



Journal of the Mississippi
Academy of Sciences

Editor

Kenneth J. Curry
University of Southern Mississippi

Associate Editors

Carolyn R. Boyle
Mississippi State University

Maureen Corcoran
Waterways Experiment Station

Ibrahim O. Farah
Jackson State University

Timothy C. Lockley
USDA APHIS PPQ IFA

Robin Rockhold
Univ. of Mississippi Medical Center

Brian Tsang
Univ. of Mississippi Medical Center

Abstracts Editor

John Boyle
Mississippi State University

The Journal of the Mississippi Academy of Sciences (ISSN 0076-9436) is published in January (annual meeting abstracts), April, July, and October, by the Mississippi Academy of Sciences. Members of the Academy receive the journal as part of their regular (non-student) membership. Inquiries regarding subscriptions, availability of back issues, and address changes should be addressed to The Mississippi Academy of Sciences, Post Office Box 55709, Jackson, MS 39296; 601-977-0627; msacad@bellsouth.net.

Manuscripts and inquiries about publication and information about advertising should be sent to the editor: Kenneth J. Curry, University of Southern Mississippi, Post Office Box 5018, Hattiesburg, MS 39406-5018. 601-266-4930 (voice & fax) kenneth.curry@usm.edu.

Contents

General Article

- 156 **Mississippi and the Publications of the State Academies of Science**—J.B. Hill and Cherie Madarash-Hill

Research Article

- 163 **p53 as a Diagnostic Tool for the Detection of Cancer**—Rander Giovanni Adams, Tracy Dellinger, Melinda Kuhn, Charles Streckfus, and Lenora Bigler

Departments

- 154 **Editorial**—Ken Curry
- 169 **President's Column**—Margo Hall
- 170 **Executive Officer's Column**—John Boyle
- 170 **Mississippi Junior Academy of Sciences**—Betsy Sullivan
- 174 **2002 Annual Meeting Abstract Form and Instructions**

**OFFICERS OF THE
MISSISSIPPI ACADEMY OF SCIENCES**

President	Margo Hall
President-Elect	Robert C. Bateman, Jr.
Immediate Past-President	William B. Lushbaugh
Executive Officer	John A. Boyle
Journal Editor	Kenneth J. Curry
Junior Academy Director	Betsy Sullivan
Directors	Johnnie-Marie Whitfield Clifford Ochs Hamed Benghuzzi
Administrative Assistant	Cynthia Huff

Editorial

The annual meeting of the Mississippi Academy of Sciences will be held in Biloxi, Mississippi, on February 21st and 22nd, 2002. This issue contains the final call for abstracts which are due by November 1st. As you look through this issue of the Journal of the Mississippi Academy of Sciences two things might strike you: (1) there are only two articles and (2) one of the articles discusses the excellence of this journal compared to those of other state academies. Many of you will be active during the next month assembling abstracts for yourself and for your students. The annual meeting is an important event, especially for students, where they have an opportunity to give their first professional talk outside the home camp. I am sure that many of you would agree that one of the prime functions of a state academy is to provide a forum for young scientists.

Please consider that this journal can also provide a wonderful opportunity for your students. Many research projects, especially at the Master's level, do not generate sufficient information of sufficient impact to

be published in a national journal or the nature of the research is very local in focus. Too many of these projects end up in filing cabinets never to be seen, but the information that was generated might certainly be of use to somebody. One of the prime starting points in searching for research that is of a local or regional nature is the state academy journals. This journal is peer reviewed, which provides an excellent opportunity for young scientists seeking their first publication. They are introduced to the peer review system and can get a publication for the curriculum vitae.

The Journal of the Mississippi Academy of Sciences is published quarterly. The January issue is reserved for abstracts for the annual meeting; the other three issues (April, July, and October) carry research articles. While you in your students are busily assembling abstracts, please consider going the extra distance and writing up that research for submission to this journal. Instructions for contributors are found on the inside back cover of any issue.—Ken Curry

The Mississippi Academy of Sciences has a new address:

**Mississippi Academy of Sciences
Post Office Box 55907
Jackson, MS 39296-5907**

[insert Ohause advertisement here.]

Mississippi and the Publications of the State Academies of Science

J.B. Hill¹ and Cherie Madarash-Hill

Southeastern Louisiana University, Hammond, LA 70402, and
University of Akron, Akron, OH 44325

Throughout their history, state academies of science have promoted and disseminated local and regional scientific research through the publication of refereed journals and conference proceedings. Since 1939, the Mississippi Academy of Sciences has published a journal featuring its members' research. Over the years, the *Journal of the Mississippi Academy of Sciences* has received inconsistent indexing, but today it is comprehensively indexed by three indexing/abstracting sources and is available to more researchers through the Academy's early adoption of electronic distribution. A few other state academies of science have also moved to electronic publication and distribution, but most have been slow to make the transition to the new medium.

During 1997 and 1998, we conducted an examination of the publications of the state academies of science. Since the publication of that study (Hill & Madarash-Hill, 2000), the publishing landscape has changed significantly. Virtually all major non-profit and for-profit publishers have added electronic publication as an increasingly important method of delivering their content.

For-profit publishers have been quick to adopt electronic publication to supplement and protect the revenue that they derive from their print publications. The large professional societies have followed suit. Initially, the emphasis of the major publishers was on creating electronic versions of existing publications. Gradually, publishers have also begun creating electronic-only publications. The relative ease of creating and distributing electronic journals has prompted universities, academicians and smaller societies to create new scholarly electronic journals. Organizations such as the International Consortium for the Advancement of Academic Publication (ICAAP) have attempted to promote the creation and distribution of free or inexpensive scholarly publications.

In addition to creating electronic journals, the large for-profit and non-profit publishers have begun bundling their electronic journals into subject specific or publisher specific e-journal packages (e.g.,

ACM Digital Library or Academic Press' Ideal). Other database producers (e.g., Gale or Ebsco) have begun purchasing titles from a variety of publishers and professional societies and including the full text of the articles in their databases.

Given the increasing importance of electronic publication, it seems natural that the state academies of science would incorporate electronic publication and distribution into their publishing activities. At the time of our original study, the Mississippi Academy of Sciences was one of only three state academies of science that had begun making publications available on the Web. The *Journal of the Mississippi Academy of Sciences* was the only peer-reviewed state academy of science journal that was available in its entirety on the Web.

It would be expected that more academies of science would follow Mississippi's lead and make issues available online (either free or by subscription). To see if this has happened, we decided to revisit the publications of the state academies of science, as well as examine the *Journal of the Mississippi Academy of Sciences* in more detail.

¹Author for correspondence.

Some information in this article also appears in "Electronic Publications of the State Academies of Science," *Michigan Academician* 2001 33(2):205–208.

PUBLICATIONS OF THE STATE ACADEMIES OF SCIENCE

The great majority of state academies of science have been slow to migrate to the Web and electronic publication. Currently, almost all state academies have their own Web pages, although the URL's are not always stable due to changes in host sites and Webmasters. Some state academies (like Mississippi) have established independent domain names (e.g., <http://www.msacad.org/>). This has led to greater stability and a stronger Web presence. Links to the Web pages of most of the state academies of science are available at the AcadSci Web site (<http://www.acadsci.com/journals.htm>).

While almost all academies have some presence on the Web, the availability of electronic content has been limited. Many academies do offer table of contents and abstracts on their Web pages. Academies offering table of contents of their publications include Arizona-Nevada (1987 to present), Arkansas (1941 to present), Georgia (1999 to present), Illinois (with abstracts, 1993 to present), Iowa (with abstracts, 1998 to present), Kansas (with abstracts, 1992 to present), Missouri (1997 only), New Mexico (special issues only), Ohio (with abstracts, 1997 to present), Oklahoma (1921 to present), Pennsylvania (1996 to present), Tennessee (1996 to present) and Texas (1998 to present). Some academies offer an index to their publications; these include California, New York and Michigan.

Currently, the only academies that have the full text of articles available via the Internet are California, Kansas, Mississippi, North Dakota and Oklahoma. Academy titles with some full text online are *California Wild*, *Transactions of the Kansas Academy of Science*, *Journal of the Mississippi Academy of Sciences*, *Proceedings of the North Dakota Academy of Science* and *Proceedings of the Oklahoma Academy of Science*.

California Wild (<http://www.calacademy.org/calwild/>) is a general-interest science and natural history magazine. The full text of issues is available from 1996 to present. In addition to the full text of articles, the Web site offers a searchable index that contains entries for approximately 2000 articles published from 1948 to present in *California Wild* (and its predecessor, *Pacific Discovery*).

The Kansas Academy of Science provides limited full text from its *Transactions of the Kansas Academy of Science* (<http://www.emporia.edu/kas/>

[transact.htm](http://www.emporia.edu/kas/transactions.htm)). The Academy's Web site provides table of contents and abstracts from 1992 to the present. Full text is available for only a few recent articles (7 articles in 1997 and 1 article in 1998).

The Mississippi Academy of Sciences provides the complete full text of the *Journal of the Mississippi Academy of Sciences* (<http://www.msacad.org/>) from 1997 to present. The 1997 issues and most of the 1998 issues are available in both HTML and PDF; the remaining issues are available in PDF.

The North Dakota Academy of Science provides the full text of the 1997 *Proceedings of the North Dakota Academy of Science* (<http://www.online.masu.nodak.edu/divisions/hssdiv/meartz/ndas/mailings.htm>) at its Web site. The 1998 *Proceedings* is not available at the Web site but is available to be downloaded by Academy members.

Of the state academies of science, the Oklahoma Academy of Science has the most years of its publication on the Web. The full text of the *Proceedings of the Oklahoma Academy of Science* (<http://digital.library.okstate.edu/oas/>) is available in both PDF and HTML format from volume 56, 1976 to present. Table of contents are available from volume 1, 1921 to volume 55, 1975. In partnership with the Oklahoma Academy of Science, the Oklahoma State University Library Digitizing Center plans to continue digitizing past, present and future volumes of the proceedings and make the volumes freely available on the Web. This digitization project, outlined by Anderson (in press), may serve as a model for future digitization and preservation of state academies of science research.

In addition to delivering e-journals directly (as individual subscriptions or as part of e-journal packages), journal publishers are signing agreements with aggregators (e.g., Ebsco and Gale) to make the full text of their articles available in aggregator databases. Aggregator databases vary greatly in size, origin, scope, and price, but they all do one thing: they aggregate or collect electronic publications into unique, identifiable and searchable databases.

Five state academies of science have reached agreements with one of the major multi-disciplinary aggregators, the Gale Group, to provide the full text of articles to Gale's Expanded Academic ASAP and InfoTrac OneFile. State academies of science titles that are included in these databases (from 2000 to present) are *Journal of the Colorado-Wyoming Academy of Science*, *Journal of the Mississippi Academy of Sciences*, *Michigan Academician*, *New*

Mexico Journal of Science, and *Ohio Journal of Science*.

Expanded Academic ASAP and InfoTrac One-File are two of the most widely available multi-disciplinary aggregator databases, so the availability of full text through these databases greatly improves the indexing and full text accessibility of these academies' publications in academic libraries across the United States.

JOURNAL OF THE MISSISSIPPI ACADEMY OF SCIENCES

The early history of the Mississippi Academy of Sciences as well as the *Journal* has been chronicled by Robert Bailey in a detailed article that appeared as a supplement to the *Journal of the Mississippi Academy of Sciences* (1993). According to Bailey, The Mississippi Academy of Sciences began with an informal meeting of eight scientists in 1929 and convened its first official meeting in 1930. At the 1939 meeting, the Academy decided to create an annual publication that would include the proceedings of the annual meeting as well as publish members' research. Although the *Journal of the Mississippi Academy of Sciences* was intended to be an annual publication, it was published irregularly during its first 35 years. It was not until volume 19, 1973-1974 that the *Journal* began to be published each year. The annual publication included refereed papers. Abstracts of the annual meeting papers were published as a supplement. Beginning in 1991, the frequency of publication was increased to approximately three times per year. Since 1996, the *Journal* has been published quarterly with three regular issues and one meeting abstracts issue.

The title of the *Journal* has experienced some minor changes over the years. In 1948, the title was changed from the *Journal of the Mississippi Academy of Science* to the *Journal of the Mississippi Academy of Sciences, Inc.* to reflect the Academy's change in name. In 1949, the title was shortened to *Journal of the Mississippi Academy of Sciences*. A more significant change occurred in 1991. Beginning with volume 36, no.2 1991, "Science in Mississippi" was added to the cover. This addition coincided with other significant changes in the journal. The decision was made to publish the journal three or four times per year and to include articles that would appeal to the general science interests of its members as well as non-scientists. In addition to

publishing original research, the new *Journal* had a glossier look with pictures, academy news and columns.

Initially submissions dropped and there was confusion over the title of the journal. In a "Letters to the Editor" column (1991), it was explained that "the addition of the title Science in Mississippi was not meant to be a complete change in the name of this publication" and that "the *Journal* should still be officially called the *Journal of the Mississippi Academy of Sciences*." Nevertheless, libraries generally treated it as a "title change" and cataloged the journal as *Science in Mississippi: the Journal of the Mississippi Academy of Sciences*, using *Journal of the Mississippi Academy of Sciences* as an alternate title. Today many libraries have the journal cataloged and possibly shelved under the title *Science in Mississippi*.

Indexes and databases that index the *Journal* continue to use the title *Journal of the Mississippi Academy of Sciences* or the abbreviated title *J Miss Acad Sci*. Like all state academies of science journals, the *Journal of the Mississippi Academy of Sciences* has received uneven indexing over the years. Due to the multi-disciplinary nature of the state academies of science journals, most indexing sources index the journals selectively. Only those articles with subjects relevant to the index are included. This is a reasonable practice, as a geology database such as GeoRef should index only articles that are relevant to the study of geology and ignore the others. However, this lack of comprehensive indexing has caused articles to vary greatly in the amount of indexing that they have received.

Selective indexing makes it difficult to determine the level of indexing of state academies of science publications. Only a few articles may be indexed by the most subject specific indexes and there may be a few years between articles that are indexed. In our original study we considered a state academy of science title to be indexed by an index or database if there was a citation to any article published in the 1990's. Based on that criteria, we found that the *Journal of the Mississippi Academy of Sciences* was indexed in 1998 by 8 indexing sources: AGRICOLA, CAB International databases, Chemical Abstracts, GeoRef, Fisheries Review, State Academies of Science Abstracts, Wildlife Review and Zoological Record. CAB International was treated as one source, even though it includes over 40 different indexes.

Based on our recent reexamination of leading indexes and databases, it appears that the *Journal of the Mississippi Academy of Sciences* is currently indexed comprehensively by State Academies of Science Abstracts, Expanded Academic ASAP and InfoTrac OneFile. The *Journal* is indexed selectively (but consistently) by CAB International databases, GeoRef, ProceedingsFirst and Zoological Record. Additional indexes and databases have indexed the *Journal* selectively in the past and may continue to include citations and abstracts from the journal in future years. Details of this indexing follow.

STATE ACADEMIES OF SCIENCE ABSTRACTS

State Academies of Science Abstracts (SASA) provides the most comprehensive indexing coverage of the *Journal of the Mississippi Academy of Sciences* and most of the other publications of the state academies of science. SASA completely indexes all full-length papers and proceedings abstracts published in the publications of 40 state academies of science. The database's coverage of the *Journal of the Mississippi Academy of Sciences* includes every article and abstract published since 1985.

EXPANDED ACADEMIC ASAP AND INFOTRAC ONEFILE

Expanded Academic ASAP and InfoTrac OneFile are multi-disciplinary databases produced by the Gale Group that index, abstract and provide some full text for scholarly, popular and trade serials. A recent study of the non-medical scientific content of multi-disciplinary aggregator databases found that Expanded Academic ASAP currently indexes 551 science and technology titles, provides full text from 261 of these titles and page images from 148 (Hill, 2001). Since InfoTrac OneFile includes the content of a number of Gale databases (including Expanded Academic ASAP and Health Reference Center), it contains a wider coverage of science titles (especially in the medical/health sciences) than Expanded Academic ASAP.

Expanded Academic ASAP and InfoTrac OneFile provide indexing and full text for articles published in the *Journal of the Mississippi Academy of Sciences* from January 2000 to present. The databases contain articles in both HTML and PDF, but

graphics (i.e., tables, figures and photos) may be omitted for some articles.

Expanded Academic ASAP and InfoTrac OneFile appear to be providing full text for all of the *Journal's* articles, including the meeting abstracts in January's "Abstracts Issue." However, the Gale databases differ from State Academies of Science Abstracts in the treatment of the Academy's meeting abstracts. SASA provides a separate record for each meeting abstract, in effect treating each abstract the same as an article. Gale does not create a separate record for each abstract; rather, it provides records for the meetings' broad subject divisions, such as "Geography and Geology." While the abstracts are available, they are a bit less accessible, as users are required to conduct a full-text search of the database in order to locate the individual meeting papers.

Despite the broad treatment of the meeting abstracts and the absence of graphics from some articles, the availability of the full text of the *Journal of the Mississippi Academy of Sciences* articles through Expanded Academic ASAP and InfoTrac OneFile greatly increases the availability of the *Journal* to researchers at universities across the United States.

CAB INTERNATIONAL

CAB International, having begun as the British Commonwealth Agricultural Bureaux, is now an international, non-profit organization that (among other things) produces two major agricultural/biological science databases, CAB Abstracts and CAB Health, as well as more than 40 subject-specific abstracting journals.

CAB Abstracts is a bibliographic database with over three million citations and abstracts from 1973 to the present. The database indexes the literature in the fields of agriculture, forestry, human health and nutrition, animal health and natural resources. CAB Health is a smaller database with approximately 700,000 records from 1973 to the present. The database indexes the literature dealing with human nutrition, parasitic, communicable and tropical diseases and medicinal plants.

In addition to producing the two larger CAB databases, CAB International also produces more than 40 subject-specific print and electronic abstracting publications. The content of these publications are derived from the larger CAB databases. These publications include:

Abstracts on Hygiene and Communicable Diseases
Agricultural Engineering Abstracts
Agroforestry Abstracts
Animal Breeding Abstracts
Crop Physiology Abstracts
Dairy Science Abstracts
Field Crop Abstracts
Forestry Abstracts
Forest Products Abstracts
Grasslands and Forage Abstracts
Helminthological Abstracts
Horticultural Abstracts
Index Veterinarius
Irrigation and Drainage Abstracts
Leisure, Recreation and Tourism Abstracts
Maize Abstracts
Nematological Abstracts
*Nutrition Abstracts and Reviews - Series A: Human
and Experimental*
*Nutrition Abstracts and Reviews - Series B: Live-
stock Feeds and Feeding*
Ornamental Horticulture
Plant Breeding Abstracts
Plant Genetic Resources Abstracts
Plant Growth Regulator Abstracts
Potato Abstracts
Poultry Abstracts
Protozoological Abstracts
Review of Agricultural Entomology
Review of Aromatic and Medicinal Plants
Review of Medical and Veterinary Entomology
Review of Medical and Veterinary Mycology
Review of Plant Pathology
Rice Abstracts
Rural Development Abstracts
Seed Abstracts
Soils and Fertilizers
Soyabean Abstracts
Sugar Industry Abstracts
Tropical Diseases Bulletin
Veterinary Bulletin
Weed Abstracts
Wheat, Barley and Triticale Abstracts
*World Agricultural Economics and Rural Sociology
Abstracts.*

CAB International routinely scans over 7000 scientific titles, including the *Journal of the Mississippi Academy of Sciences*, for possible inclusion in CAB Abstracts, Cab Health and the subject specific abstracting publications. As a result, articles from the *Journal of the Mississippi Academy of Sciences*

may be indexed and abstracted in any of the more than 40 CAB International abstracting sources. An examination of CAB Abstracts indicates that 72 articles from the *Journal* have been indexed since 1971 with the most recent article being indexed in 2000.

GEOREF

Produced by the American Geological Institute, GeoRef provides comprehensive coverage of geology and geophysics literature. The database corresponds to the print publications: *Bibliography and Index of North American Geology*, *Bibliography of Theses in Geology*, *Bibliography and Index of Geology Exclusive of North America*, *Bibliography and Index of Geology* and *Geophysical Abstracts*. The database includes citations to articles from the *Journal of the Mississippi Academy of Sciences* and over 3,500 additional journals as well as books, book chapters, conference papers, government publications, theses, dissertations, reports and maps.

An examination of GeoRef indicates that 336 articles from the *Journal of the Mississippi Academy of Sciences* have been indexed since 1939. The most recent article to be indexed was published in 2000.

PROCEEDINGSFIRST

ProceedingsFirst is a database produced by OCLC that provides citations of every congress, symposium, conference, exposition, workshop and meeting received at The British Library from 1993 to present. Each record in the database contains a list of the papers presented at each conference.

Individual papers are not indexed, but ProceedingsFirst does contain a record for each annual meeting of the Mississippi Academy of Sciences from 1994 to 2001.

ZOOLOGICAL RECORD

As the premier zoology database, Zoological Record provides international coverage of zoological literature with particular emphasis on systematic/taxonomic information. Coverage is from 1870 to present in the print index. The online version covers 1978 to present. BIOSIS, the producer of Zoological Record, routinely scans over 4,500 titles, including the *Journal of the Mississippi Academy of Sciences*.

An examination of the online version of Zoological Record indicates the 90 articles have been indexed from 1978 to 2001. An undetermined number of pre-1978 articles have also been indexed in the print version of the index.

OTHER INDEXES AND DATABASES

Several other indexing/abstracting sources have indexed the *Journal of the Mississippi Academy of Sciences* in past years but have not indexed any recent articles from the journal. These indexes/databases include AGRICOLA, BIOSIS, Chemical Abstracts, Fish and Fisheries Worldwide and Wildlife Worldwide.

AGRICOLA is a bibliographic database created by the USDA National Agricultural Library and contains citations to agricultural literature. AGRICOLA indexed 72 articles published in the *Journal of the Mississippi Academy of Sciences* between 1970 and 1993. Unfortunately, AGRICOLA appears to have discontinued indexing the *Journal* and a number of other state academies of science journals in the mid 1990's.

BIOSIS Previews is a comprehensive biology database that consists of *Biological Abstracts* (which contains references to journal articles) and *Biological Abstracts/RRM* (which contains references to conference proceedings). *Biological Abstracts* (BIOSIS) currently indexes and abstracts over 5000 journals. Between 1972 and 1981, BIOSIS Previews indexed 588 articles and meeting abstracts published in the *Journal of the Mississippi Academy of Sciences*.

Chemical Abstracts is the most comprehensive database of chemical literature with 16 million abstracts from more than 8,000 journals, patents, technical reports, books, conference proceedings, and dissertations. Between 1960 and 1990, Chemical Abstracts indexed 171 articles and abstracts from the *Journal of the Mississippi Academy of Sciences*.

Fish and Fisheries Worldwide indexed 112 articles/abstracts from 1975 to 1994 and Wildlife Worldwide indexed 59 articles from 1971 to 1994. Both of these databases are produced by the South African National Inquiry Services Centre (NISC) and contain citations from the former U.S. government publications, *Wildlife Review* and *Fisheries Review*. These publications were produced by the U.S. National Biological Service until 1995. NISC discontinued indexing the *Journal of the Mississippi Academy of Sciences* and other state academies of science journals when NISC took over publication of the indexes.

Other indexing sources that have been identified as having indexed a few articles over the years; these include Aerospace Abstracts (1 article), *Mathematical Reviews/MathSciNet* (2 articles), PASCAL (11 articles), TULSA/Petroleum Abstracts (1 article) and Water Resources Abstracts (2 articles).

As all publications of the state academies of science, the *Journal of the Mississippi Academy of Sciences* has been unevenly indexed over the years. However, with its inclusion in State Academy of Science Abstracts, Expanded Academic ASAP and InfoTrac OneFile, the *Journal* is currently being comprehensively indexed for the first time. The availability of the full text of the *Journal's* articles in Expanded Academic ASAP and InfoTrac OneFile further helps to distribute Mississippi research beyond the membership of the Academy.

CONCLUSION

There has not been a great deal of change in the publications of the state academies of science during the past three years. Very few are following the lead set by the *Journal of the Mississippi Academy of Sciences* in making their issues available electronically and thus making their articles more easily accessible to researchers.

In the past few years, the *Journal of the Mississippi Academy of Sciences* has greatly improved its accessibility through the addition of comprehensive indexing by State Academies of Science Abstracts, comprehensive indexing and provision of full text by Expanded Academic ASAP and InfoTrac OneFile and provision of journal issues on the Academy's Web site. The future challenge will be to continue to expand access to the academy members' research by increasing indexing by major indexes and pursuing contracts with additional journal aggregators for the

provision of electronic versions of the journal.

LITERATURE CITED

- Anderson C. 2001. Digitizing scientific articles: special challenges. *Science and Technology Libraries*. In press.
- Bailey, R.J. 1993. History of the Mississippi Academy of Sciences: its first fifty years. *Journal of the Mississippi Academy of Sciences* 38 (2) Supplement:1-46.
- Hill, J.B. 2001. Aggregated science: an examination of three multi-disciplinary databases. *Issues in Science and Technology Librarianship* 29. [Online]. Available: <http://www.istl.org/01-spring/> [May 18, 2001].
- Hill, J.B. and C. Madarash-Hill. 2000. Publications of the state academies of science. *Science and Technology Libraries* 19(1):21-37.
- Tiftickjian, J. 1991. Letters to the editor. *Journal of the Mississippi Academy of Sciences* 36 (3):6.

p53 as a Diagnostic Tool for the Detection of Cancer

Rander Giovanni Adams¹, Tracy Dellinger², Melinda Kuhn², Charles Streckfus² and Lenora Bigler^{2,3}
William B. Murrah High School¹, and University of Mississippi Medical Center², Jackson, MS 39216-4505

Cancer begins with the alteration of a gene and, with the continuous division of mutated cells, ends with the formation of tumors. The p53 gene which is found on chromosome number 17, encodes a protein which has been shown to prevent the proliferative steps leading to neoplastic transformation. The purpose of this study was to 1) examine the potential role of p53 in tumor progression and prevention in selected cell lines and 2) evaluate the diagnostic usage of p53 protein levels in a simple, yet unique medium (saliva) towards detection of p53 dependent cancers in the general population. The results demonstrate that human osteosarcoma cells which normally do not express the p53 gene, can be successfully transformed using a p53 plasmid vector to express the wild-type form of p53. This finding suggests that it may be possible through gene therapy, for patients suffering from p53 dependent tumors such as colon carcinoma to receive treatment through genetic alteration of the tumor cells. The results also demonstrate the presence of pantropic p53 in saliva, suggesting the possible use of measuring salivary pantropic p53 levels to determine possible patients at risk from p53 dependent cancers.

Cancer is a multi-step process which begins with the alteration of a gene. Subsequent continuous division of mutated cells leads to a tumor. In order to maintain a stable position of tissue homeostasis within the body there must be a balance between proliferation and death of cells. The p53 gene found on chromosome number 17 encodes a protein which has been shown to prevent the proliferative steps which can lead to neoplastic transformation (Stanbridge and Cavenee, 1989). In its wild-type form the p53 protein detects genomic damage caused by either defective cell proliferation or chemically-induced damage, and forms a tetramer which binds to DNA. Acting as a transcription factor the tetramer causes the production of protein p21 in complex with cyclin-dependent kinase (cdk2) which prevents the cell from entering the next stage of cell division (Kubbutat et al., 1998). The cell is allowed a period of time to repair the damage; however, if the damage suffered is too great the cell undergoes p53-induced apoptosis, or cell death (Crook et al., 1996). This process is an important part of tumor suppression

due to the prevention of the continuous division of mutated cells.

In contrast, mutant p53, which is triggered by point mutations or defective inherited alleles, changes the structure of the protein preventing it from binding DNA successfully. Because of the necessary tetramer formation, p53 functions incorrectly with the mutation of a single allele. Tumors deriving from p53-expressing cells tend to regress after chemotherapy and radiation treatments; however, those deriving p53-deficient or mutated cells continue to grow following such treatments (Lowe and Ruley, 1996). Loss of p53 function becomes a determining factor in the development of highly malignant tumors. The detection of gene mutations found in the protein of saliva has been investigated in previous studies for its potential novel use as specific tumor cell markers (Boyle et al., 1994; Ball et al., 1997). The intent of this study was to examine the role of p53 in cancer development using specific cell lines and evaluate the potential diagnostic usage of p53 protein levels found in saliva

¹This research was performed by RGA as part of his tenure in a high school biomedical research mentorship program called Base Pair, sponsored by the Howard Hughes Medical Institute.

³Author for correspondence.
Division of Dental Research, 2500 N. State Street

towards detection of p53-dependent cancers.

MATERIALS AND METHODS

Cell lines and plasmids—All cell lines, p53 null osteosarcoma cells (HOS), adenocarcinomas of the colon and breast (DLD-1 and AU 565, respectively) were purchased from the American Type Culture Collection (Rockville, MD), and maintained in Dulbecco's modified Eagle's medium (DMEM) containing 10% fetal calf serum at 37EC in the presence of 5% CO². A p53-containing plasmid vector under the transcriptional control of the CMV promoter (pCB6; Tang et al., 1998) was kindly donated by Dr. Karen Vousden at NCI.

Transfections and reporter assays—The HOS cell line was transfected with the pCB6 plasmid vector using the Quiagen Superfect Transfection Reagent (Quiagen, Inc., Los Angeles, CA; as described by Ausubel et al., 1991 and Chen et al., 1990). Plasmid expression was confirmed through flow cytometric comparison of transfected HOS cells to the non-transfected control group regarding growth inhibition/apoptosis as described below.

Cell growth conditions/apoptosis measurement—Each cell type including the transfected HOS cells were cultured to a density of $2^4 \times 10^6$ in 100 mm dishes. The cells were irradiated at varying time intervals using UV light (mid-range exposure of 310 nm wavelength) with two separate control groups. The negative control group of each cell type was not irradiated and the positive control was irradiated and also treated with tumor promoter PMA (phorbol 12-meristate 13-acetate; 20 μ l/ml of medium). Preceding irradiation the cells were incubated at 37EC for a period of one hour to allow cellular response. Following irradiation, cells were immediately examined by flow cytometric analysis for apoptotic activity. Analysis of apoptosis initiation was measured by assaying the treated cells for the presence of the annexin protein which is produced when cells are induced to undergo apoptosis. The assay was performed as directed by the manufacturer with the Annexin V FITC Detection Kit (Biovision, Inc., Palo Alto, CA) followed by flow cytometric analyses of the FITC stained cells. Photomultiplier settings were such that negative and background staining was excluded from analysis. A useful property of annexin V in the staining of apoptotic cells is derived from the fact that it can bind many sites on cell surfaces and therefore result in a very

intense signal.

Saliva collection—Stimulated whole saliva was obtained from forty randomly chosen subjects of the general population. Personal characteristics such as past and present surgeries, sparse consumption of alcoholic beverages, and history of cancer within the immediate family, were noted on interview. Saliva was collected by having the volunteers chew flavorless gum for 5 minutes and spitting accumulated saliva as needed into a pre-weighed container. The saliva was then placed on ice and taken to the laboratory for analysis as described below.

P53 protein analysis—Total protein of each sample was calculated according to the protocol of the Micro BCA Protein Assay Reagent Kit (Pierce Laboratories; as described by Akins and Tuan, 1992). These values were used as a standard for all protein and antigen concentrations. All p53 protein levels were determined using ELISA methodology. Briefly, antibodies that recognize both wild-type (pantropic) and mutant p53, or those which recognize mutant p53 exclusively were bound to a solid matrix. Saliva samples were added and allowed to incubate, followed by washing with appropriate wash buffer as provided by the manufacturer. Secondary antibody was added followed by incubation of a horseradish peroxidase (HRP) conjugate which contains streptavidin which catalyses the conversion of substrate tetra-methylbenzidine (TMB) to produce a color change whose intensity is directly proportional to the amount of p53 protein found within the sample. The absorbance was measured by spectrophotometry at 450 nm wavelength.

Statistical analyses—The statistical analyses were performed on two levels. The first level entailed the use of descriptive statistics. These analyses yielded means, frequency distributions, medians, and standard deviations for interval data. The second level of analyses employed the use of non-parametric statistics. The interval variables, pantropic p53, and mutant p53 levels, were dichotomized using a cut off value of 0.01 for each variable. Those individuals above 0.01 were classified as positive and those below the value as negative for each marker. The Fisher Exact Probability Test was used to determine if the frequencies were significant. The alpha level was at the $p < 0.05$ level.

RESULTS

Osteosarcoma (HOS) transformation—To evaluate the role of p53 in cell cycle regulation, human osteosarcoma cells (HOS) were transfected to express the wild-type form of the p53 gene. Using the Superfect Transfection Reagent, the pCB6 plasmid vector was successfully integrated into the cells. Human osteosarcomas transfected with the wild-type p53 gene displayed an increased induction of apoptosis preceding UV irradiation as measured by the cellular response to irradiation by flow cytometry. Cells transfected with the pCB6 plasmid were twice as likely to undergo apoptosis as those cells that had not been transfected; i.e., the presence of wild-type p53 made the cells susceptible to apoptosis induction.

Analysis of p53 expression in cell culture—Preceding DNA mutation the p53 gene prevents genetically damaged cells from dividing causing cells to arrest in G1 of the cell cycle. The production of p21(WAF1) is an essential component of this process due to its role as a cyclin-dependent kinase inhibitor. WAF1 is an inhibitor of cyclin dependent kinases and is responsible for inactivating the Rb protein during G1/G2 phases of the cell cycle. The induction of WAF1 is essential for p53-mediated G1 arrest (Waldman et al., 1995). Accumulation of p53 protein may lead to apoptosis in response to increased levels of DNA damage; thus, apoptosis induction was linked with p53 gene expression. Two additional cell lines were compared to determine if apoptosis induction was p53 driven (human breast cancer cells AU-565 and colon carcinoma cells DLD-1).

The human breast and colon cancer cell lines displayed a lower percentage of apoptosis preceding irradiation when compared with HOS cells as shown in Figure 1 (panels B and C). The colon adenocarcinoma, which has the most invasive potential, displayed the lowest percentage increase in p53-induced apoptosis. Treatment of HOS cells with PMA caused a decrease in apoptosis induction; however, an increase in apoptosis induction was observed in the adenocarcinomas of the breast and colon when treated with the known tumor promoter (Figure 1).

Salivary analysis—Due to the role of saliva as a homeostatic fluid, it has been used as a diagnostic medium for a number of diseases and also serves as an indicator of disease through certain symptoms that develop in the oral cavity. Many proteins that are tested for in serum can also be found in the saliva. Because of p53 tetramer formation, it was

predicted that p53 levels could be measured using saliva. The following table provides the demographic characteristics of the people who contributed saliva in this portion of the study, as well as the finding that p53 was indeed present in saliva:

Mean Age	42
Maximum Age	75
Minimum Age	25
% Male	22.50%
% Female	77.50%
% Smokers	15%
% Drinkers	88.24%
% History of Cancer	70%
Mean Total Protein	1.041 mg/ml
Mean p53 Pantropic	.044 ng/ml
Mean p53 Mutant	Not detected

We determined that there was a correlation between race and the presence of p53 protein in the saliva of the participants in this study, with fewer African-Americans having high p53 protein levels in their saliva than Caucasian participants ($p < 0.04$). Whether or not Caucasian individuals have overall higher levels of erb present in their saliva versus African-Americans requires further study, however, this finding may suggest a more sensitive triggering mechanism of c-erbB-2 induction in Caucasians than in African-Americans, thus rendering them better candidates for targeted therapy. Clearly more detailed study is needed in this regard.

DISCUSSION

The suggested regulatory function of the p53 gene is apoptosis. By preventing the advancement of mutated cells into the G2 stage of the cell cycle, p53 can control (avert) tumor growth. It was originally hypothesized in this study that p53 protein expression could be used as a diagnostic tool for the detection of cancer as well as a determinant of degree of cancerous growth. Through the observation of apoptosis induction in the various cancer cell types used in this study, it is suggested that tumors derived from p53 mutations may be less responsive to radiation and possibly chemotherapy treatments. Along these lines, patients with ataxia telangiectasia, a neurodegenerative disorder with high cancer predisposition, have cells that are especially sensitive to ionizing radiation. Their cells fail to G1 arrest after radiation exposure and show delayed and

reduced induction of p53. Genes that are mutated in these patients are critical for cell cycle regulation and are being investigated for possible upstream regulation of p53-induced apoptosis (Kastan et al., 1992). Therefore, cells with mutated p53 could potentially be resistant to radiation, and possibly adjuvant chemotherapeutic treatment.

Recent studies have revealed the presence of a biomarker, c-erbB-2, for breast cancer in saliva (Streckfus et al., 2000). Additionally, the marker was elevated in the saliva of women diagnosed with breast cancer as compared to healthy controls. The investigators have also performed studies that have determined the reliability, estimated the cut-off values, and resolved confounding variables which

could potentially distort the findings (Streckfus et al., 2001). Using a simple and inexpensive procedure such as saliva analysis to determine p53 status of cancer patients, physicians may develop treatments that have a positive affect on the suppression of further transformation of p53-derived cancers. This type of technique may also one day serve as a screening process for predetermined susceptibility of acquiring the disease in the general population. The ultimate objective is to use p53 measurement as a means of early detection of highly malignant cancers. Further research may focus on a more specific demographic group to validate p53 protein measurement as an effective diagnostic procedure.

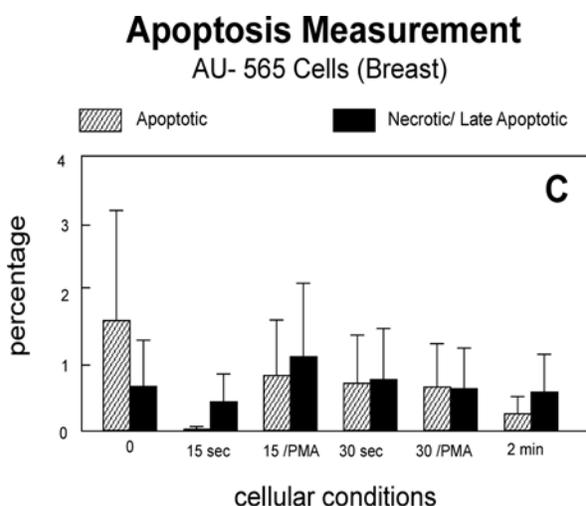
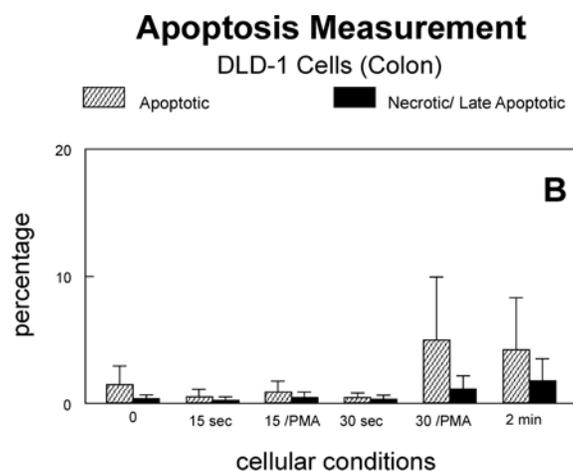
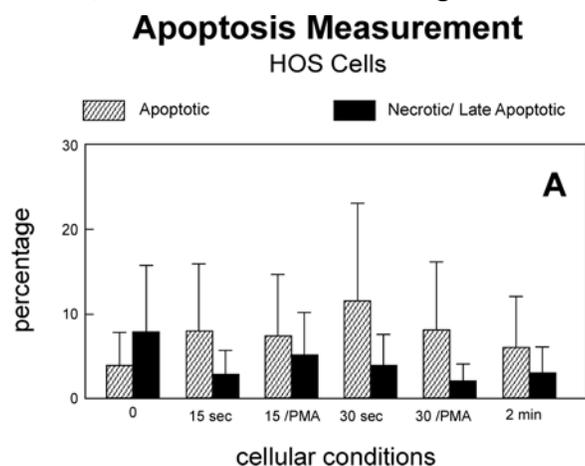


Figure 1. Flow cytometric analyses of annexin V-FITC staining of HOS (panel A), Colon carcinoma cells (panel B) and breast cancer cells (panel C). Cells were assayed as described in the Materials and Methods section. Briefly, cells were exposed to UV irradiation (310 nm) for the indicated times with or without the presence of tumor promoter PMA. The percentage of the total cell population examined which exhibited apoptotic characteristics are represented in the bar.

ACKNOWLEDGMENTS

This work was supported by an award to the Base Pair Student Program at UMMC to RG Adams through a grant from the Howard Hughes Medical Institute and in part by NIDR/NIH Shannon Award R55 DE/OD 12414-01 to CS.

LITERATURE CITED

- Akins, R.E., and R.S. Tuan. 1992. Measurement of protein in 20 seconds using a microwave BCA assay. *Biotechniques* 12:496–499.
- Ausubel, F.M., R. Brent, R.E. Kingston, D.D. Moore, J.G. Seidman, J.A. Smith, and K. Struhl, eds., 1991. *Current Protocols in Molecular Biology*, John Wiley & Sons, New York.
- Ball, V.A., P.D. Righi, E. Tejada, S. Radpour, Z.P. Pavelic, and J.L. Gluckman. 1997. p53 immunostaining of surgical margins as a predictor of local recurrence in squamous cell carcinoma of the oral cavity and oropharynx. *ENT-Ear, Nose and Throat Journal* 76:818–823.
- Boyle, J.O., L. Mao, J.A. Brennam, W.M. Koch, D.W. Eisele, J. R. Saunders, and D. Sidransky. 1994. Gene mutations in saliva as molecular markers for head and neck squamous cell carcinomas. *The American Journal of Surgery* 168:429–432.
- Chen, P., Y. Chen, R. Bookstein, and W. Lee. 1990. Genetic mechanisms of tumor suppression by the human p53 gene. *Science* 250:1576–1580.
- Crook, T., R.L. Ludwig, N.J. Marston, D. Wilkomm, and K.H. Vousden. 1996. Sensitivity Of p53 lysine mutants to ubiquitin-directed degradation targeted by human papillomavirus E6. *Virology* 217:285–292.
- Kastan, M.B., Q. Zhan, W.S. el-Deiry, F. Carrier, T. Jacks, W.V. Walsh, B.S. Plunkett, B. Vogelstein, and A. J. Fornace, Jr. 1992. A mammalian cell cycle checkpoint pathway utilizing p53 and GADD45 is defective in ataxia-telangiectasia. *Cell* 71:587–597.
- Kubbutat, M.H.G., R.L. Ludwig, M. Ascroft, and K.H. Vousden. 1998. Regulation of Mdm2-directed degradation by the C terminus of p53. *Molecular and Cellular Biology* 18:5690–5698.
- Lowe, S.W., and H.E. Ruley. 1996. p53-Dependent apoptosis in tumor progression and in cancer therapy. *Cellular Aging and Cell Death* 209–234.
- Stanbridge, E. J., and W.K. Cavenee. 1989. *Oncogenes and the Molecular Origins of Cancer*. Cold Spring Harbor Laboratory Press. pp. 298–300.
- Streckfus, C.F., L. Bigler, T.D. Dellinger, X. Dai, A. Kingman, and J.T. Thigpen. 2000. The presence of c-erbB-2B-2, and CA 15-3 in saliva and serum among women with breast carcinoma: A preliminary study. *Clin. Cancer Res.* 6:2363–2370.
- Streckfus, C.F., L.G. Bigler, T. Dellinger, X. Dai, W.J. Cox, A. McArthur, A. Kingman, and J.T. Thigpen. 2001. Reliability assessment of soluble c-erbB-2 concentrations in the saliva of healthy women and men. *Oral Surg. Oral Med. Oral Pathol. Oral Radiol. Endod.* 91:174–179.
- Tang, M.X., C.T. Redemann, and F.C. Szoka, Jr. 1998. In vitro gene delivery by degraded polyamidoamine dendrimers. *Bioconjugate Chem.* 7:703–714.
- Waldman T., K.W. Kinzler, and B. Vogelstein. 1995. p21 is necessary for the p53-mediated G1 arrest in human cancer cells. *Cancer Res.* 55: 5187–5190.

MAS AWARDS

Nominations Solicited

The Awards and Resolutions Committee seeks nominations from the membership at large for awards to be presented at the Annual Meeting of the Mississippi Academy of Sciences:

- **Outstanding Contributions to Science**
Recognizes a member of the MAS whose research, teaching, or service to the community has significantly furthered the cause of science
- **Dudley F. Peeler Outstanding Contributions to the Mississippi Academy of Sciences Award (Peeler Award)**
Recognizes a member of the MAS for long-term service to the Academy itself.
- **Community/Junior College Science Teacher**
Recognizes a member of the MAS with outstanding accomplishment in the teaching of science at the community or junior college level
- **Secondary Science Teacher**
Recognizes a member of the MAS with outstanding accomplishment in the teaching of high school science

These awards recognize the exceptional contributions of fellow MAS colleagues. To nominate a **current MAS member** for any of these awards, please specify the award category and submit the following:

- a. **two supporting letters** from members of the Academy having firsthand knowledge of the nominee's accomplishments
 - Nominees for the **Outstanding Contributions to Science** should exhibit a commitment to the acquisition, dissemination, and application of scientific knowledge. An extensive research publication record by itself is not the only criterion on which nominations are considered.
 - Nominees for the **Peeler Award** should exhibit long-term, fundamental contributions toward the advancement of the Mississippi Academy of Sciences.
 - Nominations for either of the **Science Teacher Awards** must include a summary of the nominee's science teaching achievements as well as a summary of outstanding achievements of the nominee's students.
- b. **curriculum vitae of the nominee**
 - Include educational background, professional experience, current position and work address, and both daytime and evening phone numbers as well as any other information considered to be pertinent for a specific award.
- c. **additional letters of support** (optional)
 - Letters of recommendation from persons who are not MAS members will be accepted but are not required.

Send nominations to:
Dr. Sarah Lea McGuire, Chair
MAS Awards and Resolutions Committee
Department of Biology
Post Office Box 150305
Millsaps College
Jackson, MS 39210

If you have questions or comments, please do not hesitate to contact the Chair at 601-974-1414 (phone), 601-974-1401 (FAX), or mcguisl@millsaps.edu (email).

DEADLINE FOR ALL NOMINATIONS IS DECEMBER 1, 2001

Call for a Volunteer

We need someone to volunteer to be the Poster Chairperson for the Mississippi Academy of Sciences annual meeting (to be held February 20-22, 2002 in Biloxi, MS). Please contact Margot Hall at Margot.Hall@usm.edu or phone # (601) 266-4912 or 266-4908 (secretary) if you would like to volunteer for this very important position or you would like more information about it. *MAS will fund one room (2 nights) at the hotel* for the poster chairperson. The job will require that the chairperson bring some students with him/her and that they set up the poster easels and boards on Wednesday afternoon/evening, move the easels as needed on Thursday evening (after the Dodgen lecture), and remove the easels on Friday afternoon following the meeting. The job is not difficult but it does require that one be at the meeting on Wednesday afternoon/evening and that one remain on Friday until the last poster easel has been taken down and put in trucks/vans to return to storage.

“The Mississippi Academy of Sciences Candle Burns Brightly!”

Congratulations to Bob Bateman who is our new president-elect and to Ham Benghuzzi who is our newest director for the Mississippi Academy of Sciences (MAS). Similarly, congratulations are in order for Steve Case who is the new president-elect for the National Association of Academies of Science (NAAS). Our hats are off to all of them!

As we begin a new academic year, let me encourage you to put the MAS annual meeting on your calendar. It will be held in *Biloxi, MS on February 21-22, 2002*. We hope that you will plan to attend the meeting and bring your students and colleagues. The meeting is an excellent place for young investigators to network with scientists and students from other institutions. Many a student has met his/her future employer or university professor(s) at the Academy meetings. Others have learned about specific scholastic and/or industrial job opportunities at the meetings. Faculty have developed relationships with vendors which have led to new equipment for their teaching labs. We urge you and your students to submit abstracts and present your research findings at the meeting. This is an excellent way for young investigators to get their initial experience presenting at scientific meetings and it is a place to present on-going work to your colleagues. We also encourage you to submit articles to the Journal of the Mississippi Academy of Sciences. The journal is peer-reviewed and has an excellent publication record and turn around time. It is a particularly appropriate venue for research results detailing work that involves this state and/or region.

The greatest value of the Academy is its inclusiveness, due in part to its low cost (membership dues), but nothing worthwhile ever comes for free. Therefore, I urge you to become involved with the Academy and to support it. To paraphrase Jack Kennedy, “Ask not what the Academy can do for you, ask what you can do for the Academy”... Here are some suggestions: 1) bring a friend to the next MAS annual meeting (This costs you nothing and increases our membership and the visibility of the Academy statewide), 2) submit the name(s) of individuals you think are deserving of an Academy award (This costs only a small amount of time to write a letter of nomination or support for the individual and enhances the applicant pool while giving encouragement to the nominee), 3) offer to serve on a MAS committee (This takes a little more time but reaps huge dividends for you, your institution and the state). Please give as much time as you feel you can and know that your efforts are greatly appreciated!

As we prepare for the next annual meeting, I am delighted to announce that our Dodgen lecturer will be Dr. Stephanie Cave. Dr. Cave practices family medicine in Baton Rouge where she specializes in the treatment of pediatric patients with autism, autism spectrum disorders, and attention deficit hyperactivity disorder. She will give a presentation on the pathology and treatment of these disorders. Autism is the fastest growing pediatric pathology and Dr. Cave is reputed to be an excellent speaker so we are indeed fortunate to have her as our speaker. There will be more information about her presentation in

the next edition of the Academy journal.

For those of you who are involved with the Mississippi Junior Academy of Sciences (MJAS), Betsy Sullivan (MJAS Director) has asked me to inform you that the MJAS annual meeting will be held at the Mississippi Gulf Coast Community College-Perkinston Campus on January 25, 2002.

Additionally, it is clear that Mississippi will be well represented this year in Boston where the American Association for the Advancement of Science (AAAS), the National Association of Academies of Science (NAAS), and the American Junior Academy of Science (AJAS) will be holding their joint meeting (February 13-17, 2002). Our own Joan

Messer is in the second year of a three year term as president of AJAS and has put together a “tea party” of science which should rival her most successful meeting in San Francisco last year. Mississippi will also be represented by Steve Case who as president-elect of NAAS will be coordinating the “Breakfast with Scientists” at which the delegates will enjoy the opportunity to meet with renowned scientists from around the country and discuss career and educational opportunities. We thank them, we salute all the people who are supporting MAS and her sister academies, and we wish you a most excellent academic year!—Margot Hall

Executive Officer’s Column

Blend until smooth—many recipes (okay—many drink recipes or so I’ve been told) finish with those instructions. In science these days, we frequently have to blend diverse disciplines together in order to achieve our goals. Unfortunately, the result is frequently far from smooth. Research science has become so intricate and involved that the model of the single scientist studying all aspects of a question is no longer practical. Yet, many scientists still tend to maintain the “Lone Ranger” approach or single PI attitude.

No one individual can follow the literature in the many overlapping fields of modern science. We are discovering that molecular biologists are needing the assistance of mathematicians and computer scientists; chemists need physicists; zoologists need everybody. As we delve deeper into processes, we

see that complexity is the common theme and crossovers in scientific fields help provide the approaches needed.

The MAS Annual Meeting can provide a local venue to observe expertise that others might have and be willing to contribute. Check out the abstracts for people that might be doing something that could impact your work. I realize that sometimes it’s difficult to move from one session to another; however, you might just try meeting them somewhere for a brief discussion. It’s even easier if they have a poster. This provides the ideal opportunity for dialogue. Don’t just stay with your own kind; you never know when that zoologist standing by the poster might have something really important to contribute to your engineering project! Then blend until smooth.—John Boyle

Mississippi Junior Academy of Sciences

Mississippi Junior Academy of Sciences (MJAS), sponsored through the Mississippi Academy of Sciences (MAS), is an organization for students (grades 9–12) interested in scientific research. Members of the MJAS annually submit papers based on their scientific research.

The annual research paper competition consists of three phases. In phase I, submitted papers are judged on written documentation. Papers are selected by a panel of research scientists to be presented in phase II, the oral presentation. These papers are divided into two classes based on student grade level. Class I students are in grades 9 and 10.

Class II students are in grades 11 and 12. Papers are then placed in divisions based on the topic of research. Phase III is the overall competition in which the first-place divisional winners of class to compete for the Clyde Sheely award.

The 2001 MJAS research paper competition was held on January 14, 2001, on Milsaps College Campus in Jackson. Over 100 students and teachers attended this event. The lecture and overall competition was held at the Mississippi Museum of Natural Science. Charles Knight, conservation biology and research coordinator of the Mississippi Museum of Natural Science lectured on research

conducted in the natural science field. The final results of the competition are as follows:

Clyde Sheely winner (overall winner)—Farzad Sadjadi of Cleveland High School, Cleveland, MS

Second-place award—Gita Subramony of St. Andrew's Episcopal school, Madison MS.

Special recognition—Paul Varnado of Hattiesburg high school, Hattiesburg MS.

The MJAS has been invited to hold its annual competition on the Perkinston campus of the Mississippi Gulf Coast Community College. The event will be held on January 25, 2002. Deadline for paper submission is November 9, 2001. Grant money is available for student research.

The executive board is now accepting invitations

to host the 2003 competition. Institutions interested in hosting M. must meet the following criteria:

1. Seven to 10 breakout rooms in which divisional competitions will be held,
2. one large room/moratorium in which the opening session, lecture, and overall competition will be held, and
3. facility for the business luncheon.

If you and your institutions are interested in hosting the 2003 competition, please contact MJAS Director Betsy Sullivan at the Mississippi Museum of Natural Science, 2148 Riverside Drive, Jackson, MS 39202 or 601-354-7303.

We are also interested in having MAS members as judges for the January 25, 2002, competition. All areas of science are represented by the students.—Betsy Sullivan



The Mississippi Academy of Sciences will hold its annual meeting in Biloxi, Mississippi, on February 21 & 22, 2002.

Mississippi Junior Academy of Sciences

Call for Papers

Students in grades 9–12 are invited to submit a research paper detailing their research projects to the Mississippi Junior Academy of Sciences Annual Research Paper Competition.

Deadline for Entry: November 9, 2001

Send entries to:

Betsy Sullivan

Mississippi Museum of Natural Science

2148 Riverside Drive

Jackson, MS 39202

601-354-7303 ext. 135

Competition Date and Location: January 25, 2002

Mississippi Gulf Coast Community College

Perkinston Campus

Mississippi Junior Academy of Sciences

Call for Judges

Judges are needed for the Mississippi Junior Academy of Sciences
Annual Research Paper Competition.

Three sets of judges are needed for the following areas:

Written Paper Judging (November 27, 2001)

Divisional Judging (January 25, 2002)

Overall Competition Judging (January 25, 2002)

All MAS members interested in becoming a judge should contact:

Betsy Sullivan

Mississippi Museum of Natural Science

2148 Riverside Drive

Jackson, MS 39202

601-354-7303 ext. 135

betsy.sullivan@mmns.state.ms.us

MISSISSIPPI ACADEMY OF SCIENCES ABSTRACT FORM/MEMBERSHIP FORM

ABSTRACT INFORMATION

Abstract title _____

Name of presenting author(s) _____
(Presenter must be a current (i.e., 2002 membership dues must be paid) student member, regular member, or life member of the MAS)

Telephone _____ Email _____

Check the division in which you are presenting

- | | | |
|---|--|---|
| <input type="checkbox"/> Agriculture and Plant Science | <input type="checkbox"/> Health Sciences | <input type="checkbox"/> Physics and Engineering |
| <input type="checkbox"/> Cellular, Molecular and Dev. Biol. | <input type="checkbox"/> History and Philosophy of Science | <input type="checkbox"/> Psychology and Social Sciences |
| <input type="checkbox"/> Chemistry and Chem. Engineering | <input type="checkbox"/> Math., Computer Sci. and Statistics | <input type="checkbox"/> Science Education |
| <input type="checkbox"/> Geology and Geography | <input type="checkbox"/> Marine and Atmospheric Sciences | <input type="checkbox"/> Zoology and Entomology |

Type of presentation

- Poster presentation Workshop
 Lecture presentation Invited symposium

If the presenting author for this paper is also presenting in another division, please list the other division: _____

Audio-visual equipment needs

- 2" x 2" slide projector
 Overhead projector

Other audio-visual equipment including computers and computer projection equipment must be provided by the speaker.

MEMBERSHIP INFORMATION

New Renewal

Mr. Ms Dr. _____

Address _____

City, State, Zip _____

School or Firm _____

Telephone _____ Email address _____

PLEASE INDICATE DIVISION WITH WHICH YOU WISH TO BE AFFILIATED _____

Regular member \$25 Student member \$5 Life member \$ 250

Educational \$150 Corporate Patron \$1000 Corporate Donor \$500

CHECKLIST

The following MUST be DONE:

- 4. Enclose copy of abstract (even if abstract has been submitted electronically)
- 5. Complete and enclose abstract form /membership form(this form)
- 6. Enclose the following payments (make check payable to Mississippi Academy of Sciences):
 - \$25 per abstract
 - \$25 regular membership fee OR \$5 student membership fee (2002 membership must be paid for abstract to be accepted)
- 7. You must supply a check # _____ or P.O. # _____ (credit cards are not accepted)

In addition you MAY preregister at this time:

- Enclose the following payments:
 - \$20 regular member (after 15 Jan.) \$12 regular member (Preregistration before Jan. 15, 2002)
 - \$10 student member (after 15 Jan.) \$ 5 student member (Preregistration before Jan. 15, 2002)
 - \$50 nonmember (after 15 Jan.) \$40 nonmember (Preregistration before Jan. 15, 2002)

NOTE: Late abstracts will be accepted with a \$10 late fee and only if there is room in the appropriate division. They will be published in the April issue of the MAS JOURNAL.

MISSISSIPPI ACADEMY OF SCIENCES—ABSTRACT INSTRUCTIONS
PLEASE READ ALL INSTRUCTIONS BEFORE YOU SUBMIT YOUR ABSTRACT

- < Your paper may be presented orally or as a poster. Oral presentations are generally 15 minutes although some divisions allow more time. The speaker should limit a 15 minute presentation to 10–12 minutes to allow time for discussion; longer presentations should be limited accordingly. Instructions for poster presentations are given on the reverse side of this sheet.
- < Enclose a personal check, money order, institutional check, or purchase order for \$25 publication charge for each abstract to be published, payable to the Mississippi Academy of Sciences. The publication charge will be refunded if the abstract is not accepted.
- < The presenting author must be a member of the Academy at the time the paper/poster is presented. Payment for membership of the presenting author must accompany the abstract.
- < Attendance and participation at all sessions requires payment of registration.
- < Note that three separate fees are associated with submitting and presenting a paper at the annual meeting of the Mississippi Academy of Sciences. (1) An abstract fee is assessed to defray the cost of publishing abstracts and (2) a membership fee is assessed to defray the costs of running the Academy. (3) Preregistration payment (\$12 regular; \$5 student) may accompany the abstract, or you may elect to pay this fee before January 15th, or pay full registration fees at the meeting.
- < Abstracts may be submitted by e-mail or entered directly through the MAS website. The URL is <http://www.msacad.org>. This abstract submission form and the appropriate fees should be sent by US mail even if the abstract has been submitted electronically.
- < Abstracts may be submitted as a WordPerfect, Word, ASCII, ANSI, or .RTF file on a PC readable diskette. *Formatting should be minimal*. This abstract submission form and the appropriate fees should be sent by US mail even if a diskette is used for the abstract.
- < Abstracts may be submitted typed or printed on clean white paper. Abstracts received in this form will be scanned into a computer. Leave ample margins and use a sanserif type font to help minimize errors in scanning.
- < Submit your abstract and appropriate fees to the Abstracts' Editor, John Boyle, TO BE RECEIVED NO LATER THAN NOVEMBER 1, 2001.
- < Late abstracts will be accepted with a \$10 late fee and only if there is room in the appropriate division. They will be published in the April issue of the MAS journal.

Dr. John Boyle
Mississippi State University
Dept. of Biochemistry
P.O. Drawer 9650
Mississippi State, MS 39762

FORMAT FOR ABSTRACT

- < Your abstract should be informative, containing: (a) a sentence statement of the study's specific objectives, unless this is given in the title; (b) brief statement of methods, if pertinent; (c) summary of the results obtained; (d) statement of the conclusions. It is not satisfactory to state, "The results will be discussed."
- < Your abstract, including a concise, descriptive title, author(s), location where work was done, text and acknowledgment, may not exceed 250 words. *Excessively long abstracts will be truncated*.
- < The title should be all capital letters. Use significant words descriptive of subject content.
- < Authors' names start a new line.
- < The institution where your research was done should include city, state, and zip code. Do not include institutional subdivisions such as department.
- < The abstract should be one paragraph, single spaced, starting with a 3-space indentation.

- < Use standard abbreviations for common units of measure. Other words to be abbreviated, such as chemical names, should be spelled out in full for the first use, followed by the abbreviation in parenthesis. Do not abbreviate in the abstract title.
- < Special symbols not on your printer or typewriter must be in black ink.
- < Use italics for scientific names of organisms.
- < Begin authors' names on a new line. Place an asterisk (*) after the presenter(s), if there are multiple authors.
- < Use superscripts for institutional affiliations where necessary to avoid ambiguity.
- < Refer to these examples as guides.

EXAMPLES OF TITLES AND AUTHORS:

[single author, no ambiguity about designated speaker or affiliation]

AN EXPERIMENTAL MODEL FOR
CHEMOTHERAPY ON DORMANT
TUBERCULOUS INFECTION WITH
PARTICULAR REFERENCE TO RIFAMPICIN

Joe E. Jones, Mississippi State University,
Mississippi State, MS 39762

Abstract body starts here . . .

[two authors, both designated as speakers, different affiliations, but no ambiguity]

AN EXPERIMENTAL MODEL FOR
CHEMOTHERAPY ON DORMANT
TUBERCULOUS INFECTION WITH
PARTICULAR REFERENCE TO RIFAMPICIN

Joe E. Jones* and Ralph A. Smith*, Mississippi
State University, Mississippi State, MS 39762 and
University of Mississippi Medical Center, Jackson,
MS 39216

Abstract body starts here . . .

[two authors, one designated speaker, different affiliations, but no ambiguity]

AN EXPERIMENTAL MODEL FOR
CHEMOTHERAPY ON DORMANT
TUBERCULOUS INFECTION WITH
PARTICULAR REFERENCE TO RIFAMPICIN

Joe E. Jones and Ralph A. Smith*, Mississippi State
University, Mississippi State, MS 39762 and
University of Mississippi Medical Center, Jackson,
MS 39216

Abstract body starts here . . .

[three authors, one designated speaker, different affiliations]

AN EXPERIMENTAL MODEL FOR
CHEMOTHERAPY ON DORMANT
TUBERCULOUS INFECTION WITH
PARTICULAR REFERENCE TO RIFAMPICIN

Joe E. Jones¹, Ralph A. Smith^{1*}, and Alice D. Doe²,
¹Mississippi State University, Mississippi State, MS
39762 and ²University of Mississippi Medical
Center, Jackson, MS 39216

Abstract body starts here . . .

GUIDELINES FOR POSTER PRESENTATIONS

- < The Academy provides poster backboards. Each backboard is 34" high by 5' wide. Mount the poster on the board assigned to you by your Division Chairperson. Please do not draw, write, or use adhesive material on the boards. You must provide your own thumb tacks.
- < Lettering for your poster title should be at least 1" high and follow the format for your abstract. Lettering for your poster text should be at least 3/8" high.
- < Posters should be on display during the entire day during which their divisional poster session is scheduled. They must be removed at the end of that day.
- < Authors must be present with their poster to discuss their work at the time indicated in the program.