21ST ANNUAL MEETING

ENVIRONMENTAL MUTAGEN SOCIETY

PROGRAM

MARCH 25 – 29, 1990
Albuquerque Hilton Hotel
Albuquerque, New Mexico
<table>
<thead>
<tr>
<th>INDEX OF SESSIONS</th>
<th>page</th>
</tr>
</thead>
<tbody>
<tr>
<td>WORKSHOPS</td>
<td></td>
</tr>
<tr>
<td>SHORT TALKS I</td>
<td></td>
</tr>
<tr>
<td>Sunday 1:00–4:00pm</td>
<td>11-13</td>
</tr>
<tr>
<td>Sunday 5:25–7:30pm</td>
<td>14</td>
</tr>
<tr>
<td>SYMPOSIUM I</td>
<td></td>
</tr>
<tr>
<td>SPECIAL LECTURE I</td>
<td></td>
</tr>
<tr>
<td>Monday 8:25–11:20am</td>
<td>20</td>
</tr>
<tr>
<td>Monday 11:25am–12:20pm</td>
<td>21</td>
</tr>
<tr>
<td>SHORT TALKS II</td>
<td></td>
</tr>
<tr>
<td>Monday 1:55–4:30pm</td>
<td>22</td>
</tr>
<tr>
<td>POSTERS I</td>
<td></td>
</tr>
<tr>
<td>Monday 4:35–6:35pm</td>
<td>28</td>
</tr>
<tr>
<td>AWARDS &amp; RECEPTION</td>
<td></td>
</tr>
<tr>
<td>Monday 7:30pm</td>
<td>37</td>
</tr>
<tr>
<td>SHORT TALKS III</td>
<td></td>
</tr>
<tr>
<td>Tuesday 8:25–10:15am</td>
<td>38</td>
</tr>
<tr>
<td>SYMPOSIUM II</td>
<td></td>
</tr>
<tr>
<td>Tuesday 10:45am–12:50pm</td>
<td>44</td>
</tr>
<tr>
<td>SYMPOSIUM III</td>
<td></td>
</tr>
<tr>
<td>Tuesday 2:30–5:00pm</td>
<td>46</td>
</tr>
<tr>
<td>POSTERS II</td>
<td></td>
</tr>
<tr>
<td>Tuesday 5:15–7:15pm</td>
<td>48</td>
</tr>
<tr>
<td>SYMPOSIUM IV</td>
<td></td>
</tr>
<tr>
<td>Business Meeting</td>
<td></td>
</tr>
<tr>
<td>Wednesday 8:25–11:20am</td>
<td>58</td>
</tr>
<tr>
<td>Wednesday 11:30am–12:30</td>
<td>59</td>
</tr>
<tr>
<td>POSTERS III</td>
<td></td>
</tr>
<tr>
<td>Thursday 8:45–10:45am</td>
<td>60</td>
</tr>
<tr>
<td>SPECIAL LECTURE II</td>
<td></td>
</tr>
<tr>
<td>Thursday 11:00–11:55am</td>
<td>71</td>
</tr>
<tr>
<td>SHORT TALKS IV</td>
<td></td>
</tr>
<tr>
<td>Thursday 1:25–3:00pm</td>
<td>72</td>
</tr>
<tr>
<td>SYMPOSIUM V</td>
<td></td>
</tr>
<tr>
<td>Thursday 3:30–5:50pm</td>
<td>76</td>
</tr>
</tbody>
</table>

AN AUTHOR INDEX
IS IN THE BACK OF THIS BOOKLET
ENVIRONMENTAL MUTAGEN SOCIETY

Twenty-First Annual Meeting

March 25–29, 1990
Albuquerque Hilton Hotel
Albuquerque, New Mexico

The Environmental Mutagen Society was founded in 1969 and incorporated under the laws of the District of Columbia. It is operated to encourage the study of mutagens in the human environment—particularly as they may affect public health—and to engage in and sponsor research and the dissemination of information related to mutagens. Membership is open to all interested scientists.

OFFICERS

President
R. JULIAN PRESTON
Oak Ridge National Laboratory

President Elect
GEORGE R. HOFFMANN
Holy Cross College

Secretary
MIRIAM BLOOM
Consumer Product Safety Commission

Treasurer
EUGENE L. ELMORE
NSI Technology Services Corp.

Meeting Manager
William G. Momberger
MISCELLANEOUS INFORMATION

1. Please DO NOT FORGET to bring your PROGRAM BOOKLET or ABSTRACT ISSUE of the Journal to the meeting. Extra copies will cost $5.00 each.

2. The Registration Desk will be in the Garden Room. It will be open
   Sunday 11:00am–8:00pm; Monday 7:30am–4:00pm;
   Tuesday 8:00am–4:00pm; Wednesday 8:00am–1:00pm;
   Thursday 8:00am–1:00pm.

3. PLEASE REMEMBER to check the MESSAGE BOARD in the
   registration area frequently for changes in the program, changes in
   room assignments, and special announcements. You may leave mes-
   sages for other attendees on the message board, but if you wish to post
   any other material, please check at the Registration Desk first.

4. Coffee breaks will be in the Foyer of the New Mexico Ballroom and
   in the exhibits area.

5. The phone number of the Albuquerque Hilton Hotel is (505) 884-2500.

6. Smoking is not permitted in the meeting rooms.

7. Council Meetings are scheduled in N. M. Ballroom Parlors C-D:
   Sunday, March 25, 8:30am to 1:00pm.
   Thursday, March 29, 7:00pm to 11:00pm.

8. There will be a slide preview room in which speakers can check their
   slides and carousels in advance. Its location will be posted on the
   message board.

9. POSTERS are in the Southwest Ballroom and Foyer.
   Set-up times are as follows:

<table>
<thead>
<tr>
<th>POSTER SESSION</th>
<th>SET-UP STARTS</th>
<th>TAKE DOWN BY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Session I (Mon. 4:35–6:35pm)</td>
<td>Sun. 5:00pm–Mon. 9:00am</td>
<td>Mon. 7:30pm</td>
</tr>
<tr>
<td>Session II (Tues. 5:15–7:15pm)</td>
<td>Mon. 8:00pm–Tues. 9:00am</td>
<td>Tues. 8:00pm</td>
</tr>
<tr>
<td>Session III (Thurs. 8:45–10:45am)</td>
<td>Tues. 8:30pm–Wed. 10:00am</td>
<td>Thurs. 1:30pm</td>
</tr>
</tbody>
</table>
COUNCILORS

Sheila M. Galloway (1990)
(Past President)
Charles S. Aaron (1992)
Diana Anderson (1990)
Brigitte F. Brandriff (1992)
Byron E. Butterworth (1990)
June H. Carver (1992)
Daniel A. Casciano (1990)
David M. DeMarini (1991)
Philip C. Hanawalt (1991)
Robert J. Langenbach (1992)
Frederick B. Oleson, Jr. (1992)
Patricia Ostrosky (1991)
Michael Plewa (1991)
Elizabeth S. VonHalle (1990)
John S. Wassom (1990)

PROGRAM COMMITTEE

Sky Benson
Marc Bichara
Sheila M. Galloway
James M. Gentile
George R. Hoffmann (Chair)
Henry E. Holden
Marc A. MacInnes
Jenness B. Majeska
Dale W. Matheson
Douglas McGregor
William F. Morgan
Michael D. Shelby

REGISTRATION FEES

<table>
<thead>
<tr>
<th>PREREGISTRATION</th>
<th>ON-SITE REGISTRATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Until January 15)</td>
<td></td>
</tr>
<tr>
<td>Members</td>
<td>$90.00</td>
</tr>
<tr>
<td>Nonmembers</td>
<td>$100.00</td>
</tr>
<tr>
<td>Student members</td>
<td>$30.00</td>
</tr>
<tr>
<td>Student nonmembers</td>
<td>$35.00</td>
</tr>
<tr>
<td>Spouses</td>
<td>$20.00</td>
</tr>
</tbody>
</table>
PATRONS AND SUSTAINING MEMBERS

The EMS Council may elect a corporation to be a Patron or Sustaining Member as a result of demonstrated and substantiated acts benefiting the Society and its purposes. The following is a list of corporations making contributions or joining the Society as Patrons or Sustaining Members. This listing contains 1989 members as well as new 1990 members.

ABBOTT LABORATORIES
Representative: Farrell Fort

ARTHUR D. LITTLE
Representative: Alice Tu

BP AMERICA
Representative: Edward Sowinski

BURROUGHS WELLCOME COMPANY
Representative: Roberta B. Krehl

CHEVRON ENVIRONMENTAL HEALTH CENTER
Representative: Judith A. MacGregor

CIBA-GEIGY CORPORATION
Representative: Jo Ann Munigle

COCA COLA COMPANY
Representative: James Emerson

E.I. DU PONT DE NEMOURS AND COMPANY
Representative: Awni Sarrif

ELI LILLY AND COMPANY
Representative: M.E. Amundson

EXXON BIOMEDICAL SCIENCES, INC.
Representative: R.A. Scala
PATRONS AND SUSTAINING MEMBERS

FMC CORPORATION
Representative: Martin J. Fletcher

G.D. SEARLE AND COMPANY
Representative: Ann T. Raphael

HAZLETON LABORATORIES AMERICA, INC.
Representative: Steve R. Haworth

HERCULES, INC.
Representative: Richard S. Waritz

HOECHST-CELANESE CORPORATION
Representative: Tito Cascieri

HOFFMANN-LA ROCHE, INC.
Representative: Jerome J. Kamm

MC NEIL PHARMACEUTICAL
Representative: Joseph J. Pittelli

MERCK SHARP AND DOHME RESEARCH LABORATORIES
Representative: Matthews O. Bradley

MERRELL DOW RESEARCH INSTITUTE
Representative: Daniel J. Thompson

MICROBIOLOGICAL ASSOCIATES
Representative: David Jacobson-Kram

MOBIL OIL CORPORATION
Representative: Myron A. Mehlman

MONSANTO COMPANY
Representative: George J. Levinskas

5
PATRONS AND SUSTAINING MEMBERS

NSI TECHNOLOGY SERVICES CORPORATION
Representative: Eugene L. Elmore

PFIZER, INC.
Representative: Verne A. Ray

PROCTER AND GAMBLE COMPANY
Representative: Edward D. Thompson

R.J. REYNOLDS TOBACCO COMPANY
Representative: D.J. Doolittle

SANDOZ RESEARCH INSTITUTE
Representative: Raymond E. Stoll

SCHERING CORPORATION
Representative: I.I.A.Tabachnik

SRI INTERNATIONAL
Representative: Jon C. Mirsalis

STERLING DRUG, INC.
Representative: Angelo Andrese

UNION CARBIDE CORPORATION
Representative: Fred R. Frank

UPJOHN COMPANY
Representative: Robert H. Denlinger

WYETH-AYERST RESEARCH
Representative: Mark Hite
SPONSORS OF THE 21ST ANNUAL MEETING

BASF CORPORATION
BRISTOL-MYERS SQUIBB
E.I. DU PONT DE NEMOURS & CO
ENVIRONMENTAL HEALTH RESEARCH AND TESTING, INC.
GENMAP, INC.
HAZLETON LABORATORIES AMERICA, INC.
INTEGRATED LABORATORY SYSTEMS
MERCK SHARP AND DOHME RESEARCH LABORATORIES
MICROBIOLOGICAL ASSOCIATES, INC.
MOBAY CORPORATION
MONSANTO COMPANY
NATIONAL TOXICOLOGY PROGRAM
PHARMAKON RESEARCH INTERNATIONAL, INC.
RJR-NABISCO
ROHM AND HAAS
R.W. JOHNSON PHARMACEUTICAL RESEARCH INSTITUTE
SRI INTERNATIONAL
THE UPJOHN COMPANY
UNITED STATES TESTING COMPANY, INC.
U.S. EPA, RESEARCH TRIANGLE PARK
WELLCOME RESEARCH LABORATORIES
EXHIBITS

Southwest Ballroom

Monday, March 26 – Wednesday, March 28

There will be a variety of interesting, informative exhibits in the Southwest Ballroom. Exhibitors will present information on the latest in laboratory instrumentation, supplies, computer capabilities, publications, and a broad range of research and testing services. Exhibit booths will be open all day on Monday and Tuesday and from 9:00am to noon on Wednesday. Company representatives will be available to answer your questions and discuss products and services with you. The exhibits will be conveniently located in the same area as poster sessions, and brochures listing exhibitors and their services will be available for all meeting participants. Coffee will be available in the exhibits area during breaks and poster sessions, and there will also be a cash bar and soft drinks during the afternoon poster sessions. Support of the exhibits is appreciated by the EMS.

ALL MEETING PARTICIPANTS
ARE CORDially INVITED TO THE EXHIBITS
A Multidisciplinary Approach to Toxicology

The Research Triangle Institute (RTI) offers unique capabilities for a multidisciplinary approach in evaluating the toxic potential of pure compounds and complex environmental mixtures. This includes both method development and validation as well as chemical sample collection and analysis. The research staff of over 1,500 employees can assist your organization with a research approach and a cost estimate.

RTI: Capabilities

1. Molecular analysis of mutational events in prokaryotes, eukaryotes and animals
2. Specific locus studies in Neurospora and mice
3. Cytogenetic analysis — in vivo SCE, CA, MN
4. Mutagenicity testing in Ames and MLA bioassays of volatiles, semivolatiles, nonvolatiles and complex environmental mixtures
5. Extraction and chemical analysis of pure chemicals and complex environmental mixtures
6. Reproductive and developmental toxicity and acute/subchronic toxicity studies in animals
7. FDA and EPA registration studies for commercial clients

RTI: Experience

- Contracts and grants from Government, State and Industrial Clients
- 84 Million Dollars in Business (1989)
- 31 Years of Experience
- Services Individually Designed to the Client's Specifications
- Independent Nonprofit Research Organization Located in the Research Triangle Park, NC

See RTI's Booth at the EMS Meeting for expanded information on any of the above topics.

Questions: For an immediate reply contact:

Dr. Frederick J. de Serres, Director
Center for Life Sciences and Toxicology
Research Triangle Institute
Post Office Box 12194
Research Triangle Park, North Carolina 27709-2194
(919) 541-6516
Arthur D. Little

Genetic Toxicology/
Cell Biology Testing

Serving the biotechnology, pharmaceutical, chemical, and medical device industries

• \textit{In Vitro Genetic Toxicology Assays}
  — Bacteria Salmonella/Microsome Mutagenesis (Ames test)
  — Bacteria E. coli/uvrA
  — Mammalian Gene Mutations (CHO/HGPRT)
  — Sister Chromatid Exchanges (SCE)
  — Cell Transformation (BALB/c-3T3, C3H-10T1/2, and SHE)

• \textit{In Vivo Genetic Toxicology Assays}
  — Mammalian Micronucleus
  — Mammalian Chromosome Aberrations
  — Mammalian Sister Chromatid Exchanges

• GLP Compliances: FDA, EPA, OECD, and Japanese regulations

For further information, please contact:
Dr. Kenneth Loveday or Dr. Jack Polidoro
Life Sciences Laboratories
Contract Toxicology and Research

Arthur D. Little, Inc.
Acorn Park
Cambridge, Massachusetts
02140-2390

Telephone 617-864-5770
Telefax 617-547-3617

Come visit our Cambridge, MA laboratories
LABORATORY SAFETY ISSUES IN GENETIC TOXICOLOGY

Presiding: David J. Brusick
Hazleton Laboratories Washington
Vienna, VA

Genetic toxicology studies encompass a broad range of techniques applied to diverse target systems including microorganisms, cultured mammalian cells and intact animals. Although it is generally assumed that exposure to the chemical agents used to treat target species represents the most likely hazard to laboratory investigators, potential safety problems may also arise from use of target organisms. Infectivity and virulence of microbes directly or from viruses harbored in cell lines and/or primary cultures (particularly human) and some forms of animal disease all must be considered in maintaining a safe laboratory environment. This workshop will provide an overview of the safety issues related to the operation of a testing laboratory and will offer recommendations for minimizing the risk to laboratory personnel.

1:00  Potential Nonbiological Hazards: Chemicals and Radiation
      Robert G. Nemchin, Organon Teknika Corp.

2:20  Coffee Break

2:40  Potential Biological Hazards: Microorganisms, Cell Culture Contaminants and Body Fluids
      Andrew Loskoff, Hazleton Laboratories Washington.

3:30  Potential Biological Hazards: Laboratory Animals
      James Ivett, Hazleton Laboratories Washington
WORKSHOP II
Sunday, 1:00 pm – 4:00 pm
New Mexico Ballroom Parlors E and F

ADVANCES IN MAMMALIAN CELL MUTAGENESIS:
APPLICATIONS IN INDUSTRY

Presiding: Albert P. Li
Monsanto Company
St. Louis

According to conventional wisdom, chemicals are tested for genotoxicity as "point mutagens" and "clastogens" using "point mutation assays" and "cytogenetic assays," respectively. Recent findings indicate that some mammalian cell mutation assays can measure both point mutagens and clastogens. This workshop is held to provide insight into the question: Can clastogens be effectively detected using point mutation assays? New developments in mammalian cell assays to detect the induction of aneuploidy will also be discussed.

1:00 Overview: Discordance between Mutagenicity and Clastogenicity of Some Chemicals in Mammalian Cells
A.P. Li, Monsanto Company.

1:20 Are There Clastogens not Detected by the Ames Test?
Errol Zeiger, NIEHS.

1:40 Detection of Clastogens with the CHO-AS52 Assay
Leon Stankowski, Jr., Pharmakon Research International.

2:00 Correlation of Small Colony Mutant Frequency with Chromosomal Aberration and Micronucleus Formation in Mouse Lymphoma Cells
Martha Moore, U.S. EPA.

2:20 Coffee Break
WORKSHOP II
Sunday 1:00 pm – 4:00 pm

New Mexico Ballroom Parlors E and F

2:40  Issues in the Analysis of L5178Y TFT\textsuperscript{-} Mutant Colony Size Distribution
      Brian Myhr, Hazleton Laboratories.

3:00  Monochromosomal Mammalian Hybrid Cell Assay for Aneuploidy
      S. Shabeg and R.S. Athwal, US EPA and New Jersey Medical School.

3:20  Detection of Aneuploidy-Induction as Micronuclei
      Ursula Hennig, University of Alberta.

3:40  Concluding Remarks
      A.P. Li, Monsanto Company.

3:45  Open Discussion
      All Speakers
CONTRIBUTED PAPERS I
Sunday, 5:25pm–7:30pm

BACTERIAL MUTAGENESIS AND REPAIR MECHANISMS
New Mexico Ballroom South
Conveners: T.A. Cebula and W.H. Koch

5:25
INTRODUCTION

5:30
CHANGES IN MUTATIONAL SPECTRA INDUCED BY MNNG AND ENU UNDER CONDITIONS OF THE ADAPTIVE RESPONSE IN E. coli


5:45
INDUCTION OF THE SOS RESPONSE IN ESCHERICHIA COLI BY AZIDOTHYMIDINE AND DIDEOXYNUCLEOSIDES

S.W. Mamber, K.W. Brookshire and S. Forenza, Bristol-Myers Squibb Company, Wallingford, CT.

6:00
A REGULATORY GENE IN ESCHERICHIA COLI [katF] THAT CONTROLS RECOVERY ENZYMES AFTER NEAR-UV AND OTHER OXIDATIVE DAMAGES

A. Eisenstark, B.D. Sak, R. Knowles, D. Rodriguez and S. Baryo, Univ. of Missouri.

MUTAGENESIS AND TRANSFORMATION IN MAMMALIAN CELLS
New Mexico Ballroom Parlor G
Conveners: D.W. Matheson and W.B. Mattes

5:25
INTRODUCTION

5:30
INCREASED UPTAKE OF LEAD IN 3T3 CELLS COEXPOSED WITH BAPE AND BPL RESULTS IN ENHANCED TRANSFORMATION

N.Z. Baturay and M.S. Baturay, St. John's Univ. and Technion Testing & Research Labs, Belleville, NJ.

5:45
PROLIFERATION AND MORPHOLOGICAL ALTERATION OF BALB/3T3 CELLS BY VANADATE

C.W. Sheu, I. Rodriguez and J.K. Lee, FDA, Washington, DC.

6:00
HEPATIC CELL PROLIFERATION INDUCED BY THE HEPATOCARCINOGEN 2-NITROPROPANE BUT NOT BY THE NON-CARCINOGEN 1-NITROPROPANE

M.L. Cunningham and H.B. Matthews, National Institute of Environmental Health Sciences.
CONTRIBUTED PAPERS I
Sunday, 5:25pm–7:30pm

HUMAN MONITORING

New Mexico Ballroom Parlor C
Conveners: R.R. Tice and B. Hirsch

5:25
INTRODUCTION

5:30
GENETIC DAMAGE IN MAN: EVALUATION OF MULTIPLE INDICES OF DAMAGE


5:45
A LONGITUDINAL INVESTIGATION OF THE INFLUENCE OF VARIOUS FACTORS ON THE CYTOKINESIS-BLOCKED LYMPHOCYTE MICRONUCLEI FREQUENCY IN WORKERS EXPOSED TO STYRENE

J.W. Yager, W.M. Paradisin, S. Selvin and S.M. Rappaport, Univ. of CA, Berkeley.

6:00
FACTORS CONTRIBUTING TO CHROMOSOME DAMAGE IN CELLS OF CIGARETTE SMOKERS

W.W. Au, D. Walker, J.B. Ward, Jr., M.S. Legator and V. Singh, Univ. of Texas Medical Branch, Galveston and Hoffmann-LaRoche, Inc., Nutley, NJ.
CONTRIBUTED PAPERS I
Sunday, 5:25pm–7:30pm

BACTERIAL MUTAGENESIS AND REPAIR MECHANISMS
New Mexico Ballroom South
Conveners: T.A. Cebula and W.H. Koch

6:15
CHROMIUM(III)-BOUND TEMPLATE DNA PROMOTES INCREASED DNA POLYMERASE PROCESSIDITY AND IS MUTAGENIC IN E. COLI

6:30
hisD3052: A PALINDROMIC TARGET FOR MUTATIONAL ANALYSIS

6:45
pKM101 INDUCES COMPLEX FRAMESHIFT EVENTS IN THE SALMONELLA TYPHIMURIUM hisC3076 LOCUS
W.H. Koch and T.A. Cebula, FDA, Washington, DC.

MUTAGENESIS AND TRANSFORMATION IN MAMMALIAN CELLS
New Mexico Ballroom Parlor G
Conveners: D. W. Matheson and W. B. Mattes

6:15
AN IMMUNOCHEMICAL METHOD TO DETECT CELL PROLIFERATION IN CULTURED RODENT CELLS TREATED WITH CARCINOGENS
N. Linpial, J. Nath and T. Ong, West Virginia Univ. and National Institute for Occupational Safety and Health.

6:30
MAMMALIAN CELL REVERSION ASSAY FOR DETECTING MUTATIONS CAUSED BY RECOMBINATION OR DELETION
S. Ponniah, J.A. Tischfield and P.I. Stambrook, Univ. of Cincinnati College of Medicine and Indiana Univ. School of Medicine.

6:45
TARGETED HOMOLOGOUS RECOMBINATION AT THE CHINESE HAMSTER APRT LOcus
G.M. Adair, J.B. Scheerer and K.A. Brotherman, Univ. of Texas M.D. Anderson Cancer Center.
CONTRIBUTED PAPERS I
Sunday, 5:25pm–7:30pm

HUMAN MONITORING

New Mexico Ballroom Parlor C
Conveners: R.R. Tice and B. Hirsch

6:15
THE EFFECTS OF A FRIED BEEF DIET UPON THE FREQUENCY OF MICRONUCLEATED POLYCHROMATIC ERYTHROCYTES (PCEs) IN SPLENECTOMIZED HUMANS


6:30
STRUCTURAL CHROMOSOMAL REARRANGEMENTS IN AGING

B. Hirsch, J.M. Pluth and S.A. Wiencke, Univ. of Minnesota, Minneapolis.

6:45
CHROMOSOME ABERRATIONS IN HOSPITAL PERSONNEL EXPOSED TO ANESTHETIC GASES

S. El-Ghazali, S. Ahmed and R. Faris, Ain Shams Univ., Cairo, Egypt and Univ. of Texas Medical Branch, Galveston.
### CONTRIBUTED PAPERS I
Sunday, 5:25pm–7:30pm

<table>
<thead>
<tr>
<th>BACTERIAL MUTAGENESIS AND REPAIR MECHANISMS</th>
<th>MUTAGENESIS AND TRANSFORMATION IN MAMMALIAN CELLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Mexico Ballroom South</td>
<td>New Mexico Ballroom Parlor G</td>
</tr>
</tbody>
</table>

#### 7:00
**Mitomycin C Induces Complex Mutations in Salmonella Strain TA1978/pKM101**

E. Kupchella and T.A. Cebula, FDA, Washington DC.

#### 7:15
**Mutagenicity Studies of Bromomethyl and Chloromethyl Fluoranthenes**

J.C. Ball and W.C. Young, Ford Motor Co., Dearborn, MI.

#### 7:00
**Dose Dependent Induction of Mutation by Ionising Radiations in CHO-AS52 Cells: Effects of High and Low Dose Rate Gamma Rays, Delayed Plating and High LET Alpha Particles**

C. Geard, G. Jenkins and J. Jones, Columbia Univ.

#### 7:15
**An Evaluation of the CHO-AS52/XPT Gene Mutation Assay: Spontaneous Mutant Frequency and Responses to Clastogenic Mutagens**

A.P. Li, Monsanto Company, St. Louis.
HUMAN MONITORING

New Mexico Ballroom Parlor C
Conveners: R.R. Tice and B. Hirsch

7:00
IN VIVO MUTANT FREQUENCIES OF FACTORY WORKERS EXPOSED TO VERY LOW DOSES OF IONISING RADIATION

K. Messing, A.M. Seifert and J. Lemaire, Université du Québec, Montréal.

7:15
THE SINGLE CELL GEL (SCG) ASSAY: A SENSITIVE TECHNIQUE FOR HUMAN BIOMONITORING

Molecular Analysis of Mutagenesis

Presiding: Thomas A. Kunkel
National Institute of Environmental Health Sciences
Research Triangle Park, NC

Sponsor: RJR-Nabisco

Our understanding of how genetic information is stably maintained and accurately replicated and how DNA damage is processed into mutations is increasing as the responsible processes are described in greater detail at the molecular level using recently developed mutagenesis assays. The talks in this symposium will address the following topics: 1) the enzymatic steps for achieving highly accurate DNA replication of undamaged DNA and repair of mismatched base pairs, using both in vitro and in vivo approaches, 2) the origins of spontaneous and induced mutations in E. coli and mammalian cells, and 3) the relationship between mutagenesis and DNA conformation, examined with DNA that can assume the Z conformation and with vectors containing specific DNA adducts introduced at unique positions in a gene. Emphasis will be on elucidating the mechanisms responsible for either avoiding or generating the mutations observed in the systems used.

8:25 INTRODUCTION
8:30 Analysis of Fidelity Mechanisms with the Human DNA Replication Complex
Thomas A. Kunkel, National Institute of Environmental Health Sciences, Research Triangle Park, NC

9:05 Molecular Analysis of Mechanisms of Spontaneous Mutagenesis in Escherichia coli
Roel Schaaper, National Institute of Environmental Health Sciences, Research Triangle Park, NC

9:40 Origins of Spontaneous Mutations in Mammalian Cells
Norman D. Drinkwater, Mc Ardle Laboratory for Cancer Research, University of Wisconsin, Madison

10:15 Coffee Break
10:45 Site-Specific Mutagenesis as Relates to DNA Conformation
Robert P.P. Fuchs, Institut de Biologie Moléculaire et Cellulaire, CNRS, Strasbourg, France
SPECIAL LECTURE I

Monday, 11:25 am – 12:20 pm

New Mexico Ballroom South

Transposable Elements
and Their Relationship to Mutagenesis

Daniel L. Hartl

Washington University School of Medicine
St. Louis, Missouri

Sponsor: Environmental Health Research and Testing, Inc.
## CONTRIBUTED PAPERS II

**Monday, 1:55pm–4:30pm**

<table>
<thead>
<tr>
<th>TIME</th>
<th>SESSION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:55</td>
<td>INTRODUCTION</td>
</tr>
<tr>
<td>2:00</td>
<td>TRANSGENIC MICE AS A MODEL SYSTEM FOR STUDYING GENE MUTATIONS IN VIVO</td>
</tr>
<tr>
<td>2:15</td>
<td>TRIPLEX DNA AMPLIFICATION FOR SCREENING DELETON MUTATIONS AT THE HPRT LOCUS IN CHINESE HAMSTER OVARY CELLS</td>
</tr>
<tr>
<td>2:30</td>
<td>MOLECULAR ANALYSIS OF BACKGROUND HPRT MUTATIONS OCCURRING IN VIVO IN HUMAN T-LYMPHOCYTES</td>
</tr>
<tr>
<td>1:55</td>
<td>CYTOGENETICS: TESTING AND METHODOLOGY</td>
</tr>
<tr>
<td>2:00</td>
<td>MULTIPLE-DOSE ERYTHROCYTE MICRONUCLEUS ASSAYS IN MICE AND RATS WITH AZIDOThYMIDINE (AZT)</td>
</tr>
<tr>
<td>2:15</td>
<td>DOSE-RESPONSE COMPARISON OF MICRONUCLEI IN HUMAN, MOUSE, AND RAT PERIPHERAL BLOOD LYMPHOcyTES EXPOSED TO X-RADIATION IN VITRO</td>
</tr>
<tr>
<td>2:30</td>
<td>COMPARISON OF MICRONUCLEUS QUANTITATION IN MIXED CELL POPULATIONS WITH ENUCLEATED CELL PREPARATIONS QUANTIFIED MANUALLY AND USING FLOW CYTOMETRY</td>
</tr>
</tbody>
</table>

**TRANSGENIC MICE AS A MODEL SYSTEM FOR STUDYING GENE MUTATIONS IN VIVO**


**TRIPLEX DNA AMPLIFICATION FOR SCREENING DELETON MUTATIONS AT THE HPRT LOCUS IN CHINESE HAMSTER OVARY CELLS**

Z. Xu, Y. Yu, B.J.F. Rossiter, R.A. Gibbs, C.T. Caskey, A.W. Hsie, Univ. of Texas Medical Branch, Galveston, Baylor College of Medicine, Laboratories for Genetic Services, Inc.

**MOLECULAR ANALYSIS OF BACKGROUND HPRT MUTATIONS OCCURRING IN VIVO IN HUMAN T-LYMPHOCYTES**

CONTRIBUTED PAPERS II
MONDAY, 1:55pm–4:30pm

GERM CELL MUTAGENESIS

New Mexico Ballroom Parlor C
Conveners: G.A. Sega and
P. D. Sudman

1:55
INTRODUCTION

2:00
COMPARISON OF DOSE RESPONSE RELATIONSHIPS FOR ETHYL METHANESULFONATE AND 1-ETHYL-1-NITROSOUREA IN DROSOPHILA MELANOGASTER SPERMATOZOA

W.R. Lee, B.J. Byrne, and A.B. Tucker, Louisiana State University.

2:15
IDENTIFICATION OF PROTEIN VARIANTS INDUCED BY PARENTAL EXPOSURE TO N-ETHYL-N-NITROSOUREA

C.S. Giometti, S.L. Tollaksen, M.A. Gemmell and J. Taylor, Argonne National Laboratory.

2:30
ENU-INDUCED SPECIFIC-LOCUS MUTATION FREQUENCY IN MOUSE EMBRYONIC STAGES

W.L. Russell, P.R. Hunsicker and E.L. Phipps, Oak Ridge National Laboratory.
MUTATION SPECTRA AND MUTATIONAL MECHANISMS IN EUKARYOTES
New Mexico Ballroom South
Conveners: J.P. O'Neill and J.A. Nicklas

2:45
Spectra of Mutations Arising Spontaneously in the Coding Region of the Human HPRT Gene During Cell Growth In Vitro and In Vivo


3:00
Spectra of Mutations Induced in the Coding Region of the HPRT Gene of Diploid Human Fibroblasts by (±)7β, 8α-Dihydroxy-9α, 10α-Epoxide-7, 8, 9, 10-Tetrahydrobenzo[a]-Pyrene (BPDE)


3:15 COFFEE BREAK

3:45
Comparing the Frequency, Kinds, and Spectra of Mutations Induced When a Shuttle Vector Containing Adducts of Structurally-Related Carcinogens Replicates in Human Cells


CYTOGENETICS: TESTING AND METHODOLOGY
New Mexico Ballroom Parlor G
Conveners: A.D. Kligerman and J.L. Wilmer

2:45
S9 Treatment Conditions for In Vitro Cytogenetic Assays

S.M. Galloway, M.J. Armstrong, C.L. Bean, C.L. Hammermeister, T.E. Johnson and M.V. Stallworth, Merck Sharp and Dohme Research Labs, West Point, PA.

3:00
Enhanced and Standard Assays Reveal Higher Chromosome Damage in Mothers Using Phenothiazines During Pregnancy and in Their Exposed Infants

D.A. Shafer, C. Coles, V.G. Dunbar, J. Griffin and A. Palek, Georgia Mental Health Inst. and Emory Univ.

3:15 COFFEE BREAK

3:45
Cytogenetic Effects of Vincaistine Sulfate and Ethylene Dibromide in Human Peripheral Blood Lymphocytes

Channarayappa, J. Nath and T. Ong, West Virginia Univ. and National Institute for Occupational Safety and Health.
GERM CELL MUTAGENESIS

New Mexico Ballroom Parlor C
Conveners: G.A. Sega and
P.D. Sudman

2:45
HIGH FREQUENCIES OF DOMINANT
SKELETAL MUTATIONS ARE INDUCED
WHEN EARLY ZYGOTES ARE EXPOSED
TO ETHYLNITROSOUREA (ENU).

P.B. Selby, W.M. Generoso, G.D.
Raymer, T.W. McKinley, Jr. and K.T.
Cain, Oak Ridge National Laboratory.

3:00
MOLECULAR EFFECTS OF CHLORAMBUCIL IN MOUSE GERM CELLS

G.A. Sega, E.E. Generoso and P.A.
Brimer, Oak Ridge National Laboratory.

3:15 COFFEE BREAK

3:45
INDUCTION OF HERITABLE TRANSLocations IN OFFSPRING AFTER TREATMENT OF MOUSE OOCYTE WITH ADRIAMYCIN

M. Katoh, N. Horiya and T. Shibuya,
Food and Drug Safety Center, Hadano,
Kanagawa, Japan.
### CONTRIBUTED PAPERS II

**Monday, 1:55pm–4:30pm**

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Authors/Institutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>4:00</td>
<td><strong>MUTATIONAL SPECTRA AND MUTATIONAL MECHANISMS IN EUKARYOTES</strong></td>
<td>New Mexico Ballroom South Conveners: J.P. O'Neill and J.A. Nicklas</td>
</tr>
<tr>
<td></td>
<td><strong>CYTOGENETICS: TESTING AND METHODOLOGY</strong></td>
<td>New Mexico Ballroom Parlor G Conveners: A.D. Kligerman and J.L. Wilmer</td>
</tr>
<tr>
<td></td>
<td><strong>4:00</strong></td>
<td><strong>In Vitro Testing Using the Sister Chromatid Exchange Assay: Correlation with In Vitro Chromosomal Aberration Assay and Salmonella Assay</strong></td>
</tr>
<tr>
<td>4:15</td>
<td><strong>Induction Kinetics of X-Ray-Induced Specific-Locus Mutations in the ad-3 Region of Two-Component Heterokaryons of Neurospora crassa</strong></td>
<td>F.J. de Serres, Research Triangle Institute.</td>
</tr>
</tbody>
</table>
GERM CELL MUTAGENESIS

New Mexico Ballroom Parlor C
Conveners: GA. Sega and
P.D. Sudman

4:00
**Female-Specific Chemical Mutagens**

P.D. Sudman and W.M. Generoso.
Oak Ridge National Laboratory.

4:15
**Factors that Influence the Nature of Specific-Locus Mutations**

POSTERS I
Monday, 4:35 pm–6:35 pm
Southwest Ballroom and Foyer

GENETIC TOXICOLOGY TESTING, TEST METHODS, AND METABOLISM

1  
**Effect of Minimal Plate Preparation on the Mutagenic Activity of 4-[2-(Aryl)Ethenyl]-2,6-Dimethylphenols in the Ames Assay**  
J.B. Majeska and D.B. McGregor, Boehringer Ingelheim Pharmaceuticals, Inc., Ridgefield, CT and IARC, Lyon, France.

2  
**Quantitative Measurement of β-Galactosidase Production in Escherichia coli BIA and SOS Chromotest Agar Spot Tests**  
S.W. Mamber, K.W. Brookshire and S. Forenza, Bristol-Myers Squibb Company, Wallingford, CT.

3  
**Microscreen: Multiple Endpoints from One Exposed Population in a Small Volume**  
T.G. Rossman, C.B. Klein and Z. Wang, NYU Medical Center.

4  
**Bullfrog Tadpole Blood Cell Micronucleus Assay on Clastogenicity of Hepachlor**  
T-H. Ma, K-C. Oh, and T-W. Kim, Western Illinois University, Macomb.

5  
**Dose-Dependent Cytotoxic and Mutagenic Effects of Anti-neoplastic Alkylating Agents on Human Lymphoblastoid Cells**  
B.J.S. Sanderson and W.D. Henner, Oregon Health Sciences University, Portland.

6  
**Genotoxicity Testing of Selected Beta-Lactam Compounds**  

7  
**A Comparison of Toxic and Anti-Proliferative Effects of Caffeine and Saccharin on Mouse L929 and Chinese Hamster Ovary Cells**  
I. St Denny and A. Di Lorenzo, Montclair State College, NJ.
8 Detection of Mammalian Cell Mutagenesis in AS52 Cells

9 In Vitro DNA Damage in Peripheral Blood Leukocytes as Measured by the Single Cells Gel (SCG) Assay

10 The In Vitro Induction of Cell Killing and Chromosome Alterations by SiC Fibers
A.L. Brooks and N.F. Johnson, Lovelace Inhalation Toxicology Research Institute, Albuquerque.

11 Genotoxicity of Three Pyridine Compounds to L5178Y/TK+/- 3.7.2C Mouse Lymphoma Cells

12 High Spontaneous Mutant Frequencies Seen in the Agar Overlay Variant of the L5178Y Mouse Lymphoma Assay Are an Artifact
D. Clive, Wellcome Research Laboratories, Research Triangle Park

13 Enhancement of Small Colony Mutant Recovery in the L5178Y Mouse Lymphoma Assay

14 Evaluation of the In Situ Variant of the L5178Y tk+/- -> tk-- Mouse Lymphoma Assay
15
**Estimation of Induced Mutation Frequencies in Mammalian Cells**
D. Daston, C. Rudd, P. Lee, and W. Caspary, NIEHS and SRI.

16
**The Development of a Sensitive Mutation Assay Using a Human Epithelial Cell Line**

17
**Increase in Sister Chromatid Exchanges (SCE's) In S-9 Treated CHO Cells**
P. Vatsala Kumaroo, SITEK Research Laboratories, Rockville, MD.

18
**Iron Supplemented Bovine Serum as an Alternative to Fetal Bovine Serum in the CHO/HGPRT Mutation Assay**
T. Oberly, M. Rexroat, B. Bewsey and K. Richardson, Eli Lilly and Co., Greenfield, IN.

19
**Modulation of Mitogenic Activation of Lymphocytes by Antioxidants**
A. Aido, L. E. Lyn-Cook and D. A. Casciano, National Center for Toxicological Research.

20
**Attenuation of Lead Treated Cytological Anomalies by Glutamic Acid**
M. A. Bempong, Norfolk State University, VA.

21
**An Evaluation of the Genotoxicity of Tetrahydroaminoacridine (THA) in the In Vitro Rodent Hepatocyte Unscheduled DNA Synthesis (UDS) Assay**

22
**Statistical Evaluation of the Number of Cells Scored in the Rat Primary Hepatocyte Unscheduled DNA Synthesis (UDS) Assay**
23 Mutagenicity Testing Guidelines for the USEPA Office of Toxic Substances (OTS)
M.C. Cimino and A.E. Auletta, US EPA, Washington, DC.

24 Proposed Changes to the Toxic Substances Control Act (TSCA) Tier Testing Scheme for Mutagenicity
A.E. Auletta and M.C. Cimino, US EPA, Washington, DC.

25 The Predicativity of Short-Term Animal vs Genotoxicity Tests for Chemical Carcinogens

26 Correlation of Genotoxicity, Tumorigenicity and Teratogenicity within a Pharmaceutical Data Base

27 The Utilization of Chemical Structure and In Vitro Genotoxicity to Predict the Outcome of Rodent Carcinogenicity Bioassays Currently Being Conducted on 44 Chemicals by the National Toxicology Program
J.W. Spalding, R.W. Tennant, S. Stasiewicz and J.A. Ashby, The National Toxicology Program, NC and ICI Central Toxicology Laboratory, Cheshire, UK.

28 Development of a Direct-Acting (-S9) Data Base in the Ames/Salmonella Assay to Rank Mutagenic Activity
T.J. Hughes, L.E. Myers, L.G. Monteith, V.S. Houk and L.D. Claxton, Research Triangle Institute and US EPA, NC.

29 Development of an Indirect-Acting (+S9) Data Base in the Ames/Salmonella Assay to Rank Mutagenic Activity
J.R. Warner, T.J. Hughes, L.E. Myers, V.S. Houk and L.D. Claxton, Research Triangle Institute and US EPA, NC.
30
Analysis of Different Methods for Estimating Maximum Tolerated Dose (MTD) in Mouse Bone Marrow Micronucleus Tests
G.J. Hook and R.R. Tice, National Institute of Environmental Health Sciences and Brookhaven National Laboratory.

31
Genotoxic Activity of Adenosine and an Adenosine-Analog Drug

32
Measurement of Aquatic Contamination by Microsomal Enzyme Preparations from Carp (Cyprinus carpio) in the Salmonella Assay
R.D. Blevins, East Tennessee State University.

33
Mutagenicity of 6-Nitrochrysene and 6-Aminochrysene in Chinese Hamster Ovary Cells

34
Mutagenicity of Mononitro Dihydrobenzo[A]pyrenes

35
The Activation of Aflatoxin B1 and Benzo[a] Pyrene by Intact Plant Cells
J.M. Gentile, G.J. Gentile, P. Johnson and S. Robbins, Hope College, Holland, MI.

36
Superinduction of Multiple Forms of Cytochrome P450 in Processing Precursors
M. Paolini, E. Sapigni, M. Scotti, M. Morotti, P. Hrelia and G. Cantelli Forti, Instituto di Farmacologia dell'Universita', Bologna, Italy.
Activation of 2-Amino-1-Methyl-6-Phenyl-Imidazo[4,5-b]Pyridine (PHIP) to Genotoxic Metabolites in Chinese Hamster Ovary (CHO) Cells Expressing Cytochrome P450
M.H. Buonarati, J.D. Tucker, R. Wu, L.H. Thompson and J.S. Felton, Lawrence Livermore National Laboratory.

The Development of Human Cell Lines Which Stably Express Human Cytochrome P450 cDNAs

Sentinel Species, Sentinel Bioassay and In Situ Environmental Mutagenesis
W.R. Lower, University of Missouri.

Paradoxical Effects of Low Doses on Cell Proliferation of Lymphocytes
P. Ostrosky, R. Montero and L. López, Instituto de Investigaciones Biomédicas, UNAM, México, D.F.

DNA Damage and Repair

Participation of the SOS System in Deletion Formation in E. coli Plasmids
E. Balbinder, Univ. of Colorado Health Science Center, Denver.

The Hydroxylation of 2'-Deoxyguanosine to 8-Hydroxy-2'-Deoxyguanosine by Hydrogen Peroxide and Glutathione
A. Abu-Shakra and E. Zeiger, National Institute of Environmental Health Sciences.

Coolwhite Fluorescent Light Mutagenesis in Salmonella
Z. Hartman and P.E. Hartman, The Johns Hopkins University
POSTERS I  Monday, 4:35 pm–6:35 pm  Southwest Ballroom and Foyer

44
Increased Sensitivity to DNA-Alkylating Agents in a Poly(ADP-Ribose) Polymerase Deficient Chinese Hamster Ovary Mutant

45
Induction and Repair of 4-Nitroquinoline 1-Oxide (4-NQO) DNA Adducts in Repair-Deficient CHO Cell Lines
M.A. Sognier and L.-J. W. Lu, The Univ. of Texas Medical Branch, Galveston.

46
Repair of Replicated DNA in an Active Gene in UV Irradiated CHO Cells
G. Spivak and P.C. Hanawalt, Stanford University.

47
Selective Method for UV-Sensitive CHO DNA Repair Mutant Complementation Group Assignments
D.B. Busch and L.H. Thompson, Armed Forces Institute of Pathology, Washington, DC and Lawrence Livermore National Lab.

48
Differences in the Patterns of 2-Acetylaminofluorene-Induced DNA Adducts in Rodent Liver and in Various Mammalian Cell Lines

49
pHAZE: A Shuttle Vector for Characterizing Ionizing Radiation and Restriction Endonuclease Induced Mutations
R.A. Winegar, L.H. Lutze and W.F. Morgan, Univ. of California, San Francisco.

50
Response of Fibroblast Cultures from Ataxia-Telangiectasia Patients to Oxidative Stress
51
A Study of SCE Induction and Related Repair of Lesions Induced by Two DNA Damaging Agents
W. Xu and J.L. Hsueh, Yunnan Normal University and Fudan University, Shanghai, China.

52
Heterogeneity in Distribution of Repair Sites in Chromatin Loops Correlates with Heterogeneity of Pyrimidine Dimer Repair at the Gene Level

53
Isolation and Preliminary Characterization of the Human DNA Repair Gene ERCC-5: Genomic and cDNA Clones
J.S. Mudgett and M.A. MacInnes, Los Alamos National Laboratory.

54
Efficient Removal of Cyclobutane Pyrimidine Dimers from the Dihydrofolate Reductase Gene in Human XP129 Cells
L. Lommel and P.C. Hanawalt, Stanford University.

55
X-Ray-Induced Genetic Damage Enhancement by Deficient Excision Repair in Drosophila
M.L. Alexander, Southwest Texas State University, San Marcos.

56
Aromatic DNA Adducts in Fish and Marine Mammals from Polluted and Unpolluted Waters
B.P. Dunn, J.F. Payne, S. Ray and R.S. Halbrook, British Columbia Cancer Research Centre, Vancouver, Department of Fisheries and Oceans, St. John's, Newfoundland, and Virginia Polytechnic Institute.
PHARMAKON RESEARCH INTERNATIONAL, INC. is an independent research and development laboratory providing a wide array of toxicology testing services for safety evaluation of cosmetics, food additives, pharmaceuticals, medical devices, biotechnology products, industrial chemicals and pesticides. A multidisciplinary approach is used to evaluate adverse health effects at the molecular, cellular, organ or whole animal levels. PHARMAKON also specializes in pharmacology and pharmacokinetic services.

GENETIC TOXICOLOGY SERVICES
- Microbial and Mammalian Cell Mutagenesis
- In Vivo and In Vitro Cytogenetics
- DNA Damage and Repair

GENERAL TOXICOLOGY SERVICES
- Acute, Subacute and Chronic Toxicology
- In Vitro Toxicology and Cytotoxicity
- Reproductive Toxicology and Teratology
- Immunotoxicology
- Carcinogenesis

PHARMACOLOGY SERVICES
- Central Nervous System
- Anti-inflammation
- Gastrointestinal
- Biochemical Pharmacology
- Broad Screen Profile
- Cardiovascular
- Analgesia
- Cardiopulmonary
- Immunopharmacology
- Pharmacokinetics

BIOTECHNOLOGY SERVICES
- General Safety Testing
- Pyrogen Testing
- Tumorigenicity in Nude Mice

For more information, or to discuss your specialized needs, call Customer Services at (717) 586-2411, or write to:

PHARMAKON RESEARCH INTERNATIONAL, INC.
P.O. Box 313
Waverly, Pennsylvania 18471
AWARDS AND RECEPTION
Monday, 7:30 pm

AWARDS
New Mexico Ballroom South

RECEPTION
New Mexico Ballroom North

Sponsored by:

Microbiological Associates and Hazleton Laboratories
<table>
<thead>
<tr>
<th>DNA REPAIR</th>
<th>CYTOGENETICS: MECHANISMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Mexico Ballroom South Conveners: M.A. MacInnes and J.S. Mudgett</td>
<td>New Mexico Ballroom Parlor G Conveners: W.F. Morgan and R.A. Winegar</td>
</tr>
</tbody>
</table>

| 8:25 | INTRODUCTION |

| 8:30 | THE HUMAN NUCLEOTIDE EXCISION REPAIR GENE ERCC2: HOMOLOGY TO THE YEAST RAD3 REPAIR PROTEIN |

| 8:45 | CHARACTERIZATION OF TWO TYPES OF MNNG-RESISTANT CELL VARIANTS |
| R. Goth-Goldstein and M. Hughes, Lawrence Berkeley Laboratory. |

| 9:00 | MOLECULAR ANALYSIS OF HUMAN DNA REPAIR GENES CONTROLLING SENSITIVITY TO IONIZING RADIATION |
| L.H. Thompson, K.W. Brookman and M.J. Siciliano, Lawrence Livermore National Laboratory and Univ. of Texas System Cancer Center, Houston. |

| 8:30 | CORRECTION OF BOTH THE CYTOGENETIC ABNORMALITY AND THE MUTAGEN HYPERSONSITIVITY IN ROBERTS SYNDROME LYMBOBLASTS BY HYBRIDIZATION WITH NORMAL LYMBOBLASTS |
| D.J. Allingham and D.J. Tomkins, McMaster Univ., Hamilton, Ontario. |

| 8:45 | CYTOGENETIC MECHANISMS IN SELECTIVE TARGETING OF CYCLOPHOSPHAMIDE AND ITS ANALOGS TO AVIAN B-LYMPHOCYTES |
| J.L. Wilmer and S.E. Bloom, Cornell Univ. |

| 9:00 | CYTOGENETIC STUDIES OF ANTIVIRAL NUCLEOSIDES AND THEIR NATURAL ANALOGUES IN HUMAN LYMPHOCYTES |
| R.J. DuFrain and N.S. Wadopian, Bristol-Myers Squibb Co., Syracuse. |
MUTAGENICITY TESTING
AND TEST METHODS
New Mexico Ballroom Parlor C
Conveners: H.E. Holden and
J.H. Carver

8:25
INTRODUCTION

8:30
Bullfrog Tadpole Gill Epithelial
Cell Micronucleus Assay for Water Pollution Monitoring

T-H. Ma, M.M. Harris and T-W. Kim,
Western Illinois Univ.

8:45
Rapid and Efficient Detection of Chemically Induced Aneuploidy Using Drosophila Females

A. Sehgal and C. Osgood. Old Dominion Univ., Norfolk.

9:00
Mutation Detection in Mammalian Sperm Without Progeny Testing: Selection of Mutant DNA

<table>
<thead>
<tr>
<th>Time</th>
<th>Session Title</th>
<th>Location</th>
<th>Conveners</th>
<th>Presenters and Affiliations</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:15</td>
<td>DNA REPAIR</td>
<td>New Mexico Ballroom South</td>
<td>M.A. MacInnes and J.S. Mudgett</td>
<td>Complementation of Mouse UV Sensitive Mutant Q31 with a Cloned Human DNA Excision Repair Gene ERCC5. M.A. MacInnes and J.S. Mudgett, Los Alamos National Laboratory.</td>
</tr>
<tr>
<td>9:45</td>
<td>X Ray Sensitive Cells (ara-C Resistant) are also Hypersensitive to Chromosome Aberration Induction by Restriction Enzymes</td>
<td>New Mexico Ballroom South</td>
<td>M.A. MacInnes and J.S. Mudgett</td>
<td>Differential Adaptive Response of Human Lymphocytes to Different Chemical Mutagens. S.Wolff, G. Olivieri and V. Afzal, Univ. of California, San Francisco.</td>
</tr>
<tr>
<td>9:45</td>
<td>Chromosome Structure Differences Between the Radiosensitive CHO Mutant xrs-5 and its Resistant Parent CHO-K1</td>
<td>New Mexico Ballroom South</td>
<td>M.A. MacInnes and J.S. Mudgett</td>
<td>Analysis of Restriction Enzyme-Induced Breaks in Chinese Hamster Ovary Cells by Pulsed-Field Gel Electrophoresis. W.F. Morgan, D. Ager, J.W. Phillips and R.A. Winegar, Univ. of California, San Francisco.</td>
</tr>
</tbody>
</table>
MUTAGENICITY TESTING AND TEST METHODS

New Mexico Ballroom Parlor C
Conveners: H.E. Holden and J.H. Carver

9:15
Concurrent Detection of Gene Mutation and Chromosomal Aberration in Individual Rats


9:30
A Longitudinal Study Comparing Premoking and Postsmoking 6-Thioguanine-Resistant Variant Frequencies in Baboons Trained to Smoke Cigarettes

M.M. Ammenheuser, J.B. Ward, Jr., E.B. Whorton, Jr. and M.V. Marshall, Univ. of Texas Medical Branch, Galveston, Univ. of Texas Health Science Center, San Antonio and Southwest Foundation for Biomedical Research.

9:45
Detection of Antimutagenic Compounds by Ames Salmonella Assay

K. Manoharan and K. Pant. SITEK Research Laboratories, Rockville, MD.
CONTRIBUTED PAPERS III
Tuesday, 8:25am–10:15am

DNA REPAIR
New Mexico Ballroom South
Conveners: M.A. MacInnes and J.S. Mudgett

10:00
DISCUSSION

10:15
COFFEE BREAK

CYTOGENETICS: MECHANISMS
New Mexico Ballroom Parlor G
Conveners: W.F. Morgan and R.A. Winegar

10:00
THE ANEUPLOIDY INDUCING CARCINOGEN DiETHYlstilbesterl (DES) INTERFERES WITH ACTIN FUNCTION IN MAMMALIAN CELLS IN VITRO

D. Schiffmann, P. Tas, K. Koschel, W. Maile and D. Weiss, Univ. of Würzburg and Technical Univ. of Munich, Germany.

10:15
COFFEE BREAK
MUTAGENICITY TESTING AND TEST METHODS

New Mexico Ballroom Parlor C
Conveners: H.E. Holden and J.H. Carver

10:00
Mutational Spectrometry Accounting for Bias

W.G. Thilly, Massachusetts Institute of Technology.

10:15
Coffee Break
SYMPOSIUM II
Tuesday, 10:45 am–12:50pm
New Mexico Ballroom South

CHROMOSOMES: MOLECULAR ORGANIZATION
AND TARGET FOR MUTAGENESIS

Presiding: B.R. Brinkley
University of Alabama at Birmingham

Sponsor: Bristol-Myers Squibb

It has long been recognized that an understanding of structure and organization of eukaryotic chromosomes is a key to understanding chromosome function. Knowledge of chromosome architecture provides insight into mitotic and meiotic mechanisms and into the underlying basis of effects of mutagens, clastogens, and agents that induce aneuploidy. Moreover, elements of structure are important determinants of how chromosomes serve as targets for mutagenesis, and they therefore influence mutability and the distribution of mutations. Through a combination of biochemistry, molecular biology and microscopic imaging methodologies, the architecture of chromosomes has increasingly become accessible to analysis. This symposium will explore current progress in understanding chromosomal architecture and focus on how modern methodology such as immunofluorescence and in situ hybridization has permitted the elucidation of specialized chromosome regions including kinetochores and telomeres at the molecular level. Possible linkages among molecular architecture, gross structural organization and mutational properties will be explored.

10:45 INTRODUCTION
10:50 Overview of Chromosome Structure and the Kinetochore
   B.R. Brinkley, University of Alabama at Birmingham

11:30 Telomeres
   Robert Moyzis, Los Alamos National Laboratory, New Mexico

12:10 Mutational Bias, Molecular Ecology, and Chromosome Evolution
   Gerald P. Holmquist, Beckman Research Institute of the City of Hope, Duarte, CA

44
Please remove centerpages for EMS membership form
Baltimore, MD 21273 USA
Postal Office Box 73103
Payment Processing Center
Environmental Migrations Society

Submit Application and Check To:

Date
Degree
Institution

Student Certification: Institution and month/year of anticipated graduation.

Federal Telephone System (FTS)
Telephone ( )
City
State
Zip/Postal Code

Signature of Applicant

Organization
Please Print or Type

Name

Sponsor name if corporate member

Last
First
Middle Initial

Middle Initial
Last
First

Applicants received after October 1 will apply to the next year unless otherwise specified.

Membership is valid for the calendar year and includes a subscription to Environmental and Molecular Migrations ($35.00) and the EMS Newsletter.

Includes additional fee for international postage.

Students should list anticipated month and year of graduation, type of degree, and include student certification. By faculty advisor or department chairman.

Includes membership and newsletter for both members. Full and Journal subscriptions to addresses shown. Add spouse address if different from address shown.

USA bank, add $2.00 bank clearance fee ($10.00 Canadian)

Payable in USA dollars drawn on a USA bank if not.

Total Remitted

Corporate membership is available as

Sustaining $550 or Patron $1,000.

D □ Contingent Lab
INTEREST QUESTIONNAIRE

-Hospital
-University
-Government
-National Lab
-Other

-Research
-Regulation
-Education
-Administration
-Other

-Canada, Mexico
-USA

00 $60.00
00 $78.00
00 $103.00
00 $101.00
00 $45.00
00 $63.00

EMS Alexander Hollender Fund
Contributions
Student with Journal
Student
Couple
Regular

Application for Membership

The Environmental Mutagen Society (EMS) brings together scientists of diverse backgrounds and varied interests who are working in the field of mutagens and molecular genetics, whether in academia, industry, or government. Basic and applied research, safety evaluation, and regulation are among topics of concern for members of the society. The society was established in 1969 by a group of geneticists and toxicologists to encourage study of mutagens in the human environment, particularly as they may affect public health, and to engage in scientific investigation and dissemination of information relating to the field of mutagens.

The EMS sponsors a Biennial Conference, an annual meeting, and a number of symposia with invited speakers, contributed papers, poster presentations, workshops, and exhibits. These are intended to provide a forum for the presentation of both basic and applied research.

The Society publishes a Journal, Environmental and Molecular Mutagens, and distributes a newsletter. The Society's annual meetings feature symposia with invited speakers, contributed papers, poster presentations, workshops, and exhibits. These are intended to provide a forum for the presentation of both basic and applied research.
NOTES

- PC. Center: Cresswell Delphi
- Exchange plates
- Exchange pipet tips
- Exchange pipet brush
- Give to another lab - do as consultant work.

We're using Difco.

Let you know when package will be arriving.
SYMPOSIUM III
Tuesday, 2:30pm–5:00pm
New Mexico Ballroom South

Panel Discussion: Are Short-Term Genetic Tests Useful for Predicting Carcinogenicity?

Moderator:
James M. Gentile
Hope College, Holland, MI

Panel Members:

John Ashby
ICI Central Toxicology Laboratory,
United Kingdom

Herman Brockman
Illinois State University, Normal

David J. Brusick
Hazleton LaboratoriesAmerica, Inc.
Vienna, VA

Virginia C. Dunkel
Food and Drug Administration
Washington, DC

Raymond W. Tennant
National Institute of Environmental Health Sciences, Research Triangle Park, NC

Sponsor: SRI International
Despite more than twenty years of using short-term genetic tests, the fundamental question posed in the title of this symposium remains unanswered. Early studies suggested that short-term tests could identify most carcinogens (~90%); skeptics, however, pointed out many flaws in the correlation between mutagenicity and carcinogenicity and questioned the general expectation that such simple tests could accurately predict the complex processes of carcinogenesis. Underscoring this criticism was the realization that the association between mutagenicity and carcinogenicity had not been subjected to sufficient critical analysis. In a key evaluative paper, Tennant et al. (Science 236:933, 1987) reported that several widely used short-term tests are ineffective predictors of the results of recent rodent carcinogenicity bioassays in the National Toxicology Program. Tennant and his associates have recently expanded their analysis to include more compounds and have obtained similar results. Others, however, have criticized the selection of chemicals, methodologies, assumptions, and/or arguments of Tennant et al. This symposium will explore major questions in the debate about short-term tests. The format will be a panel discussion in which scientists who have played a prominent role in the discussion of this issue in the scientific literature will respond to specific questions from the moderator, one another and the audience.

2:30 Discussion
3:30 Coffee Break
4:00 Discussion
MUTATIONAL MECHANISMS: GENETIC AND MOLECULAR ANALYSIS

57
Mutagenicity of Substitutionally Inert Chromium (III) Complexes: A Possible Role for Redox Cycling in the Mechanism of Action
K.D. Sugden and S.J. Rogers, Montana State University.

58
A Comparison of DNA Arylation and Salmonella Mutagenicity with 3,4,5-Trichloro-Nitrobenzene (3,4,5-TCNB)
J.B. Bishop, L.T. Burka and E. Zeiger, National Institute of Environmental Health Sciences.

59
The Effect of pH on the Mutagenicity of Dimethyl- and Diethylthiocarbamate/Divalent-Metal Complexes in Salmonella
D.A. Pagano and E. Zeiger, National Institute of Environmental Health Sciences.

60
Investigations into Microsomal Inhibition of 1,8-Dinitropyrene Mutagenicity in Salmonella
A.B. Shah, I.R. Rowland and R.D. Combes, Portsmouth Polytechnic, BIBRA, and Inveresk Research International Ltd, UK.

61
Induction of Revertants of the hisD3052 Allele of Salmonella typhimurium TA98 by Cigarette Smoke Condensate and Analysis by the Polymerase Chain Reaction and Direct DNA Sequencing
J.G. Levine and D.M. DeMarini, Univ. of NC and US EPA, NC.

62
The Role of Metabolism and Glutathione in the Mutagenicity of Vapour Phase Dichloromethane in Bacteria
D.M. Dillon, R.D. Combes, M. McConville and E. Zeiger, Inveresk Research International Ltd, UK and NIEHS.
DNA Sequence Analysis of hisD3052 Revertants of Salmonella typhimurium TA98 Induced by an Unfractionated and a Neutral/Base Fraction of an Ambient Air Sample
D.A. Bell and D.M. DeMarini, US EPA, NC.

The Effects of Cinnamaldehyde and Vanillin in Growth Assays of Escherichia coli and Salmonella typhimurium
C.E. Haines, Jr., and D.M. Shankel, Univ. of Kansas.

Site Specific Mutagenesis of a Hotspot Site in the LacI Gene of Escherichia coli
J.A. Hallday and B.W. Glickman, York University, Toronto.

Development of a Phagemid-Based Test System for Detecting Point Mutations
W.C. Drosopoulos and J.B. Guttenplan, NYU Dental Center.

Mutational Specificity of NNK in the LacI Gene of Escherichia coli

N-Nitrosopyrrolidine-Induced Mutation in the LacI Gene of Escherichia coli
M. Zielenska, A. Ahmed and B.W. Glickman, York Univ., Toronto.

A Genetic Approach for the Study of Spontaneous Deletion Mutations in a Eukaryote Model System

Molecular Spectrum Analysis of Frameshift Mutations in Yeast
D. Kalinowski, K.M. Mottus, M.J. Plewa and F.W. Larimer, Univ. of Illinois and Oak Ridge National Laboratory.
71
The Use of PCR in the Molecular Spectra Analysis of 4-Nitroquinoline-N-Oxide Induced Reversion in Saccharomyces Cerevisiae
K.M. Mottus, M.J. Plewa and F.W. Larimer, University of Illinois and Oak Ridge National Laboratory.

72
dCMP Deaminase Deficiency Enhances Spontaneous Mutation in Yeast by Nucleotide Misincorporation
S.E. Kohalmi and B.A. Kunz, The University of Manitoba.

73
Analysis of the Mutator Phenotype Confferred by a Yeast Excision Repair Defect (rad1)

74
A Defect in the rad18 Gene Specifically Increases G·C to T·A Transversions in Yeast
X. Kang, L. Kohalmi and B.A. Kunz, The University of Manitoba.

75
Molecular Analysis of Chinese Hamster Ovary Cell Mutants Induced by 1-Nitrosopyrene

76
Nitrobenzo[a]pyrene-Induced Gene Amplification in a Transformed Chinese Hamster Cell Line
R.E. Neft, H.M. Schol, P.P. Fu and D.A. Casciano, National Center for Toxicological Research.

77
Effect of Repair on the Kinds and Spectra of Mutations Induced by BPDE in the HPRT Gene of Diploid Human Fibroblasts Treated at S Phase and 12 Hr Prior to S
78
Strand Specific Mutation Spectra in Repair Proficient and Repair Deficient Mammalian Cells

79
Simplified (and Automatable) Procedures for Genotype Analysis of L5178Y tk⁻ Mutants: Application to Spontaneous Mutations

80
Application of Denaturing Gradient Gel Electrophoresis in the Molecular Analysis of Ionizing Radiation-Induced Mutation in Human Cells

81
Comparative Study of Two Improved Methods for Enhancing DNA-Adduct Detection in the $^{32}$P-Postlabeling Assay with Lung Cells
W-Z. Whong, J.D. Stewart, J. Lewtas and T. Ong, National Institute for Occupational Safety and Health, WV, and EPA, NC.

82
Comparison of Clastogen-Induced Mutation and Chromosome Aberrations in AS52 and CHO-K1-BH4 Cells

83
Karyotypic Variability within the AS52 Cell Line
84 COLONY SIZE DISTRIBUTION OF XPRT MUTANTS IN AS52 CELLS
L.F. Stankowski, Jr., W.G. Tuman, K.F. McLaren, T.A. Polinsky
and J.P. Coyle, Pharmakon Research International, Inc., Waverly,
PA.
85 DELAYED MUTATION IN HUMAN HT1080 FIBROBLASTS
R.A. MacLaren and T.D. Stamato, The Wistar Institute of Anatomy
and Biology, Philadelphia.
86 IN VITRO MAMMALIAN MUTAGENESIS AS A MODEL FOR GENETIC LESIONS
IN HUMAN CANCER
M.M. Moore, M. Applegate, C.L. Doerr, K. Harrington-Brock, and
J.C. Hozier, US EPA, NC, Florida State Univ., Environmental
Health Research and Testing, Inc., NC, and Florida Institute of
Technology.

ANTIMUTAGENESIS, STRUCTURE-ACTIVITY
RELATIONSHIPS, AND COMPLEX MIXTURES

87 MECHANISMS OF ANTI-MUTAGENESIS/ANTI-CARCINOGENESIS BY THE
NATURAL TUMOR MODULATOR INDOLE-3-CARBINOL
R.H. Dashwood, J.D. Hendricks and G.S. Bailey, Oregon State Univ.
88 THE EFFECT OF DIETARY BRUSSELS SPROUTS ON METABOLISM, S-PHASE
SYNTHESIS AND GENOTOXICITY OF AFLATOXIN B1
C. Hamilton, K. Allen, R. Holmes, J. Bakke, K. Garin, K. Steinmetz,
G. Stoewsand, and J. Mirsalis, SRI International and Cornell Univ.
89 EFFECT OF SIX NATURALLY OCCURRING ANTIMUTAGENS ON THE MUT-
AGENICITY OF THREE HETEROCYCLIC AMINES FROM COOKED FOOD IN
Salmonella typhimurium Strain TA98
K. Pupatwibul, Illinois State University.
POSTERS II  Tuesday, 5:15 pm–7:15 pm  Southwest Ballroom and Foyer

90
THE MECHANISM OF THE ANTIMITAGENIC EFFECT OF DIETHYLDITHIOCARBAMATE IN THE PLANT ACTIVATION OF PROMUTAGENS
E.D. Wagner, S.R. Smith, K. Hajek and M.J. Plewa, Univ. of Illinois.

91
ANTIMITAGENICITY OF A LOW MOLECULAR WEIGHT SUPEROXIDE DISMUTASE MIMIC AGAINST OXIDATIVE MUTAGENS

92
STRUCTURE ACTIVITY RELATIONSHIP COMPARING ARYLNITRENIIUM ION STABILITY AND MUTAGENICITY FOR AMINOARENES
K.B. Yeatts, and A.M. Dietrich, Virginia Polytechnic Institute and State University.

93
MUTAGENICITY OF NEW ANALOGS OF METHYL 5-NITRO-2-FUROATE IN SALMONELLA TYPHIMURIIUM TA 100

94
STRUCTURE ACTIVITY ANALYSIS OF AZO DYE MUTAGENICITY IN SPECIFIC SALMONELLA STRAINS
D.B. Walsh and L.D. Claxton, EHRT, Inc., NC, and US EPA, NC.

95
NITRO GROUP ORIENTATION, REDUCTION POTENTIAL AND DIRECT-ACTING MUTAGENICITY OF NITRO-POLYCYCLIC AROMATIC HYDROCARBONS
H. Jung, A.U. Shaikh, R.H. Heflich and P.P. Fu, Univ. of Arkansas, Little Rock and National Center for Toxicological Research.

96
GENETIC TOXICITY SCREENING OF CHEMICAL DERIVATIVES WITH POTENTIAL ANTI-HYPERTENSIVE ACTIVITY

53
POSTERS II  Tuesday, 5:15 pm–7:15 pm  Southwest Ballroom and Foyer

97  
Genotoxic and Carcinogenic Potential of Anticholinesterases  

98  
Comparison of DNA Adducts in Mouse Tissues Following In Vivo Exposure to Complex Air Pollution Sources  
M. George, M. Jackson, J. Gallagher and J. Lewtas, Environmental Health Research and Testing and US EPA, NC.

99  
Genotoxic Compounds Associated with Respirable Urban Air Particulate. Chemical Fractionation and Bioassay of Complex Mixtures  

100  
Use of the Spiral Salmonella Assay to Detect the Mutagenicity of Complex Environmental Mixtures  

101  
In Vitro Genotoxicity Testing of Ammunition Residue Extracts  

102  
Assessing Mutagen Exposure from Environmental Tobacco Smoke in Pre-School Children's Homes  

103  
Mutagenic Activity of the Photooxidation Products of Several Compounds in Automobile Exhaust  
104
Analysis of the Genotoxicity of Municipal Incinerator Ash
M.A. Silkowski and M.J. Plewa, University of Illinois.

105
An Evaluation of the Genotoxic Potential of Mineral Hydro-
carbons
R.H. McKee, R.T. Przygoda, A.C. Tummey, R.N. Infurna and J.J.
Freeman, Exxon Biomedical Sciences, Inc., East Millstone, NJ.

106
Genotoxicity of Organics Isolated from the Effluent of a
Wastewater Reuse Pilot Plant and Environmental Water
M.A. Pereira, M.M. Khoury, K.K. Wasmund, M.S. Hensley, G.L.
Ereksen, J.L. Huston, R.A. Mcgee and B.C. Casto, Environmental
Health Research and Testing, Inc., Cincinnati, and Research Tri-
angle Park.

107
Mutagenic Activities of Water Samples Disinfected with Chlor-
ine or Monochloramine Alone or Following Ozonation
EPA, Cincinnati.

108
Toxicity Reduction Evaluation (TRE) at a Municipal Wastewa-
ter Treatment Plant Using Genotoxicity as an Endpoint
J.U. Doerger, J.R. Meier, R.A. Dobbs, D. Green, R. Johnson and G.
Ankley, US EPA, Cincinnati, Biological Research Faculty and
Facility, Cincinnati, and Environmental Research Laboratory, Du-
luth.

109
Risk Assessment with Complex Mixtures

110
Summary of Mass Extractability, Extraction Techniques and
Mutagenic Activity of Unique Complex Mixtures
R.W. Williams, R. Watts, S. Warren, D. DeMarini, J. Mumford, J.
Lewtas and L. Claxton, Environmental Health Research and Testing
and EPA, NC.
111  
Effect of the Addition of 1-Nitropyrene on the Mutagenicity of Dinitropyrenes  
B.S. Shane and D.L. Calahan, Louisiana State Univ.  

112  
Tradescantia-Micronucleus (TRAD-MCN) and Stamen Hair Mutation (TRAD-SHM) Assays on the Clastogenicity of Chemical Mixtures and In Situ Monitoring of Air and Water Pollution  
Genesys

SPECIALISTS IN GENETIC TOXICOLOGY

Salmonella Mutagenesis

Mammalian Cell Mutagenesis

Cytogenetics Assays

Sister Chromatid Exchange

Unscheduled DNA Synthesis

Micronucleus Testing

Genesys offers an extensive range of protocols required for product registration. Inquiries concerning experience, capabilities and prices are welcome. For an immediate reply, please contact:

Dr. Ann D. Mitchell, President
Genesys Research, Incorporated
2520 Wyandotte Street
Mountain View, California 94043
(415) 968-3635

TESTING SERVICES YOU CAN TRUST
It is now possible to measure directly genetic damage that occurs in vivo in humans. This technology promises to substitute laboratory endpoints for disease endpoints in evaluating human health hazards. Epidemiology is the classical means for defining disease occurrences in populations and must serve as the "gold standard" for any surrogate methods that are proposed for making human risk assessments. The first paper in this symposium explores the methods of epidemiology. One of the newer methods for detecting genetic damage in vivo in somatic cells is the analysis of specific gene mutations. The current assays for doing this will be discussed, compared and evaluated in terms of performance. There has long been a need for surrogate methods to detect human heritable genetic damage. The assay of germlinal mutations at hyper-variable loci is a newly described method that may have applications to this problem. This assay is presented and discussed in the third paper. Finally, regardless of the ultimate utility of these new technologies, studies of humans in "real life" situations forces immediate interpretations, imperfect though they may be. This symposium will conclude with a consideration of the issues that arise when current-day medicine deals with the results of in vivo mutagenicity monitoring in humans.
EMS BUSINESS MEETING
Wednesday, 11:30am–12:30pm

New Mexico Ballroom South

All EMS Members are Invited to Participate
POSTERS III
Thursday, 8:45 am–10:45 am
Southwest Ballroom and Foyer
Coffee will be available in the Poster Session

CYTOGENETICS

113
Genotoxicity of Inhibitors of DNA Topoisomerases I (Campotecin) and II (m-AMSA)

114
Genotoxicity of 1-Nitronaphthalene in Chinese Hamster V79 Cells

115
Influence of Chromium Compounds in Causing Chromosome Changes in Cultured CHO Cells
W. Howard, B. Leonard, W. Moody and T.S. Kochhar, Kentucky State University, Frankfort.

116
Determination of Genotoxic and Cytotoxic Effects of Chelators and Metal Deprivation to CHO Cells

117
Sister Chromatid Exchange in Chinese Hamster Ovary Cells with Diaminozide and 1,1-Dimethylhydrazine

118
Flow Cytometric Evaluation of Cell-Cycle Progression in Ethyl Methanesulfonate and Methyl Methanesulfonate-Exposed P3 Cells. Relationship to the Induction of Sister-Chromatid Exchanges and Cellular Toxicity
119
Radiation Induced Chromosome Aberrations in Human Lymphocytes—Aberration Loss Through Successive Cell Divisions

120
Chromosome Abnormalities in MTX-Arrested Human Leukocytes Exposed to Protein-Specific Alkyl Imidates and X-Radiation
V.B. Richardson, A.M. Sayer and L.G. Littlefield, Tuskegee Univ. and Oak Ridge Associated Universities.

121
A Mixture of Benzene Metabolites Produces a Synergistic Genotoxic Response in Cultured Human Lymphocytes
M.L. Robertson, D.A. Eastmond and M.T. Smith, Univ. of California, Berkeley.

122
The Mutagenicity of Salicylazosulfapyridine (SASP)

123
Mitomycin C Induced In Vivo Centric Fusions in the Bone Marrow Cells of CD-1 Mice

124
Micronucleus Test (MNT) and Chromosome Aberrations (CA) from a Single Animal

125
The Database for the Micronucleus Test (MNT)
POSTERS III   Thursday, 8:45am–11:45am   Southwest Ballroom and Foyer

126
Software for the Analysis of Micronucleus (MN) and Chromosomal Aberration (CA) Data

127
Changes in Mouse Marrow Aspirates After Leukocyte Removal Via Cellulose Columns

128
The Rat Bone Marrow Micronucleus Assay: Approach to Steady-State Micronucleus Frequencies During Repeated Dosing Using Direct Smears and Purified Erythrocytes
K.E. Garin, J.T. MacGregor and J.C. Mirsalis, SRI International.

129
In Vivo Cytogenetic Studies of Ethyl Acrylate in C57BL/6 Mice

130
Protocol Evaluation for the Micronucleus Test: Bleeding Enhances Chemically-Induced Micronuclei Frequencies

131
Induction of Micronuclei and SCEs by Polycyclic and N-Heterocyclic Aromatic Hydrocarbons in Cultured Human Lymphocytes
G.K. Livingston, D. Warshawsky, M. Fonouni-Fard, K. LaDow, University of Cincinnati.

132
Induction of Micronuclei in Rat Bone Marrow and Spleen Cells by Varied Dose-Rate of Ethylene Oxide
V. Hochberg, X-C. Shi, W. Moorman and T. Ong, National Institute for Occupational Safety and Health.
133 Cytogenetic Evaluation of Three Structurally-Related Phenylenediamines in the Mouse Micronucleus Assay
L. Soler-Niedziela, J. Nath and T. Ong, Research Triangle Institute, West Virginia University and NIOSH.

134 Mouse-Peripheral-Erythrocyte-Micronucleus (MUS-PEMN) Assay on Common Clastogens

135 A Comparison of Micronucleus Frequencies in Mouse Bone Marrow and Peripheral Blood Erythrocytes Using Multiple Sampling Times After Exposure to Mitomycin C In Vivo
J.L. Huston, R.M. McGee, G.L. Erexson and B.C. Casto, Environmental Health Research and Testing, NC.

136 Protocol Evaluation for the Micronucleus Test: Peripheral Blood Versus Bone Marrow

137 Sister Chromatid Exchange and Micronucleus Analyses in Rat Peripheral Blood Lymphocytes Following In Vivo Exposure to Dibenz(a,h)anthracene

138 Induction of Micronuclei in Human Lymphocytes After In Vitro Exposure to Low Doses of Neutrons
K. Rithidech, R.R. Tice and V.P. Bond, Brookhaven National Laboratory.
139
**TEMPORAL EXPOSURE FACTORS INFLUENCING INDUCTION OF SISTER CHROMATID EXCHANGES BY ETHYLENE OXIDE IN RAT SPLEEN AND BONE MARROW CELLS**

140
**In Vito Aneuploidy Assay in Mouse Bone Marrow Erythrocytes**
R.D. Gudi and A. Thilagar, SITEK Research Laboratories, Rockville MD.

**CELL TRANSFORMATION AND ONCOGENES**

141
**IN VolVEMENT OF ras ONCOGENES IN SPONTANEOUS AND CHEMICALLY-INDUCED TUMORS AND IN RADON-INDUCED LUNG TUMORS IN THE RAT**
L.S. McCoy, M.E. Foreman and M.E. Frazier, Pacific Northwest Laboratory, Richland WA.

142
**INDUCTION OF MORPHOLOGICAL TRANSFORMATION BY SMOKELESS TOBACCO EXTRACTS IN BALB/3T3 CELLS**

143
**ANEUPLOIDY AND NONRANDOM STRUCTURAL CHROMOSOME CHANGES ASSOCIATED WITH EARLY AND LATE STAGES OF BENZO(a)PYRENE-INDUCED NEOPLASTIC TRANSFORMATION OF SYRIAN HAMSTER EMBRYO CELLS**

144
**GENOTOXICITY OF ZINC CHELATES OF NITRILOTRIACETIC ACID (NTA) AND EDTA**
145
Immortalization of Fibroblasts Derived from Patients with Hereditary Form of Retinoblastoma with SV40-Derived Plasmid Vectors

MUTAGENESIS & DNA DAMAGE IN MAMMALIAN CELLS IN VIVO

146
Analysis of In Vivo Somatic Mutations of the HPRT Gene in Mouse Lymphocytes
K. Burkhart-Schultz, J.M. Jones and C.L. Strout, Lawrence Livermore National Laboratory.

147
Induction of HPRT Mutations in Spleen Lymphocytes of BALB/C and CD-1 Mice by X-Ray or Cyclophosphamide
J.B. Ward, Jr., D.L. Morris and M.M. Ammenheuser, University of Texas Medical Branch, Galveston.

148
Patterns of HPRT Mutations Detected in Newborns and Elderly by Cloning Assay

149
Detection of Clonally-Amplified Populations of HPRT- Cells

150
The Effect of Morphine Administration on T-Cell Response to Phytohemagglutinin and Ethynitrosourae
D.B. Couch and T.G. Smith, University of Mississippi Medical Center.
151 Concurrent Detection of Gene Mutation and Chromosomal Aberrations Induced In Vivo in Somatic Cells
J.A. Heddle, A. Bouch, M. Khan and J.D. Gingerich, York University, Toronto.

152 Multiple Endpoint In Vivo Genetic Toxicology Assay: Evaluation of Hepatic Unscheduled DNA Synthesis, S-Phase Synthesis and Peripheral Blood Micronuclei Following Repeated Dosing of Male B6C3F1 Mice

153 The Relationship of Lipid Peroxidation and DNA Strand Breakage in Mammalian Hepatic Tissue
T.J. Stinson, S. Jaw, E. Jeffery and M.J. Plewa, Univ. of Illinois.

MAMMALIAN GERM-CELL MUTAGENESIS

154 Design of a Multiple Endpoint System for Detection of Germlinal Mutations in the Mouse

155 Mutation Detection in Mammalian Sperm without Progeny Testing: Visualization of Polymerase Chain Reaction (PCR)-Amplified Genomic Mouse DNA by Electron Microscopy
A.D. Safron, K.B. Rank, L. Beuving and G. Ficsor, Western Michigan University.

156 A Dominant Lethal Test of Dimethyl Formamide
157
Comparison of Chemically Induced Aneuploidy Between Mammalian Oocytes and Spermatocytes
J.B. Mailhes, Z.P. Yuan and M.J. Aardema, Louisiana State University Medical Center, Shreveport, and The Procter & Gamble Company, Cincinnati.

158
An In Vivo Aneuploidy Assay in Mouse Germ Cells Using Kinetochore Specific Antibodies
R.D. Gudi and A. Thilagar, SITEK Research Laboratories, Rockville, MD.

159
Induction of Chromosome-Type Aberrations in Zygotes and High Incidence of Heritable Translocations in Offspring After Treatment of Mouse Spermatozoa with Nitrogen Mustard-N-Oxide Hydrochloride
R.P. Valdivia and M. Katoh, University of Chile, Santiago, and Food and Drug Safety Center, Hadano, Kanagawa, Japan.

160
Chromosomal Imbalance in Malformed Mouse Fetuses

HUMAN MONITORING

161
"Spontaneous" Levels of Chromosomal Breakage in Epithelial Cells of "Normal" Human Populations
M.P. Rosin, I. Csongos and D. Stirling, Simon Fraser University and Trinity Western University, BC.

162
Estimation and Analysis Considerations for the 6-Thioguanine-Resistant Somatic Cell Mutation Assay
E.B. Whorton, M.M. Ammenheuser, J.B. Ward, Jr. and D.L. Morris, University of Texas Medical Branch, Galveston.
163
**Development of a Method for Detection of Nucleotide Substitution Mutations in the Human Genome**

164
**Development of a Screen for Insertion, Deletion and Rearrangement (I/D/R) Mutations in Humans**

165
**Differential Clonogenic Potential of T-Lymphocytes in the HPRT Clonal Assay**
H. Dubeau, C. Baron, W. Zazi and A.M. Seifert, Université du Québec, Montréal.

166
**Studies of Radioimmunoglobulin Therapy (RIT) Patients with the HPRT Cloning Assay**

167
**Personal Exposure of Railroad Workers to the Mutagens in Diesel Exhaust**

168
**Comparative Studies of the Mutagenicity of Urine from Smokers and Nonsmokers on a Controlled, Nonmutagenic Diet**
169  
**Cytogenetic Study Among Workers Packing Pesticides**  
S. El-Ghazali, W.W. Au, W. Anwar, M. Legator and A. Massoud, Ain Shams University, Cairo, Egypt, and University of Texas Medical Branch, Galveston.

170  
**Variation in Cellular Levels of Beta-Carotene after Short-Term Supplementation**  

171  
**Frequency of Sister Chromatid Exchanges in Workers Exposed to Pesticides**  
H. Groot de Restrepo and F. Valenzuela, Universidad de los Andes, Bogotá, Colombia.

172  
**Further Studies of the "Adaptive" Repair Response in Human Lymphocytes After Treatment with MNNG**  
A.J. Francis, D. Anderson and P. Fisher, BIBRA, Surry, UK and Royal London Homoeopathic Hospital, London.
SPECIAL LECTURE II

Thursday, 11:00 am – 11:55 am

New Mexico Ballroom South

The Human Genome Project
and Its Implications for Mutation Research

Anthony V. Carrano

Lawrence Livermore National Laboratory
Livermore, California

Sponsors: Monsanto Company
and
Genmap, Inc.
CONTRIBUTED PAPERS IV
Thursday, 1:25pm–3:00pm

DNA DAMAGE AND REPAIR
New Mexico Ballroom South
Conveners: R.K. Elespuru and
D.A. Bell

1:25
INTRODUCTION

1:30
DNA ADDUCT DETECTION BY ACCELERATOR MASS SPECTROMETRY: A POWERFUL NEW RADIOTRACER TECHNIQUE FOR MEASUREMENT OF EXTREMELY LOW-LEVELS OF BIOLOGICALLY AND ENVIRONMENTALLY IMPORTANT MOLECULES

K.W. Turteltaub, J.S. Felton, J.S. Vogel, I.D. Proctor, J.C. Davis and B.L. Gledhill, Lawrence Livermore National Laboratory.

1:45
EVALUATION OF BENZO[a]PYRENE ADDUCTS IN RAT LIVER, LUNG AND PERIPHERAL BLOOD LYMPHOCYTE DNA


2:00
IMMUNOFLUORESCENCE ASSAY OF UV-INDUCED THYMIDINE DIMERS REMOVAL IN A DNA POLYMERASE-A MUTANT


METABOLISM AND METABOLIC ACTIVATION
New Mexico Ballroom Parlor G
Conveners: M.J. Plewa and
S.R. Smith

1:25
INTRODUCTION

1:30
DEVELOPMENT OF MATCHED REPAIR-DEFICIENT AND -PROFICIENT CELL LINES THAT METABOLIZE HETEROCYCLIC AMINES


1:45
ACTIVATION OF 2-AMINOFLUORENE INTO A SALMONELLA MUTAGEN BY HUMAN LEUKOCYTES

V.J. Isola, S.J. Trumble, M. Ruzek and J.M. Gentile, Hope College, Holland, MI.

2:00
MUTATION ANALYSIS BY THE HUMAN-HAMSTER HYBRID CELL/PRIMARY EMBRYONIC CHICK HEPATOCYTE [A/PECH] METHOD

## CONTRIBUTED PAPERS IV

**Thursday, 1:25pm–3:00pm**

### COMPLEX MIXTURES AND CHEMICAL ANALYSIS

- **New Mexico Ballroom Parlor C**
- **Conveners:** L.D. Claxton and T.J. Hughes

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Authors/Roles</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:25</td>
<td><strong>INTRODUCTION</strong></td>
<td></td>
</tr>
<tr>
<td>1:30</td>
<td><strong>Separation of the Mutagenic Components from the Carcinogen HC Blue 1</strong></td>
<td>A. Abu-Shakra, L. Johnson, K. Earley, R. Gupta, W. Jameson, F. Kari and R. Langenbach, National Institute of Environmental Health Sciences and Univ. of Kentucky.</td>
</tr>
<tr>
<td>1:45</td>
<td><strong>Isolation and Identification of Two Pyrido-Indole Mutagens from a Commercial Beef Extract</strong></td>
<td>R.T. Taylor, E. Fultz and M.L. Hanna, Lawrence Livermore National Laboratory.</td>
</tr>
<tr>
<td>2:00</td>
<td><strong>Mutagenicity and the Bioremediation of the Alaskan Oil Spill</strong></td>
<td>L.D. Claxton, V.S. Houk and F. Kremer, US Environmental Protection Agency, NC and Cincinnati.</td>
</tr>
</tbody>
</table>

**Sponsors for Contributed Papers IV:**
Rohm and Haas
United States Testing Company, Inc.

### NOTES
CONTRIBUTED PAPERS IV
Thursday, 1:25pm–3:00pm

DNA DAMAGE AND REPAIR
New Mexico Ballroom South
Conveners: R.K. Elespuru and D.A. Bell

2:15
Chemically Induced DNA Repair in Human Mammary Epithelial Cells

2:30
Isolation and Characterization of Uracil DNA Glycosylase from Barley (Hordeum vulgare) Embryos
S. Trevizo, L. Bitticks and P. Arenaz, Univ. of Texas, El Paso.

2:45
Gene-Specific and Genomic DNA Repair of Alkylation Damage in Human T-Lymphocytes
J.D. Bartlett, D.A. Scicchitano and S.H. Robison, Univ. of Vermont and The American Health Foundation, Valhalla, NY.

METABOLISM AND METABOLIC ACTIVATION
New Mexico Ballroom Parlor G
Conveners: M.J. Plewa and S.R. Smith

2:15
The Biochemical Basis of the Activation of Pro-Mutagens by Plant Cell Systems
M.J. Plewa and E.D. Wagner, Univ. of Illinois.

2:30
Deactivation of Nitropyrenes by Alligator Weed (Alternanthera philoxeroides) Suspension Cultures
B.S. Shane and D.J. Longstreth, Louisiana State Univ.

2:45
Tryptophan Metabolism in a Cancer Susceptible Species of Mouse
R.A. Modzelewski and M.K. Conner, Univ. of Pittsburgh.

3:00
Coffee Break

3:00
Coffee Break

74
COMPLEX MIXTURES AND CHEMICAL ANALYSIS

New Mexico Ballroom Parlor C
Conveners: L.D. Claxton and T.J. Hughes

2:15
Bioassay-Directed Chemical Analysis of Incinerator Effluents and Other Combustion Emissions


2:30
Discussion

3:00
Coffee Break
SYMPOSIUM V  
Thursday, 3:30pm–5:50pm  
New Mexico Ballroom South  

THE ALEXANDER HOLLAENDER SYMPOSIUM  

PROVOCATIVE MODELS FOR DNA REPAIR  

Presiding: Philip C. Hanawalt  
Stanford University  

Sponsor: U.S. EPA, Research Triangle Park  

Alexander Hollaender in 1935 provided early evidence for DNA repair, based upon growth studies with UV-irradiated bacteria. Throughout his illustrious career he inspired research toward an understanding of basic mechanisms in this field. He would have been gratified to learn of recent progress and remarkable discoveries, a few of which are documented here: 1) An early step in excision-repair in UV-irradiated human cells may involve hydrolysis of the DNA backbone between dimerized pyrimidines. 2) Transcribed DNA strands in expressed genes are selectively repaired in UV-irradiated cells, suggesting that damage recognition can be directly coupled to transcription. 3) The mismatch repair system edits strand exchange in recombination, to abort heteroduplex intermediates carrying mismatched base pairs, thereby providing a barrier to interspecies recombination.  

3:30 Provocative Models for DNA Repair: An Overview  
Philip C. Hanawalt, Stanford University  

3:50 Intermediates in the Repair Processing of Pyrimidine Dimers  
Malcolm C. Paterson, Cross Cancer Institute, Edmonton, Alberta.  

4:30 Implications of Strand-Specific DNA Repair  
Isabel Mellon, University of Kentucky, Lexington.  

5:10 Role of Mismatch Repair in Fidelity of Recombination, Chromosomal Stability, and Evolution of Species  
Miroslav Radman, National Institute of Environmental Health Sciences, Research Triangle Park, NC.
AUTHOR INDEX
AUTHOR INDEX

-A-
Aardema, M.J. 60, 64, 67
Aaron, C.S. 30, 61
Abbott, M.G. 62
Abu-Shakra 33, 73
Adair, G.M. 16
Afzal, V. 40
Ager, D. 40
Ahmed, A. 49
Ahmed, S. 17
Aidoo, A. 30
Albertini, R.J. 22, 58, 65, 68
Alexander, M.L. 35
Allegrutta, M. 65
Allen, J.W. 60
Allen, K. 52
Allingham, D.J. 38
Arnes, B.N. 15
Ammenheuser, M.M. 41, 65, 67
Anderson, D. 69
Andrews, P. 19, 28, 54
Ankley, G. 55
Anwar, W. 69
Anzick, S.L. 51
Applegate, M. 52
Arenaz, P. 74
Armstrong, M.J. 24
Arreola, G.G. 63
Ashby, J.A. 31, 46
Athwal, R.S. 13
Atwater, A.L. 62, 63
Au, W.W. 15, 69
Auletta, A.E. 31

-B-
Backer, L.C. 60
Bailey, G.S. 52
Bakke, J. 52, 54, 66
Balbinder, E. 33
Ball, J.C. 18
Balwierz, P.S. 32
Banerjee, A. 65
Barnett, L.B. 66
Baron, C. 68
Bartlett, J.D. 74
Baryo, S. 14
Baturay, M.S. 14
Baturay, N.Z. 14
Bean, C.L. 24, 28
Bell, D.A. 49
Bempong, M.A. 30
Benedict, W.F. 65
Beuving, L. 66
Bewsey, B. 30
Bi, B.L. 64
Bishop, J.B. 48, 61
Bitticks, L. 74
Black, F. 54
Blevins, R.D. 32
Blonsky, K.S. 26
Bloom, S.E. 38
Boldt, J. 24
Bond, V.P. 63
Bouch, A. 66
Boyse, B.G. 60
Bradley, M.O. 28
Brimer, P.A. 25
Brinkley, B.R. 44
Brockman, H. 46
Brookman, K.W. 38
Brooks, A.L. 29
Brookshire, K.W. 14, 28
Brotherman, K.A. 16
Brott, D. 22
Brusick, D.J. 11, 46
Bryan, G.T. 53
Bryant, D.W. 54
<table>
<thead>
<tr>
<th>Author</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bryant, M.F.</td>
<td>22, 62, 63</td>
</tr>
<tr>
<td>Bufalini, J.</td>
<td>54</td>
</tr>
<tr>
<td>Buonarati, M.H.</td>
<td>33</td>
</tr>
<tr>
<td>Burger, G.T.</td>
<td>68</td>
</tr>
<tr>
<td>Burk, L.T.</td>
<td>48</td>
</tr>
<tr>
<td>Burkhart-Schultz, K.</td>
<td>65</td>
</tr>
<tr>
<td>Busch, D.B.</td>
<td>34</td>
</tr>
<tr>
<td>Butterworth, B.E.</td>
<td>73</td>
</tr>
<tr>
<td>Byrne, B.J.</td>
<td>23</td>
</tr>
<tr>
<td>Cacheiro, N.L.</td>
<td>67</td>
</tr>
<tr>
<td>Cain, K.T.</td>
<td>25, 67</td>
</tr>
<tr>
<td>Calahan, D.L.</td>
<td>56</td>
</tr>
<tr>
<td>Calandra, T.D.</td>
<td>60</td>
</tr>
<tr>
<td>Campbell, J.A.</td>
<td>60</td>
</tr>
<tr>
<td>Cantelli Fori, G.</td>
<td>32</td>
</tr>
<tr>
<td>Cariello, N.F.</td>
<td>51</td>
</tr>
<tr>
<td>Carrano, A.V.</td>
<td>71</td>
</tr>
<tr>
<td>Carson, J.R.</td>
<td>53</td>
</tr>
<tr>
<td>Caruso, J.E.</td>
<td>60</td>
</tr>
<tr>
<td>Casciano, D.A.</td>
<td>30, 50, 60</td>
</tr>
<tr>
<td>Caskey, C.T.</td>
<td>22</td>
</tr>
<tr>
<td>Caspary, W.</td>
<td>30</td>
</tr>
<tr>
<td>Casto, B.C.</td>
<td>55, 63</td>
</tr>
<tr>
<td>Cebula, T.A.</td>
<td>16, 18</td>
</tr>
<tr>
<td>Centanni, J.</td>
<td>34</td>
</tr>
<tr>
<td>Chang, C-C.</td>
<td>30</td>
</tr>
<tr>
<td>Channaraayappa,</td>
<td>24</td>
</tr>
<tr>
<td>Chastenay, B.</td>
<td>65</td>
</tr>
<tr>
<td>Chen, J.K.</td>
<td>64</td>
</tr>
<tr>
<td>Chen, R-H.</td>
<td>50</td>
</tr>
<tr>
<td>Chen, T.D.</td>
<td>56</td>
</tr>
<tr>
<td>Chen, W.</td>
<td>40</td>
</tr>
<tr>
<td>Christensen, C.C.</td>
<td>31</td>
</tr>
<tr>
<td>Chu, E.H.</td>
<td>68</td>
</tr>
<tr>
<td>Ciaravino, V.</td>
<td>22, 31</td>
</tr>
<tr>
<td>Cimino, M.C.</td>
<td>31</td>
</tr>
<tr>
<td>Ciofalo, V.B.</td>
<td>61</td>
</tr>
<tr>
<td>Claxton, L.D.</td>
<td>31, 53, 54, 55, 73</td>
</tr>
<tr>
<td>Clive, D.</td>
<td>29</td>
</tr>
<tr>
<td>Cochrane, J.</td>
<td>22</td>
</tr>
<tr>
<td>Cohen, M.D.</td>
<td>16</td>
</tr>
<tr>
<td>Coles, C.</td>
<td>24</td>
</tr>
<tr>
<td>Colyer, S.P.</td>
<td>61</td>
</tr>
<tr>
<td>Combes, R.D.</td>
<td>48</td>
</tr>
<tr>
<td>Conner, M.K.</td>
<td>74</td>
</tr>
<tr>
<td>Cornett, C.V.</td>
<td>67</td>
</tr>
<tr>
<td>Couch, D.B.</td>
<td>65</td>
</tr>
<tr>
<td>Cowan, J.M.</td>
<td>40</td>
</tr>
<tr>
<td>Coyle, J.P.</td>
<td>52</td>
</tr>
<tr>
<td>Cragin, D.W.</td>
<td>66</td>
</tr>
<tr>
<td>Crespi, C.L.</td>
<td>33</td>
</tr>
<tr>
<td>Croom, D.K.</td>
<td>54</td>
</tr>
<tr>
<td>Csonitos, I.</td>
<td>67</td>
</tr>
<tr>
<td>Cunningham, M.L.</td>
<td>14</td>
</tr>
<tr>
<td>Cupitt, L.</td>
<td>54</td>
</tr>
<tr>
<td>Dashwood, R.H.</td>
<td>52</td>
</tr>
<tr>
<td>Daston, D.</td>
<td>30</td>
</tr>
<tr>
<td>Davis, J.C.</td>
<td>72</td>
</tr>
<tr>
<td>Davison, A.J.</td>
<td>69</td>
</tr>
<tr>
<td>de Leeuw, W.J.</td>
<td>22</td>
</tr>
<tr>
<td>De Marini, D.M.</td>
<td>48, 49, 55, 60, 75</td>
</tr>
<tr>
<td>de Serres, F.J.</td>
<td>26</td>
</tr>
<tr>
<td>Deahl, J.T.</td>
<td>29</td>
</tr>
<tr>
<td>Dearfield, K.L.</td>
<td>29, 62</td>
</tr>
<tr>
<td>DeGraff, W.G.</td>
<td>53</td>
</tr>
<tr>
<td>Delclos, D.B.</td>
<td>32</td>
</tr>
<tr>
<td>Dhesi, J.S.</td>
<td>26</td>
</tr>
<tr>
<td>Di Lorenzo, A.</td>
<td>28</td>
</tr>
<tr>
<td>Diamond, A.</td>
<td>40</td>
</tr>
<tr>
<td>Dietrich, A.M.</td>
<td>53</td>
</tr>
<tr>
<td>Dillon, D.M.</td>
<td>48</td>
</tr>
<tr>
<td>Dobbs, R.A.</td>
<td>55</td>
</tr>
<tr>
<td>Doerger, J.U.</td>
<td>55</td>
</tr>
<tr>
<td>Doerr, C.L.</td>
<td>29, 52, 60</td>
</tr>
<tr>
<td>Domon, O.E.</td>
<td>60</td>
</tr>
</tbody>
</table>
Doody, L.A.  29
Doolittle, D.  68, 72
Drinkwater, N.D.  20
Drosopoulos, W.C.  49
Dubeau, H.  68
Dufraine, R.J.  38
Dunbar, V.G.  24
Dunkel, V.C.  46
Dunn, B.P.  35

---

E---

Earley, K.  72, 73
Earley, G.  54
Eastmond, D.A.  61
Eisenstark, A.  14
El-Ghazali, S.  17, 69
Eldridge, S.R.  74
Elespuru, R.K.  14
Elia, M.C.  34
Erexson, G.L.  22, 55, 62, 63

---

F---

Falek, A.  24
Falta, M.  65, 68
Faris, R.  17
Felton, J.S.  17, 33, 72
Feuers, R.J.  30
Ficsor, G.  39, 66
Fisher, P.  69
Fonouni-Fard, M.  62
Foreman, M.E.  64
Forenza, S.  14, 28
Francis, A.J.  69
Frazier, M.E.  64
Fry, S.  58
Freeman, J.J.  55
Fu, P.P.  32, 50, 53
Fuchs, R.P.P.  20
Fujino, Y.  62
Fultz, E.  73

---

G---

Gad, S.C.  32
Gallagher, J.  54
Galloway, S.M.  24, 28
Garin, K.  52, 62, 66
Garrett, N.E.  54
Geard, C.R.  18
Gelboin, H.V.  33
Gemmell, M.A.  23
Generoso, E.E.  25
Generoso, W.M.  25, 27
Gentile, G.J.  32
Gentile, J.M.  32, 72
George, M.H.  54
Getman, S.M.  22
Gibbs, R.A.  22
Gibson, D.P.  64
Giglio, T.  61
Gilbert, A.M.  69
Gill, A.  53
Gill, B.S.  26
Gingerich, J.D.  66
Ginsberg, L.C.  39
Giometti, C.S.  23
Gledhill, B.L.  72
Glickman, B.W.  49
Gonglewski, N.  61
Gonzalez, F.J.  33
Gossen, J.A.  22
Goth-Goldstein, R.  38
Gould, M.N.  74
Green, D.  54
Greer, G.A.  40
Griffin, J.  24
Groot de Restrepo, H.  69
Grzegorczyk, C.R.  30
Gudi, R.D.  64, 67
Gulati, D.  61
Gunnell, S.  65

80
Gupta, R. 72, 73
Guttenplan, J.B. 49
Guzzie, P.J. 32

-H-
Haines, Jr., C.E. 49
Hajek, K. 53
Halbrook, R.S. 35
Halliday, J.A. 49
Halperin, E.C. 22
Hamilton, C.M. 52, 66
Hammermeister, C.L. 24
Hammond, K.S. 54
Hammond, S.K. 68
Hanawalt, P.C. 34, 35, 76
Hanna, M.L. 73
Haraf, D. 40
Harbach, P.R. 30
Harrington-Brock, K. 29, 52, 60
Harris, M.M. 39
Hartl, D.L. 21
Hartman, P.E. 33
Hartman, Z. 33
Hashimoto, T. 65
Hatcher, J.F. 53
Hayes, A.W. 68
Hedle, J.A. 41, 66
Heflich, R.H. 32, 50, 53
Henderson, F.W. 54
Hendricks, J.D. 52
Henner, W.D. 28
Hennig, U. 13
Hensley, M.S. 55
Herrmann, A. 58
Hiatt, R. 15
Hilliard, C.J. 63
Hirai, O. 19, 62
Hirsch, B. 17, 65
Hochberg, V. 62
Hogan, C.C. 60
Holmes, R. 52
Holmquist, G.P. 44
Hook, G.J. 32
Horiya, N. 25
Houk, V.S. 31, 54, 73
Howard, D.R. 60
Howard, G. 68
Howard, W. 60
Hozier, J. 51, 52
Hrelia, P. 32
Hsie, A.W. 22
Hsieh, D.P. 68
Hsu, G.S. 72
Hsueh, J.L. 35
Hu, S-X. 65
Hudgens, E. 54
Hughes, M. 38
Hughes, T.J. 31, 54
Hunsicker, P.R. 23, 27
Huston, J.L. 55, 63

-I-
Ichikawa, M. 53
Infurna, R.N. 55
Isola, V.J. 72
Ivett, J. 11

-J-
Jackson, M. 54
Jacobson-Kram, D. 40, 68
Jaffe, D. 40
Jagannath, D.R. 34
Jameson, W. 73
Jaw, S. 66
Jeffery, E. 66
Jenkins, G. 18
Jensen, R. 15
Jiao, J.L. 49
Johnson, L. 73
Johnson, N.F. 29
<table>
<thead>
<tr>
<th>Name</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Johnson, P.</td>
<td>32</td>
</tr>
<tr>
<td>Johnson, R.</td>
<td>54</td>
</tr>
<tr>
<td>Johnson, T.E.</td>
<td>24</td>
</tr>
<tr>
<td>Joiner, E.E.</td>
<td>61</td>
</tr>
<tr>
<td>Jones, I.M.</td>
<td>65</td>
</tr>
<tr>
<td>Jones, J.</td>
<td>18</td>
</tr>
<tr>
<td>Jou, Y-S.</td>
<td>30</td>
</tr>
<tr>
<td>Judd, S.A.</td>
<td>68</td>
</tr>
<tr>
<td>Jung, H.</td>
<td>32, 53</td>
</tr>
<tr>
<td>Kado, N.Y.</td>
<td>68</td>
</tr>
<tr>
<td>Kalinowski, D.</td>
<td>49</td>
</tr>
<tr>
<td>Kang, X.</td>
<td>50</td>
</tr>
<tr>
<td>Kari, F.</td>
<td>73</td>
</tr>
<tr>
<td>Katoh, M.</td>
<td>25, 67</td>
</tr>
<tr>
<td>Keohavong, P.</td>
<td>51</td>
</tr>
<tr>
<td>Kerckaert, G.A.</td>
<td>64</td>
</tr>
<tr>
<td>Khan, M.</td>
<td>41, 66</td>
</tr>
<tr>
<td>Khoury, M.M.</td>
<td>55</td>
</tr>
<tr>
<td>Kim, H.</td>
<td>65</td>
</tr>
<tr>
<td>Kim, N.</td>
<td>26</td>
</tr>
<tr>
<td>Kim, T.</td>
<td>28, 39, 63</td>
</tr>
<tr>
<td>Klein, C.B.</td>
<td>28</td>
</tr>
<tr>
<td>Kleindienst, T.</td>
<td>54</td>
</tr>
<tr>
<td>Klepetka, J.F.</td>
<td>39</td>
</tr>
<tr>
<td>Kligerman, A.D.</td>
<td>22, 60, 62, 63</td>
</tr>
<tr>
<td>Knowles, R.</td>
<td>14</td>
</tr>
<tr>
<td>Koch, W.H.</td>
<td>16</td>
</tr>
<tr>
<td>Kochhar, T.S.</td>
<td>60</td>
</tr>
<tr>
<td>Kodell, R.L.</td>
<td>60</td>
</tr>
<tr>
<td>Kohalmi, L.</td>
<td>50</td>
</tr>
<tr>
<td>Kohalmi, S.E.</td>
<td>50</td>
</tr>
<tr>
<td>Koschel, K.</td>
<td>42</td>
</tr>
<tr>
<td>Kovacs, B.W.</td>
<td>58</td>
</tr>
<tr>
<td>Kraynak, A.R.</td>
<td>28</td>
</tr>
<tr>
<td>Kremer, F.</td>
<td>73</td>
</tr>
<tr>
<td>Krishna, G.</td>
<td>22, 31</td>
</tr>
<tr>
<td>Kropko, M.</td>
<td>22, 31</td>
</tr>
<tr>
<td>Kumar, A.</td>
<td>49</td>
</tr>
<tr>
<td>Kumaroo, P.V.</td>
<td>30</td>
</tr>
<tr>
<td>Kunkel, T.A.</td>
<td>20</td>
</tr>
<tr>
<td>Kunz, B.A.</td>
<td>50</td>
</tr>
<tr>
<td>Kupchella, E.</td>
<td>16, 18</td>
</tr>
<tr>
<td>Kwan, T.C.</td>
<td>17</td>
</tr>
<tr>
<td>Kwanyuen, P.</td>
<td>62, 63</td>
</tr>
<tr>
<td>LaDow, K.</td>
<td>62</td>
</tr>
<tr>
<td>Langenbach, R.</td>
<td>73</td>
</tr>
<tr>
<td>Langlois, R.</td>
<td>15</td>
</tr>
<tr>
<td>Larimer, F.W.</td>
<td>49, 50</td>
</tr>
<tr>
<td>Leander, K.R.</td>
<td>28</td>
</tr>
<tr>
<td>LeBocuf, R.A.</td>
<td>60, 64</td>
</tr>
<tr>
<td>Lee, G.S.</td>
<td>26</td>
</tr>
<tr>
<td>Lee, J.K.</td>
<td>14</td>
</tr>
<tr>
<td>Lee, P.</td>
<td>30</td>
</tr>
<tr>
<td>Lee, W.R.</td>
<td>23</td>
</tr>
<tr>
<td>Legator, M.S.</td>
<td>15, 69</td>
</tr>
<tr>
<td>Lemaire, J.</td>
<td>19</td>
</tr>
<tr>
<td>Lemieux, P.M.</td>
<td>75</td>
</tr>
<tr>
<td>Leonard, B.</td>
<td>60</td>
</tr>
<tr>
<td>Levine, J.G.</td>
<td>48</td>
</tr>
<tr>
<td>Lewis, S.C.</td>
<td>66</td>
</tr>
<tr>
<td>Lewis, S.E.</td>
<td>66</td>
</tr>
<tr>
<td>Lewtas, J.</td>
<td>51, 54, 55</td>
</tr>
<tr>
<td>Li, A.P.</td>
<td>12, 18</td>
</tr>
<tr>
<td>Liechty, M.C.</td>
<td>51</td>
</tr>
<tr>
<td>Linak, W.P.</td>
<td>75</td>
</tr>
<tr>
<td>Linpital, N.</td>
<td>16</td>
</tr>
<tr>
<td>Lippert, M.J.</td>
<td>65</td>
</tr>
<tr>
<td>Littlefield, L.G.</td>
<td>61</td>
</tr>
<tr>
<td>Liu, P.K.</td>
<td>72</td>
</tr>
<tr>
<td>Livingston, G.K.</td>
<td>62</td>
</tr>
<tr>
<td>Loarca, F.P.</td>
<td>63</td>
</tr>
<tr>
<td>Logan, D.M.</td>
<td>55</td>
</tr>
<tr>
<td>Lohman, P.H.</td>
<td>51</td>
</tr>
<tr>
<td>Lommel, L.</td>
<td>35</td>
</tr>
<tr>
<td>Longstreth, D.J.</td>
<td>74</td>
</tr>
<tr>
<td>Lopez, L.</td>
<td>33</td>
</tr>
</tbody>
</table>

82
<table>
<thead>
<tr>
<th>Name</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Losikoff, A.</td>
<td>11</td>
</tr>
<tr>
<td>Loveday, K.S.</td>
<td>26</td>
</tr>
<tr>
<td>Lower, W.R.</td>
<td>33</td>
</tr>
<tr>
<td>Lu, L-J.</td>
<td>34</td>
</tr>
<tr>
<td>Lucenti, S.M.</td>
<td>61</td>
</tr>
<tr>
<td>Lugo, M.</td>
<td>51</td>
</tr>
<tr>
<td>Lutze, L.H.</td>
<td>51</td>
</tr>
<tr>
<td>Lyn-Cook, L.E.</td>
<td>30</td>
</tr>
<tr>
<td>McKee, R.H.</td>
<td>55, 66</td>
</tr>
<tr>
<td>McKee, M.</td>
<td>22</td>
</tr>
<tr>
<td>McKinley, Jr., T.W.</td>
<td>25</td>
</tr>
<tr>
<td>McLaren, K.F.</td>
<td>29, 51, 52</td>
</tr>
<tr>
<td>McManus, T.P.</td>
<td>39</td>
</tr>
<tr>
<td>McSorley, J.A.</td>
<td>75</td>
</tr>
<tr>
<td>Mecca, D.</td>
<td>61</td>
</tr>
<tr>
<td>Meier, J.R.</td>
<td>55</td>
</tr>
<tr>
<td>Mellon, I.</td>
<td>76</td>
</tr>
<tr>
<td>Menichini, P.</td>
<td>51</td>
</tr>
<tr>
<td>Messina, D.</td>
<td>61</td>
</tr>
<tr>
<td>Messing, K.</td>
<td>19</td>
</tr>
<tr>
<td>Metker, L.</td>
<td>54</td>
</tr>
<tr>
<td>Minor, T.Y.</td>
<td>32</td>
</tr>
<tr>
<td>Mirsalis, J.</td>
<td>52, 62, 66</td>
</tr>
<tr>
<td>Mitchell, A.D.</td>
<td>29</td>
</tr>
<tr>
<td>Mitchell, D.E.</td>
<td>54</td>
</tr>
<tr>
<td>Mitchell, J.B.</td>
<td>53</td>
</tr>
<tr>
<td>Mittelstaedt, R.A.</td>
<td>50</td>
</tr>
<tr>
<td>Miyamae, Y.</td>
<td>62</td>
</tr>
<tr>
<td>Modzelewski, R.A.</td>
<td>74</td>
</tr>
<tr>
<td>Mohrenweiser, H.W.</td>
<td>68</td>
</tr>
<tr>
<td>Moneith, L.G.</td>
<td>31</td>
</tr>
<tr>
<td>Montero, R.</td>
<td>33</td>
</tr>
<tr>
<td>Moody, W.</td>
<td>60</td>
</tr>
<tr>
<td>Moore, M.M.</td>
<td>12, 29, 52, 60</td>
</tr>
<tr>
<td>Moore, II, D.H.</td>
<td>17</td>
</tr>
<tr>
<td>Moorman, W.</td>
<td>62, 64</td>
</tr>
<tr>
<td>Morgan, W.F.</td>
<td>34, 40</td>
</tr>
<tr>
<td>Morotti, M.</td>
<td>32</td>
</tr>
<tr>
<td>Morris, D.L.</td>
<td>65, 67</td>
</tr>
<tr>
<td>Morris, M.J.</td>
<td>60, 64</td>
</tr>
<tr>
<td>Morris, S.M.</td>
<td>60</td>
</tr>
<tr>
<td>Mottus, K.M.</td>
<td>49, 50</td>
</tr>
<tr>
<td>Moyzis, R.</td>
<td>44</td>
</tr>
<tr>
<td>Mudgett, J.S.</td>
<td>35, 40</td>
</tr>
<tr>
<td>Mullenders, L.H.</td>
<td>35, 51</td>
</tr>
<tr>
<td>Mumford, J.</td>
<td>54, 55</td>
</tr>
<tr>
<td>Myers, L.E.</td>
<td>31</td>
</tr>
<tr>
<td>Myhr, B.C.</td>
<td>13, 34</td>
</tr>
</tbody>
</table>
Naismith, R.W.  61
Natarajan, A.T.  35
Nath, J.  16, 24, 63
Nauman, C.H.  19, 29, 62
Neft, R.E.  50
Nelson, G.  72
Nemchin, R.G.  11
Nesnow, S.  72
Newton, R.K.  50
Nichols, W.W.  28
Nicklas, J.  22, 65, 68
Niedziela, L.M.  66
Noguchi, H.  62

Oberly, T.J.  30
Oh, K-C.  28
Okinaka, R.T.  51
Oldham, J.W.  53
Oleson, F.B.  22
Olivieri, G.  40
Oller, A.  51
O'Neill, J.P.  22, 65, 68
Ong, T.  16, 24, 51, 62, 63, 64
Osgood, C.  39
Oshiro, Y.  32
Ostrosky, P.  33

Pagano, D.A.  48
Pallokkoff, P.A.  31
Pant, K.  41
Paolini, M.  32
Paradisin, W.M.  15
Parker, L.  29
Passananti, G.T.  68
Paterson, M.C.  76
Payne, J.F.  35
Payne, W.L.  16
Pellom, A.  62

Peng, Y.  56
Penman, B.W.
Pereira, M.A.  55
Perry, B.A.  68
Perry, E.  54, 75
Peters, B.  15
Phillips, J.W.  40
Phillips, M.D.  63
Phipps, E.L.  23
Piper, C.E.  32
Plewa, M.J.  49, 50, 53, 55, 66, 74
Pluth, J.M.  17
Polinsky, T.A.  29, 51, 52
Ponniah, S.  16
Preston, R.F.  53
Preston, R.J.  40
Proctor, I.D.  72
Przygoda, R.T.  55
Puck, T.  72
Pupatwibul, K.  52
Putman, D.L.  60, 64

Radman, M.  76
Rahn, C.A.  68
Raj, A.S.  55
Rank, K.B.  66
Rappaport, S.M.  15
Rauchfuss, H.  51
Ray, S.  35
Raymer, G.D.  25
Recio, L.  22
Reeder, B.A.  60, 64
Rescio, L.  65
Rexroat, M.  30
Riccio, E.  68
Richardson, K.  30
Richardson, V.B.  61
Rinchik, E.M.  27
Ringhand, H.P.  55
Rithidech, K.  63
| Robbins, S.  | 32  |
| Robertson, M.L. | 61 |
| Robertson, S.D.  | 62 |
| Robison, S.H.  | 74 |
| Rodriguez, D.  | 14 |
| Rodriguez, I.  | 14 |
| Rogers, C.G.  | 60 |
| Rogers, S.J.  | 48 |
| Rosin, M.P.  | 34, 67, 69 |
| Ross, J.  | 72 |
| Rossiter, B.J.  | 22 |
| Rossman, T.G.  | 28 |
| Rostami, H.J.  | 30 |
| Rowland, I.R.  | 48 |
| Rudd, C.  | 30 |
| Ruiz, E.F.  | 56 |
| Russell, L.B.  | 27 |
| Russell, W.L.  | 23, 27 |
| Russo, A.  | 53 |
| Ruzek, M.  | 72 |
| Scotti, M.  | 32 |
| Sedor, D.D.  | 53 |
| Sega, G.A.  | 25 |
| Sehgal, A.  | 39 |
| Seifert, A.M.  | 19, 68 |
| Selby, P.B.  | 25 |
| Selvin, S.  | 15 |
| Shabeg, S.  | 13 |
| Shaddock, J.G.  | 30 |
| Shafer, D.A.  | 24 |
| Shah, A.B.  | 48 |
| Shahied, S.I.  | 60 |
| Shaikh, A.U.  | 53 |
| Shane, B.S.  | 56, 74 |
| Shankel, D.M.  | 49 |
| Shelby, M.D.  | 60, 63 |
| Sheu, C.W.  | 14 |
| Shi, X-C.  | 62 |
| Shibuya, T.  | 25 |
| Shigenega, M.  | 15 |
| Siciliano, M.J.  | 38 |
| Sigman, C.C.  | 31 |
| Silkowski, M.A.  | 55 |
| Simons, J.W.  | 51 |
| Simpson, D.  | 22 |
| Sina, J.F.  | 28 |
| Sinclair, J.  | 72 |
| Singh, V.  | 15 |
| Skopek, T.  | 22, 65 |
| Smith, C.  | 72 |
| Smith, D.  | 54 |
| Smith, M.T.  | 61 |
| Smith, S.R.  | 53 |
| Smith, T.G.  | 65 |
| Smith, T.J.  | 68 |
| Snow, E.T.  | 16 |
| Snow, R.  | 54 |
| Sobels, F.H.  | 35 |
| Soelter, S.G.  | 32 |
| Sognier, M.A.  | 34 |
| Solar-Niedziela, L.  | 63 |

85
Sontag, M. 22
Sorg, R.M. 51
Spalding, J.W. 31
Spivak, G. 34
Srivatsan, E. 65
Stack, H.F. 54
Stallworth, M.V. 24
Stamato, T.D. 34, 52
Stambrook, P.J. 16
Stankowski, Jr., L.F. 12, 29, 51, 52
Stapley, R. 60
Stasiewicz, S. 31
Steimel, D.T. 33
Steinmetz, K. 52, 66
Stephens, J. 40
Stewart, J. 51, 64
St Denny, I. 28
Stich, H.F. 69
Stinson, T.J. 66
Stirling, D. 67
Stoewsand, G. 52
Storer, R.D. 28
Strniste, G.F. 51
Strout, C.L. 65
Sudgen, K.D. 48
Sudman, P.D. 27
Swaminathan, S. 53
Sweet, L.M. 65
Swenson, D.H. 30
Theiss, J. 22, 31
Theodorakis, P. 49
Thilagar, A. 64, 67
Thilly, W.G. 43, 51
Thompson, E.D. 60, 64
Thompson, L.H. 33, 34, 38, 72
Tice, R.R. 19, 28, 32, 54, 62, 63
Tischfield, J.A. 16
Tollaksen, S.L. 23
Tomkins, D.J. 38
Trevizo, S. 74
Trosko, J.E. 30
Trumble, S.J. 72
Tucker, A.B. 23
Tucker, J. 17, 23, 33
Tuman, W.G. 29, 51, 52
Tummey, A.C. 55
Turtlemaub, K.W. 72

-U-
Ucko, A. 72
Urda, R.P. 67

-V-
Valdivia, R.P. 67
Valenzuela, F. 69
van der Sluis, D.A. 31
van Hoffen, A. 35
van Rooijen, W. 51
van Zeeland, A.A. 35, 51
Vandelaan, M. 17
VanDerwiele, L. 22
Vaughan, A.T. 40
Venema, J. 35, 51
Vesell, E.S. 68
Vijig, J. 22
Vogel, J.S. 72
von Borstel, R.C. 26
Von Tungeln, H. 51
Vrieling, H. 51
Wadopian, N.S.  38
Wagner, E.D.  53, 74
Waldren, C.  72
Walker, D.  15
Walker, R.P.  32
Walsh, D.B.  53
Wang, Y-C.  24
Wang, Z.  28
Ward, Jr., J.B.  15, 41, 65, 67
Warner, J.R.  31
Warren, S.  55
Warshawsky, D.  62
Wasmund, K.K.  55
Waters, M.D.  54
Watts, R.  55
Webb, P.  72
Weber, C.A.  38
Wehr, C.M.  15
Weiss, D.  42
Whong, W-Z.  51, 64
Whorton, Jr., E.B.  41, 67
Wiencke, S.A.  17
Williams, J.R.  40, 68
Williams, R.W.  55, 74
Wilmer, J.L.  38
Winegar, R.A.  34, 40
Wiser, S.K.  30
Witmer, M.V.  34
Witt, K.L.  61
Wolff, S.  40
Wood, S.  72
Woskie, S.R.  68
Wu, R.  33
Wu, R.W.  72
Wu, Z.L.  64

Xiao, S.  40
Xing, S.  64
Xu, L-S.  16

Xu, W.  35
Xu, Z.  22

Yager, J.W.  15
Yamamoto, K.  53
Yang, J-L.  24
Yasui, L.  40
Yeatts, K.B.  53
Yi, M.  34
Young, R.R.  32
Young, W.C.  18
Yu, R.L.  61
Yu, Y.  22
Yuan, Z.P.  67

Zandee, J.  22
Zazi, V.  68
Zdzienicka, M.  51
Zeiger, E.  12, 33, 48, 61
Zielenska, M.  49