by-Mail, a Boston Museum of Science program, which is in its second year. We are looking for science and technology professionals who are interested in corresponding with children and their families as they solve science challenges created by a dedicated team of scientists, museum educators, parents, and teachers. Last year the program attracted over 2000 children from around the world. The participant population included those who are gifted, as well as the learning disabled, from wealthy and disadvantaged areas, those who represent minority populations, and large numbers of girls as well as boys. Scientists from industry, hospitals, academia, private medical practices, and consultants have been inspiring a wide range of children, who are as close to the Museum as downtown Boston and as far away as California, Alaska, northern Maine, and France.

As a Science-by-Mail scientist, you will be asked to respond to between 3 and 6 small groups of children approximately 3 times during the school year. (Solutions will be sent to you sometime around January, March, and May.) Your role in Science-by-Mail would be to motivate, inspire, and instill an understanding of scientific process and procedure and to comment on the children's ingenuity in creative problem solving. The final component of the program is Science-by-Mail Day, when all participants and their pen pal scientists are invited to attend the day of activities. Although not a mandatory part of your commitment, the event allows students and scientists to meet for a day, to share ideas, solve challenges, and get to know the person beyond the postage stamp.

Science-by-Mail has proved to be a tremendous success. One of its unique features is that children get a real sense of what science is all about. By reaching out to those who already know they want a career in science, to those who as a result of this program will consider a professional life of exploring the world around them, or to those who are for the first time excited about science, you can make a significant difference in the lives of young students. The children are filled with excitement as they await the arrival of letters from their own pen pal computer scientist, doctor, physicist, chemist, or geologist.

If you are interested in participating during the next school year, contact Kathy Kalasinsky of the Coblentz Society for an application form. We'd love to hear from you and are looking forward to working with you.

Stephen Brand
Head of Public Outreach
Boston Museum of Science

REQUEST FOR NOMINATIONS

The Coblentz Society requests nominations for the prestigious awards it supports:

1990 Coblentz Award. The Coblentz Award is presented annually to an outstanding young spectroscopist under the age of 36. (The candidate must be under the age of 36 on January 1 of the year of the award.) The award carries with it a $1000 prize, plus a travel allowance. Nominations, which should include a detailed description of the nominee's accomplishments, a curriculum vitae, and as many supporting letters as possible, must be submitted to the award Chairman: Dr. Alan Campion, Dept. of Chemistry, University of Texas, Austin, TX 78712, on or before 1 August 1989.

1990 Williams-Wright Award. This award is presented annually at the Pittsburgh Conference to an industrial spectroscopist who has made significant contributions to
vibrational spectroscopy while working in industry. The work may include infrared and/or Raman spectroscopy, and instrumental development, as well as theory and applications of vibrational spectroscopy. No restrictions are placed on the selection of the awardee because of age, sex, or nationality, but the awardee must be still working at the time the award is presented (government labs are not considered industry in this definition). The nominating document should clearly state the significance of the contribution made by the nominee, i.e., the introduction of novel methods, techniques, or theories; innovative work in the field of vibrational spectroscopy; significant improvement on existing methods, theory, or techniques; or important impact on the field of vibrational spectroscopy arising from the volume of contributions in a specific area. The nomination should include a current vitae on the nominee and highlight any publications and talks. Seconding letters to the nomination are useful, but not necessary. Files on nominees will be kept active for three years, after which the candidate must be renominated with an updated file, or the file will be closed. Like the Coblentz Award, the prize includes a $1000 cash prize, plus a travel allowance to the Pittsburgh Conference. Nominations should be sent to the chairman of the Williams-Wright Award Selection Committee: Dr. Geri Richmond, Dept. of Chemistry, University of Oregon, Eugene, OR 97403, Ph: (503)686-4635, on or before 1 June 1989.

1990 Bomem-Michelson Award. Bomem Inc., 625, rue Marais, Vanier, Quebec, Canada, a manufacturer of high-performance Fourier transform infrared systems, sponsors an award to honor scientists who have advanced the technique of vibrational, molecular, Raman, or electronic spectroscopy. The Bomem-Michelson Award, consisting of a medal and a $2500 honorarium, is dedicated to the memory of Professor A. E. Michelson, developer of the Michelson interferometer. The recipient must be actively working in the academic, industrial, government, or private sector and be between the ages of 35 and 50. In order to ensure that the Bomem-Michelson Award is based on an independent evaluation of a candidate's performance, the selection will be made by a committee chosen by the Coblentz Society. A nominating letter and seconding letters should be sent to: Dr. D. Warren Vidrine, Measurex, 1 Results Way, Cupertino, CA 95016. The candidate's C.V. should be included, as well as specific research efforts which make the candidate eligible for this award. Nominations will close 1 May 1989.

AWARD-WINNING RESEARCH

Some of the 1988 Coblentz Student Award winners have been able to provide us with their own brief descriptions of their work in the various areas of molecular spectroscopy for which they were nominated and won the award.

ANGELA M. AHERN, Department of Chemistry, University of Pittsburgh (Prof. Robin L. Garrell).

Surface-enhanced Raman spectroscopy (SERS) has been employed to probe the interactions between molecules (in particular, macromolecules) and metal/solution interfaces. We have used the utility of SERS in two ways. First we have used SERS to investigate the gel network formation of polyacrylamide (PAC). The information gained from our SERS study of PAC corroborates and adds to the work of other investigators, providing a more complete understanding of the polymer formation, the gel pore size, and the time scale required for equilibration. We found that (1) PAC can inhibit the aggregation of the silver colloid for 2 months; (2) the PAC gels require about 1 month to reach equilibrium with the solvent; and (3) the effective pore size of PAC gels is typically greater than 10 nm. The second way we have extended the utility of SERS is through the development of a new metal colloid substrate that is less tedious to work with than the most-often-employed SERS substrates. Silver metal particles are formed when laser radiation impinges upon aqueous solutions of AgNO₃ or AgClO₃, containing the sample to be studied. Since the use of roughened silver or gold electrodes may not be applicable to every experimental situation, and the preparation of conventional colloids may be too time-consuming, the use of colloids prepared in situ will aid in making SERS a more general analytical method.

ERIK J. HASENOEHRL, Department of Chemistry, Loyola Marymount University (Prof. James M. Landry).

My research involved the IR study of the keto-enol equilibrium, the vibrational frequencies, and the crystal structure of acetylacetonate and several of its 3-substituted derivatives. The keto-enol equilibrium of the acetylacetonate compounds was investigated by both solution and neat liquid-phase IR spectroscopy. Oriented polycrystalline films at subambient temperatures were grown, and their IR spectra recorded. These data were used to make tentative vibrational assignments of these compounds as well as to investigate their crystal structures.

WAYNE KUBALA, Department of Chemistry, Baylor University (Prof. K. W. Busch and Prof. M. A. Busch).

Although early work by Coblentz demonstrated that combustion flames emit distinct infrared emission bands, the analytical potential of this phenomenon has only recently been demonstrated in this laboratory, with the development of flame infrared emission (FIRE) detectors for use in gas and liquid chromatography. FIRE detection systems employ the emission arising from the asym-
metric stretching vibration of the carbon dioxide molecule at 4.4 μm. Vibrationally excited CO₂ is produced either by combustion of organic compounds in a low-background hydrogen/air flame or by thermal excitation of carbon dioxide produced by sample pretreatment and introduced directly into the flame. In addition to fundamental studies to develop a theoretical model of the overall flame infrared emission process, a major goal of my research is the application of FIRE detection to problems in environmental analyses. One particular goal is to develop a total inorganic/organic carbon analyzer for water and wastewater analyses based on FIRE detection. The potential of FIRE as a means of screening water samples for the presence of trihalomethanes and other priority organic pollutants is also under investigation.

KYUNG-HEE LEE, Chemistry Department, Oregon State University (Prof. Joseph W. Nibler).

My research involves the study of vibrational spectra of small molecular clusters in the vibrational overtone region. The purpose of this study is to learn more about the structures, dynamics, and potential energy surfaces of hydrogen-bonded complexes such as (HCN)ₙ. I have used photoacoustic techniques for these studies of molecules in the gas phase, with excitation achieved by visible and near-IR laser sources. In addition, I am exploring thermal lensing spectroscopy for the study of high overtone levels of similar molecules isolated in inert gas matrices.

REBECCA S. LEE, Department of Chemistry, Texas A&M University (Prof. Jaan Laane).

My research at Texas A&M University is focused on the conformational analysis of ring molecules. The determination of the most stable conformer present is obtained from four different approaches. The first of these is by using computational methods involving molecular mechanics (MM2). The relative stability of the possible conformers is determined and compared to a planar structure. The second approach involves vibrational spectroscopy (infrared and Raman) to determine the bands resulting from the low-frequency motions of the various molecules. These bands are then fit with the use of a model that is dependent on the conformer. Another computational approach used is that of band contour simulation. This method (developed at the University of Antwerp) calculates the rovibrational envelope, which in turn can be compared to the experimental vibrational envelope. The last approach that is being attempted at this time involves gas-phase NMR to determine rate constants, which in turn can be used to determine various thermodynamic properties. These properties can be used to ascertain the stability of various conformers.

BO LOU, Department of Physics, Emory University (Prof. Sidney Perkowitz).

My research includes investigations of the optical properties of semiconductors and high-temperature superconductors, and far-infrared and Raman spectroscopic studies and characterizations of GaAs-AlGaAs and HgTe-CdTe superlattices and superconductors. The project includes studies of: free carrier effects (concentration, mobility, and effective mass), optical phonons, electron-phonon coupling, superlattice phonon anisotropic behavior, superlattice layer thickness determination, intravalence transitions, impurity states, and binding energies.

WILLIAM E. MARTINDALE, Department of Physics, Fisk University (Prof. E. Silberman).

Ethyl nitrate has been previously reported by Scoggins, Riveros, and Wilson to have two rotational isomers. The two rotamers, designated gauche and trans, were assigned as a result of investigations of its gas-phase microwave spectrum. My research currently involves the conformational study of this molecule, focusing primarily on its matrix-isolated mid-infrared spectrum.

MICHAEL McGLASHEN, Department of Chemistry, University of Michigan (Prof. Michael D. Morris).

I have been developing surface-enhanced Raman scattering (SERS) as a probe of neurotransmitter concentrations in biological matrices. Current detection limits are 3 × 10⁻⁷ M with a 10-second integration time. As with all in vivo probes, however, protein adsorption is a potential problem. Current work with both dialysis membranes and polymercoated SERS electrodes promises to eliminate much of this protein interference. Further development of these methods will allow measurements in most neurochemical matrices.

PATRICK J. McNEILLY, School of Pharmacy, University of Maryland (Prof. S. Edward Krikorian).

This research project involves detailed characterization of the near-infrared absorption bands of various acyclic and cyclic imides. This will be accomplished by correlation of near-infrared bands with relevant fundamental modes in the infrared, along with deuteration and solvent effects to help confirm these assignments. Information obtained from these studies will be used to examine the usefulness of the near-infrared as a probe for both conformational and association phenomena for imides as a functional group class.
JILL M. OLINGER, Department of Chemistry, University of California, Riverside (Prof. Peter R. Griffiths).

Research in the field of near-infrared (NIR) diffuse reflectance spectroscopy was done in order to obtain a better understanding of the reasons for which Kubelka-Munk theory appears to fail in a typical NIR reflectance analysis. Through the use of model systems, it has been determined that the absorption of a matrix, if high enough, can reduce the depth of penetration of the incident radiation enough that the scattering which takes place is not sufficient to ensure an isotropic distribution of the scattered and reflected radiation, thus causing large deviations from Kubelka-Munk theory.

SHYAMAL PAREKH, Department of Chemistry, University of Toledo (Prof. Gordon A. Parker).

The most promising starting material for the synthesis of warburganal is the readily available ketonedehyde. A general method for the total synthesis of this key intermediate has been improved and optimized. An important intermediate, which offers the advantage of diastereofacial selectivity for the requisite sterochemistry of the C-1 center has been developed for the total synthesis of warburganal. A new formyl anion equivalent, methoxy (phenyldimethylsilyl) methyllithium, has been developed. This formyl “umpolung” synthon has a striking feature. It can achieve reductive nucleophilic acylations, with an extension of one carbon atom, either with or without introduction of the α-hydroxyl moiety. This is certainly an advantage over the existing methodologies. A new silver-ion-catalyzed halide displacement method for the synthesis of methoxy-methylphenyldimethylsilane has been developed. This method gave a clean bromide displacement by methoxide at a carbon position juxtaposed to silicon in an otherwise difficult-to-functionlize silane-opentyl system. The scope and limitations of this newly developed “umpolung” reagent have been studied by employing the new formyl anion equivalent in nucleophilic addition reactions with a variety of electrophiles.

JOHN RABASCO, Department of Chemistry, Bowdoin College (Prof. Dana W. Mayo).

A series of 1,2-dimethylcycloalkanes and 1,2-dimethylcycloalkenes, as well as the appropriate deuterated species, were synthesized and examined by resolution enhancement techniques of the symmetric methyl deformation region (1390–1365 cm⁻¹) in the infrared spectrum. This latter series of compounds provides strong evidence for the presence of spatial coupling between sterically crowded methyl groups. Two bands were observed (1382 and 1376 cm⁻¹) by deconvolution of this region in the spectrum of 1,2-dimethylcyclohexene. The spectrum of 1-methyl-2-methyl-d₅-cyclohexene under the same conditions exhibited a single band at 1379 cm⁻¹. Substitution of the deuterio methyl group effectively decouples the system, causing the two bands in the light compound to collapse to a single band. A single band was observed at 1380 cm⁻¹ in the deconvoluted spectrum of 1,2-dimethylcyclopentene. The spectrum of 1-methyl-2-methyl-d₅-cyclopentene under the same conditions exhibits a single band at the identical value of that found in the light compound (1380 cm⁻¹). No splitting is observed in this case, since the smaller ring size moves the methyl groups in the 1,2-positions far enough apart to relieve the spatial interaction which was observed in the six-membered ring case. These observations add further support to the theory that splitting of the gem-dimethyl symmetric deformation band involves a significant spatial interaction term.

PATRICK RICE, Department of Chemistry and Biochemistry, University of Arkansas (Prof. Donald Bobbitt).

The Raman-induced Kerr effect (RIKE) is an intensity-dependent birefringence which manifests itself as a change in the rotation of the plane of polarization of a probe beam due to the presence of a pump field shifted in frequency by an amount equal to a Raman-active band. The advantages common to other nonlinear Raman methods are maintained in the RIKE, but with a simpler experimental arrangement than, for example, CARS. My investigations are designed to address the experimental parameters upon which the RIKE technique is dependent.

KEVIN SPENCER, Department of Chemistry, Syracuse University (Prof. Laurence A. Nafie).

My research at Syracuse University has been on the development of new instrumentation and applications for vibrational optical activity. Gas-phase studies of (1R,2R)- and (1S,2S)-dideuteriocyclopropane have included recording the first high-resolution FT-IR vibrational circular dichroism (VCD) spectrum. Preliminary results suggest the possibility of following the kinetics of racemization of this molecule in the gas phase with high precision, using VCD. My research has also focused on the design of a unique scattered circular polarization Raman optical activity (SCP-ROA) spectrometer, which has higher throughput and lower artifact levels than ROA instruments that employ incident circular polarization (ICP). Faster collection times and smaller artifacts should allow SCP-ROA to probe biochemically relevant solutions.

SHALABH TANDON, Department of Chemistry, Carthage College (Prof. Dennis P. Strommen).

An analyte molecule was isolated from other quenching impurities with the use of amylose to produce inclusion complexes with the solute in a Me₃SO-H₂O mixed solvent. Me₃SO-H₂O mixed solvents give stable complexes and enhance the thermooptical sensitivity. A twofold increase was obtained in the fluorescence signal of 3,3'-diaryloxacycarbonylamine with the use of the above system.

MARK WEBER, Department of Physics and Astronomy, University of Tennessee (Prof. W. E. Blass).

My graduate research project concentrated on the room-temperature intensity measurements of acetylene's fundamental v₁ band, the seven hot bands 2v₃ - v₁, and v₁ + v₃, v₁ + v₄, and v₁, of the isotope C¹³C¹₂H₂ in the 14-μm region, using a tunable diode laser spectrometer. Intensity measurements are very important to modeling planetary and stellar atmospheres where acetylene was detected as a gas sub-
Acetylene has been identified in the atmospheres of Saturn, Titan, Jupiter, and the red carbon star IRC 10216. From individual measured line intensities, we have recovered band strengths, Herman-Wallis factors due to the rotation-vibration interaction, and zero-order dipole moment matrix elements.

ERIC L. WOODBRIDGE, University of Colorado (Prof. Stephen R. Leone).

The research honored by the Coblentz Society was a study of the photofragmentation dynamics of acetone. It had been proposed that a nonconcerted C-C bond breaking in this molecule would yield a highly rotationally excited CO molecule. Our investigation provided direct spectroscopic evidence for the formation of this CO using the relatively new technique of time-resolved FT-IR emission spectroscopy. We observed CO with a nascent vibrational excitation approximated by a temperature of 2030 K and a near-nascent rotational distribution approximated by a temperature of 3360 K, in agreement with a proposed impulsive fragmentation of an acetyl radical intermediate.

HONORARY MEMBERS

The Coblentz Society has selected Gerhard Herzberg and A. Lee Smith to receive honorary membership due to their outstanding contributions to the field of spectroscopy. They will each be presented with a plaque at the Coblentz Society general business meeting prior to the Williams-Wright Award Symposium at the Pittsburg Conference in Atlanta.

VISIT OUR MEMBERSHIP BOOTH AT ATLANTA PITTSBURGH CONFERENCE

This is a good place to meet your friends and discuss what’s new both in spectroscopy and in the city. It’s a good place for nonmembers to make our acquaintance and join up.

You’ll be able to try SPECTRASEARCH on the Coblentz data base on a PC and look over our reference books. Don’t forget to bring some floppies of your own spectra to contribute to the new Coblentz Society digitized spectral collection. IT’S YOUR SOCIETY—YOUR PARTICIPATION IS NEEDED.

SOCIAL ANNOUNCEMENTS

MEMBERSHIP: Anyone wishing to join the Society may do so by sending $5.00 to Dr. James A. de Haseth, Coblentz Society Membership Chairman, Department of Chemistry, University of Georgia, Athens, GA 30607.

BOARD MEETING: The Coblentz Society Board will hold its semi-annual meeting in the first week in March at the Pittsburgh Conference in Atlanta. Any article of business that you wish the Board members to consider needs to be sent in writing to Dr. Rod McDowell, Coblentz Society President, Mail Stop J567, Los Alamos National Lab., Los Alamos, NM 87544, prior to the conference.

WINE & CHEESE: The Coblentz Society will sponsor the Williams-Wright Award Symposium on Tuesday afternoon at the Pittsburgh Conference, followed by a wine & cheese reception (open to all conference participants). Consult your program for time and location. The Society will also sponsor the Bomem-Michelson Award Symposium on Thursday afternoon.

BEER: The Coblentz Society will present the Coblentz Award Monday morning at the Ohio State Molecular Spectroscopy Symposium to be held in Columbus, Ohio, 12–16 June 1989. The Award lecture will follow the presentation. The Society will also sponsor a beer blast the following Tuesday evening for all conference participants.

COBLENTZ SOCIETY BOARD AND OFFICERS

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<tr>
<th>Name</th>
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<tr>
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<td>1989</td>
<td>(404)542-1968</td>
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<td>Department of Chemistry, University of Georgia, Athens, GA 30602</td>
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<tr>
<td>Dr. Kathryn S. Kalasinsky</td>
<td>1989</td>
<td>(601)325-3324</td>
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<td>Mississippi State Chemistry Lab., P.O. Box CR, Mississippi State, MS 39762</td>
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<tr>
<td>Dr. Robin S. McDowell</td>
<td>1989</td>
<td>(505)667-7071</td>
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<td>Mail Stop J567, Los Alamos National Laboratory, Los Alamos, NM 87545</td>
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<td>Dr. Matthew A. Harthcock</td>
<td>1990</td>
<td>(409)238-1190</td>
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<td>Analytical Services, B1218, Dow Chemical USA, Freeport, TX 77541</td>
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<td>Measurex, 1 Results Way, Cupertino, CA 95014</td>
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<td>(216)581-5562</td>
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<td>BP America Research, 4400 Warrensville Center Road, Cleveland, OH 44128</td>
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<td>Dr. John F. Rabolt</td>
<td>1991</td>
<td>(408)927-1613</td>
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<td>IBM Almaden Research Center, K91/801, 650 Harry Road, San Jose, CA 95120-6099</td>
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<td>Dr. Hector L. Casal</td>
<td>1992</td>
<td>(613)990-0945</td>
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<td>Division of Chemistry, National Research Council, 100 Sussex Drive, Ottawa, Ontario, CANADA K1A 0R6</td>
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<tr>
<td>Dr. Geraldine Richmond</td>
<td>1992</td>
<td>(503)686-4635</td>
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<td>Department of Chemistry, University of Oregon, Eugene, OR 97403</td>
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