



# NEWSLETTER

## INTERNATIONAL HUMIC SUBSTANCES SOCIETY

Number 26

Fall, 2001

Dear colleagues and friends,

have you ever been aware of the fundamental role of the humic matter in nature and culture? Of course, you will say, we all know about the basic importance of humics for the fertility of soils and we all enjoy the unique habitats of bog areas and their brown waters. For some of you there might be even the experienced problem of halogenated products in drinking water disinfection. Fine papers dealing with these issues can be found in literature. But have you thought about the word itself? Especially if you play with it? Is it by chance that we have several similar words which carry the same core and differ e. g. in not more than two characters from HUMUS? "Humic" seems to be trivial but there is also *human*, *humid* and *humor*, words which we also find in other languages than English. Ethymologists might analyse the words as we analyse the matter spectroscopically. Others might even discover in the bunch of words the essence of life. No matter how, you are dealing with the most interesting substances, footprints of life gone by and sources for new life at the same time.

As often relevance and good understanding do not go parallel. I encourage you to use the chance of closing the gap of information by sound research. You should use all the facilities IHSS can offer: A fine collection of standard and reference material, an active exchange of minds within the national chapters and amongst them, the scholarly discussion of experimental results in national and international meetings and a broad transdisciplinary approach to research with the colleagues you find in the membership. As President of the Society, I can assure you that the board is eager to serve you with all the necessary tools to support your research on humics and by this to increase the knowledge in this important field of natural resources.

I want to draw your attention to some points which might be of special interest to you.

- It has been decided to rearrange some national chapters and to form regional ones in order to strengthen the scientific basis for cooperation.
- The sample collection will be enlarged to offer you an even more comprehensive selection of typical substances from different climatic zones.
- The next IHSS conference will be held in Boston, USA, from July 21 to 26 at Northeastern University, and for the one to follow there is an application from Brazil. Again travel awards will be offered for our young PhD students.
- The Society has two new honorary members: Dr. Russell F. Christman and Dr. Konrad Haider. Both are outstanding experts in the field of humics and have contributed significantly to a better understanding of this complex matter.
- Last but not least I want to announce the election for three board positions and I ask you to vote the candidates which were selected by a nomination committee under the guidance of Dr. Gregory Korshin.

In addition, I want to encourage you to play an active role in the society. Send your humics-related ideas to Dr. Teddy Miano, the coordinator of the News Letter, supply abstracts of finished PhD thesis and inform us about events and projects which might be of general interest.

Think and live humics (and may be the other variations of the word).

Cordially,

**F. H. Frimmel**

# INTERNATIONAL HUMIC SUBSTANCES SOCIETY BOARD OF DIRECTORS

2001

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Sapelo Island  
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☎ (+) 1 706 583 0049  
☎ (+) 1 706 542 5888  
jalberts@arches.uga.edu

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Dip. Biologia e Chimica Agro-Forest.  
e Ambientale, Univ. di Bari  
Via Amendola, 165/A  
70126 Bari, Italy  
☎ (+) 39 080 544 2857  
☎ (+) 39 080 544 2850  
miano@agr.uniba.it

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Dip. Prod. Vegetale e Tecn. Agrarie  
Università di Udine  
Via delle Scienze 208  
33100 Udine, Italy  
☎ (+) 39 0432 558644  
☎ (+) 39 0432 558603  
maria.denobili@dpvta.uniud.it

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Dr. Fritz H. Frimmel  
Engler-Bunte Inst., Ber. Wasserchemie  
Universität Karlsruhe  
Engler-Bunte-Ring 1  
76131 Karlsruhe, Germany  
☎ (+) 49 721 608 2580  
☎ (+) 49 721 608 7051  
fritz.frimmel@ciw.uni-karlsruhe.de

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Dr. C.E. Clapp  
Dept. Soil, Water, Climate  
University of Minnesota  
1991 Upper Buford Circle  
St. Paul, MN 55108, USA  
☎ (+) 1 612 625 2767  
☎ (+) 1 612 625 2208  
eclapp@soils.umn.edu

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Ecole Sup. d'Ingenieurs de Poitiers  
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40, Av. du Recteur Pineau  
86022 Poitiers Cedex, France  
☎ (+) 33 49 45 3915  
☎ (+) 33 49 45 3768  
croue@campus.univ-poitiers.fr

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Dr. Yona Chen  
Dept. of Soil & Water Sciences  
Hebrew University of Jerusalem  
P.O. Box 12  
76100 Rehovot, Israel  
☎ (+) 972 8 9489234  
☎ (+) 972 8 9468565  
yonachen@agri.huji.ac.il

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Dr. Paul R. Bloom  
Dept. Soil, Water, Climate  
University of Minnesota  
1991 Upper Buford Circle  
St. Paul, MN 55108, USA  
☎ (+) 1 612 625 4711  
☎ (+) 1 612 625 2208  
pbloom@soils.umn.edu

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Dr. Russel CHRISTMAN  
Dr. Konrad HAIDER

## International Humic Substances Society on the World Wide Web

Visit our home page at:

<http://www.ihss.gatech.edu>

Dr. E. M. Perdue coordinates the development of the IHSS WEB page. Progresses toward this goal may be followed at the above WEB site which resides on a server located at the Georgia Institute of Technology, Atlanta, USA.

Suggestions and comments regarding the content and organization of the WEB pages are actively requested from all IHSS members.

E-mail Dr. E. M. Perdue at [michael.perdue@eas.gatech.edu](mailto:michael.perdue@eas.gatech.edu) for more information.

## CONGRATULATIONS

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### ***Dr. Russell F. Christman is Awarded Honorary IHSS Membership***

The board of the IHSS has unanimously appointed Dr. Russell F. Christman as an Honorary Member of the Society. The decision was announced at the IHSS Meeting in Toulouse and the certificate was given to Dr. Christman at the banquet of the Humics Workshop at Boston this spring. Dr. Christman has spent the last 25 years of his career as Professor for Environmental Science at the University of North Carolina at Chapel Hill. He is a research pioneer in the area of the chemical properties of aquatic humic substances. His scientific contributions include characterization of dissolved humics by fluorescence and other spectrometric methods, oxidative and reductive degradation with mass spectrometric identification of the products and the formation of disinfection by-products from humics with chlorine. Through the several books he edited and international conferences he chaired, Professor Christman has shared his inspiring conceptual understanding of this complex natural product with many colleagues and students. He is a Past-President of the Society is responsible for the establishment of a student travel fund within IHSS which offers financial assistance to students wishing to participate in IHSS conferences.

*Fritz Frimmel, President of the IHSS*

### ***Dr. Konrad Haider is Awarded Honorary IHSS Membership***

Dr. Konrad Haider studied chemistry, microbiology and botany at the Universities of Munich and Frankfurt in the Fifties. After two years with the HOECHST company he joined the Federal Research Agency for Agriculture where he became director of the Institutes for Biochemistry of Soil and for Plant Nutrition and Soil Sciences. He enjoyed intensive collaborations with J.P. Martin. Konrad Haider published more than 300 scientific papers. Most of them are closely related to humic substances formation. He is best known for his work on analytical identification of phenolic building blocks and other constituents of humics using  $^{14}\text{C}$  and other isotope-labelled compounds. In addition, his work focussed on the decomposition and transformation of humic precursors and the utilisation of the products by plants. Recently, he extended his fine NMR-work on the interaction of humics with xenobiotics. Konrad Haider has not only given important scientific impulses on humics research, he also has been one of the strong supporters of IHSS and its activities from the beginning. The IHSS proudly announces the honorary membership of this successful scholar.

*Fritz Frimmel, President of the IHSS*

## IHSS VOLUMES (and related publications)

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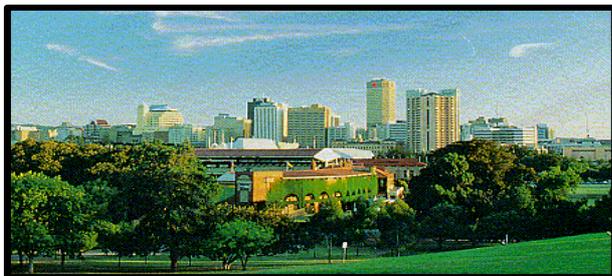
UNDERSTANDING HUMIC SUBSTANCES: ADVANCED METHODS, PROPERTIES and APPLICATIONS (286 pp.). Edited by E Ghabbour and G Davies, Royal Society of Chemistry, Cambridge, England, 1999. **ISBN 0-85404-799-9**

HUMIC SUBSTANCES: VERSATILE COMPONENTS OF PLANTS, SOILS AND WATER (341 pp.) Edited by E Ghabbour and G Davies, Royal Society of Chemistry, Cambridge, England, 2000. **ISBN 0-85404-855-3**

HUMIC SUBSTANCES AND CHEMICAL CONTAMINANTS (502 pp.). Edited by CE Clapp, MHB Hayes, N Senesi, PR Bloom, and PM Jardine, Soil Science Society of America, Inc., Madison, 2001.

HUMIC SUBSTANCES: STRUCTURES, MODELS AND FUNCTIONS (387 pp.) Edited by E Ghabbour and G Davies, Royal Society of Chemistry, Cambridge, England, 2001. **ISBN 0-85404-811-1**

UNDERSTANDING AND MANAGING ORGANIC MATTER IN SOILS, SEDIMENTS AND WATERS (600 pp.). Edited by R.S. Swift and K.M. Spark, IHSS, 2001.



## ***Understanding and managing organic matter in soils, sediments and waters***

**Editors:** R.S. Swift and K.M. Spark

**Proceedings of the 9<sup>th</sup> International Conference of the International Humic Substances Society, University of Adelaide, Adelaide, Australia, 21<sup>st</sup>-25<sup>th</sup> September 1998.**

The proceedings has been organized into five sections under the themes:

- ***Characterization of organic matter,***
- ***Dynamics of organic matter in composts, peats and soils,***
- ***Geochemistry and organic matter,***
- ***Organic matter in waters,***
- ***Interactions of organic matter with pesticides and xenobiotics.***

The proceedings are excellent value as they incorporate 75 papers highlighting the presentations given at the conference, have a hardcover and are approximately 600 pages in length.

Some of the papers included in the proceedings are:

- ♣ Progress towards understanding aspects of composition and structure of humic substances. *M.H.B. Hayes and R.S. Swift*
- ♣ Long- and short-term changes in soil organic matter quality and aggregate stability as affected by agricultural management. *R.J. Haynes*
- ♣ Fate of refractory organic matter in water treatment -degradation and reaction. *F. H. Frimmel, G. Abbt-Braun, S. Hesse, and G. Kleiser*
- ♣ Characterisation of native and non-native organic matter in soils by means of <sup>13</sup>C CPMAS NMR spectroscopy. *I. Kögel-Knabner and H. Knicker*
- ♣ Capillary electrophoretic behaviour of humic substances of different origin. *M. De Nobili, G. Bragato and A. Mori*
- ♣ Transformation of organic matter to humic substances in composted municipal solid waste. *G. Abbt-Braun F.H. Frimmel, Y. Chen, B. Chefetz and Y. Hadar*
- ♣ Plant growth promoting activity of humic substances *C.E. Clapp, Y. Chen, M.H.B. Hayes and H.H. Cheng*

### Purchase request form

**PLEASE PRINT CLEARLY**

Please send to me  copies of the proceedings of the 9<sup>th</sup> International Conference of the International Humic Substances Society, University of Adelaide, Australia.

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## AWARDS

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P.M. (Ming) Huang, Department of Soil Science, University of Saskatchewan, Canada has received the Soil Science Society of America's most distinguished research award, "**The Soil Science Research Award**". This award was presented to Professor Huang at the 2000 Annual Meetings of ASA-CSSA-SSSA in Minneapolis, Minnesota. The award is in recognition of unusual research creativity, excellence in reasoning ability and/or technical skill, and originality and significance of research to basic soil science. It is the highest award presented for research by the Society. Only one award from a membership of around 6000 is presented each year.

Professor Huang's research contributions are in the areas of environmental soil chemistry, with emphasis on the chemistry of abiotic formation of humic substances, structure and surface properties and reactivity of mineral colloids and organo-mineral complexes, kinetics and mechanisms of their reactions with nutrients and pollutants in soils and waters, and their impact on agriculture and the ecosystem. He has authored two books and edited twelve books. His research accomplishments, embodied in over 250 refereed publications, of which nine were published in the journal *Nature*, are fundamental to the development of innovative strategies for managing land and water resources.

Professor Huang received his B.S. degree in Agricultural Chemistry from the National Chung Hsing University in Taiwan, 1957, M.S. degree in Soil Science from the University of Manitoba, Canada, 1962, and Ph.D. degree in Soil Science from the University of Wisconsin, Madison in 1965. He has been a faculty member of the University of Saskatchewan since 1965. He is the founding and current Chair of the working Group MO "Interactions of Soil Minerals with Organic Components and Microorganisms" of the International Union of Soil Sciences. He is Titular Member of Commission of Fundamental Environmental Chemistry of the International Union of Pure and Applied Chemistry. He was elected Chair of Division of Soil Chemistry and Division of Soil Mineralogy of the Soil Science Society of America. He has served as member of many editorial boards of journals such as *Geoderma*, *Chemosphere*, *Soil Science and Plant Nutrition*, *Humic Substances in the Environment*, *Water Pollution Research Journal of Canada*, and *Soil Science Society of America Journal*. Very recently he has served as Editor of the Soil Chemistry section of the *Handbook of Soil Science* (Editor-in-Chief, M.E. Sumner, CRC Press, Boca Raton).

Professor Huang is Fellow of the Canadian Society of Soil Science, the American Society of Agronomy, the Soil Science Society of America, and the American Association for the Advancement of Science. He is the recipient of the 1997 Distinguished Researcher Award of the University of Saskatchewan, Canada.

## MEETINGS

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**2<sup>nd</sup> European Meeting on Environmental Chemistry**, Dijon, France, December 12-15, **2001**. Contact: ACE – 2EMEC, GEOSOL-CST, University of Burgundy 6, Boulevard Gabriel, F-21000 Dijon, France. [ACE.MEETING@u-bourgogne.fr](mailto:ACE.MEETING@u-bourgogne.fr) Fax: 33 3 80396372. <http://www.u-bourgogne.fr/ACE>

**XI International Symposium of Iron Nutrition and Interactions in Plants**, Udine, Italy, June 23-28, **2002**. On behalf of the Organizing Committee I wish to inform you that the XI International Symposium on Iron Nutrition and Interactions in Plants will be held in Udine, Italy on June 23-28, 2002. If you are interested in the meeting, please contact the following address: [iron.symp@dpvta.uniud.it](mailto:iron.symp@dpvta.uniud.it), or visit the web site of the Symposium ([www.ironsymp2002.unimi.it](http://www.ironsymp2002.unimi.it)). Thank you for your attention and please extend this message to any colleague of yours that may be interested in attending the symposium, but may possibly be missing from our mailing list. Best regards, Roberto Pinton, Chairman of the Symposium. Dipartimento di Produzione Vegetale e Tecnologie Agrarie, Università di Udine, Via delle Scienze, 208, I-33100 Udine, Italy. Phone: +39.0432.558641 (office) +39.0432.558601 (dept. secretary). fax +39 0432 558603

**International Humic Substances Society 20<sup>th</sup> Anniversary Conference**, "*Humic Substances – Nature's Most Versatile Materials*", Northeastern University, Boston, MA, USA, July 21-26, **2002**. Call for papers. You are cordially invited to participate in the 20<sup>th</sup> Anniversary Conference of the International Humic Substances Society, to be held at Northeastern University in Boston, Massachusetts, USA from Sunday July 21 to Friday

July 26, 2002. The Biennial IHSS Conference returns with joy to the United States 20 years after the First Conference at Estes Park, Colorado in 1983. Previous Conferences were held in Birmingham (England), Oslo (Norway), Matalascanas Beach (Spain), Nagoya (Japan), Monopoli (Italy), St. Augustine (Trinidad & Tobago), Wroclaw (Poland), Adelaide (Australia) and Toulouse (France). **Important Deadlines: November 30, 2001** Early Registration payment; **December 31, 2001** Extended Abstracts receipt; **February 28, 2002** Acceptance of Extended Abstracts; **March 31, 2002** Advanced Registration payment; **April 30, 2002** Final Program published; **May 31, 2002** Late Registration payment.

**Contact for first Announcement:** Dr. E. Ghabbour, Barnett Institute, 341 Mugar Hall, Northeastern University, Boston MA 02115, USA, Phone: (Int.+) (617) 373-7988, Fax:(Int.+) (617) 373-2855, E-mail: e.ghabbour@neu.edu, Web [www.hagroup.neu.edu](http://www.hagroup.neu.edu).

**Humic Substances Seminar VI**, Boston, MA, USA, July 27, **2002**. Humic Substances Seminar VI will be held at Northeastern University, Saturday, July 27, 2002 immediately following the IHSS11 Conference at Northeastern University. The Honorary Chair is Dr. M. De Nobili of the University of Udine, Italy. Registration (US\$50) & abstracts deadline is Dec. 30, 2001. Limited to 80 participants. Please contact Dr. E. Ghabbour, Barnett Institute, 341 Mugar Hall, Northeastern University, Boston MA 02115, USA, Phone: (Int.+) (617) 373-7988, Fax: (Int.+) (617) 373-2855, E-mail: e.ghabbour@neu.edu, Web <[www.hagroup.neu.edu](http://www.hagroup.neu.edu)>

**7<sup>th</sup> International Conference on the Biogeochemistry of Trace Elements (ICOBTE)**, Uppsala, Sweden, June 15-19, **2003**. An interdisciplinary conference dedicated to links between biosphere phenomena and physical & chemical reactions in the lithosphere. SLU Conference/7<sup>th</sup>ICOBTE, PO Box 7059, SE-750 07 Uppsala, Sweden, [www.conference.slu.se/7thICOBTE](http://www.conference.slu.se/7thICOBTE)

## PAST MEETINGS

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**ESF-Workshop “The Prediction of the Environmental Function of the Dissolved Organic Matter (DOM) in Ecosystems”, Schloss Hirschberg, Beilngries, Germany, 2-6 July 2001**  
by Prof. Dr. Fritz H. Frimmel

The European Science Foundation (ESF) acts as a catalyst for the development of science by bringing together leading scientists and funding agencies to debate, plan and implement pan-European scientific and science policy initiatives. The Hirschberg workshop was organized and chaired by **Dr. Adam Zsolnay**, coming from the Institute for Soil Ecology, GSF Research Centre for Environment and Health in Neuherberg.

About 20 specialists representing the soil and water field were invited and presented and discussed DOM themes introduced by one or two theme leaders. The participants came from Belgium, France, Germany, United Kingdom, Hungary, Italy, Norway, Poland, Spain, Switzerland and The Netherlands. The workshop had no traditional presentations, but each participant presented the status of research at his or her institute. Emphasis was layed on future research needs and directions in DOM research on the European level. At the beginning, soil themes were addressed followed by those devoted to aquatic systems, and the different points of view of soil and water specialists became very clear. Chemical, physical and microbiological aspects were included as well as environmental issues. Towards the end of the workshop, the overall results were discussed and as a result a proposal to the ESF for a DOM Network will be developed.

**1<sup>st</sup> Symposium of IHSS-Canadian Chapter, Charlottetown, Prince Edward Island, Canada**  
by Dr. P. M. (Ming) Huang

The 1<sup>st</sup> Symposium of the Canadian National Chapter of the International Humic Substances Society (IHSS) was held in Charlottetown, Prince Edward Island, on August 10, 1999. This symposium was co-sponsored by the Canadian Society of Soil Science (CSSS) and the Working Group MO “Interactions of Soil Minerals with Organic Components and Microorganisms” of the International Union of Soil Sciences. The aim of this symposium was to promote the field of humic substances in soil and related environments by providing a forum for the sharing of current expertise among researchers and to enhance their scientific communication and collaboration in this very important and exciting area of science across Canada. Besides Canadian participants, the symposium had invaluable international inputs. Altogether, eighteen papers were presented.

Thirteen papers are included in a special issue of the *Canadian Journal of Soil Science* (Guest Editor: P.M. Huang; Associate Editors: M.A. Arshad, H. Diné, and T.B. Goh; in press). These papers address the issues on the *in situ* analysis of organic matter in soils, recent advancement in analytical instrumentation, formation and transformation of humic substances, their sorption of natural and anthropogenic organic compounds, humic substances and metal dynamics, and the impact of efficient composting treatments on ecosystem

health. They clearly illustrate the current state-of-the-art and identify the gaps in knowledge on the subject matter. It is hoped that this special issue would provide a basis for stimulating further research to uncover the dynamics and mechanisms of environmental processes pertaining to humic substances in nature. This special issue should be useful for scientists, professors, students, and consultants working in environmental systems. We wish to express our sincere appreciation to the authors for their invaluable contributions. We would also like to thank the external referees for the critical comments to maintain the quality of this special issue. Our gratitude is extended to the Potash and Phosphate Institute of Canada and ARC TECH, Chantilly, Virginia, USA, for their funding to materialize this project.

#### **4<sup>th</sup> International Conference “Humic Substances in Environment 4”, Rackova Valley, Slovakia**

*by Gabriela Barancikova and Erika Tobiasova*

Slovak and Polish experts dealing with humic substances from 1997 regularly organize conference entitled “Humic Substances in environment”. In sequence fourth Conference was held from June 10 – 14, 2001 at Rackova Valley in Slovakia. Fourth International Conference “Humic Substances in environment 4” was organized by Slovak Agricultural University Nitra, Dept. of Pedology and Geology in cooperation with Soil Science and Conversation Research Institute Bratislava and University of Technology and Agriculture Bydgoszcz, Dept. Environmental Soil Chemistry. Chairman of the Scientific and Organizing Committee was Prof. Anton Zaujec, Director of Dept. of Pedology and Geology, Slovak Agricultural University Nitra. The Conference was part of the 55<sup>th</sup> anniversary of Dept. of Soil Science.

The meeting offered the opportunity to present of the most interesting findings in subject of humic substances and to discuss them on an international scale with other experts in the field of humic substances.

The main topics of scientific program were:

- transformations of organic matter in soils, sediments and water
- turnover organic carbon and humic substances in ecosystems
- structure and properties of terrestrial and aquatic humic substances
- organic fertilizers and preparations from organic wastes
- humic substances and soil organic matter in university education.

In these sections 25 oral contributions and 17 posters were presented. In a number of presentations the great emphasis on humic substances as the most important long term form of carbon sequestration was done. On the Conference took part not only experts and young scientific workers from Slovakia and Poland but also from other countries (Czech Republic, Spain and Germany).

In one day of relax, excursion of High Tatras National Park was organized. The participants had opportunity to know specifics environment of these mountains.

Proceedings of the 4<sup>th</sup> Int. Conference “Humic Substances in Environment” can be obtained from: Dept. Pedology & Geology, Slovak Agriculture University by the end of the year, contact: [Erika.Tobiasova@uniag.sk](mailto:Erika.Tobiasova@uniag.sk)

#### **Workshop DOM 2001, Bayreuth, Germany**

*by Gudrun Abbt-Braun*

From 9 to 11 October, 2001, an international workshop on “Ecological Aspects of Dissolved Organic Matter in Terrestrial Ecosystems”, organized by Dr. Karsten Kalbitz and Dr. Klaus Kaiser, was held by the University of Bayreuth, Germany (Wissenschaftszentrum Schloss Thurnau, Thurnau). The aim of the workshop was to offer a forum for discussing properties and dynamics of DOM in relation to its ecological effects and functions in terrestrial and related ecosystems. About 60 participants from 10 countries discussed (i) definitions, methods, concepts, (ii) nutrient cycles, biodegradability, effects of DOM on microorganisms, (iii) mobilization and transport of metals and organic pollutants, and (iv) land use effects on DOM, role of DOM for C sequestration in soils.

Nine invited keynote speakers offered new perspectives on different aspects and provoked questions to focus on in further studies. They were followed by short oral presentations on specific items. These presentations and additional posters were of outstanding scientific quality and served as a base for an intensive discussion. Especially, the biodegradability of DOM and its implications for the C dynamic in the soil were discussed. As a first result, a project was initiated to compare different methods to determine the biodegradation of DOM among six laboratories from four countries (USA, Canada, UK, Germany). Another intensively discussed issue was how certain fractions of DOM affect the binding of metals and pollutants. This might be important for the modelling of the environmental interactions of DOM.

A special issue of GEODERMA representing the oral and poster presentations will be published in 2002. For more information contact Dr. Karsten Kalbitz (e-mail: [karsten.kalbitz@bitoek.uni-bayreuth.de](mailto:karsten.kalbitz@bitoek.uni-bayreuth.de)) or Dr. Klaus Kaiser (e-mail: [klaus.kaiser@uni-bayreuth.de](mailto:klaus.kaiser@uni-bayreuth.de)).

## MISCELLANEOUS

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### **A series of lectures by Michael H.B. Hayes at the University of Bari, Italy**

*by Nicola Senesi, former President of the IHSS*

A series of lectures (in the framework of the seminarial activities of the Doctorate Programme in *Chimica Agraria*, coordinated by Professor Nicola Senesi) was given in the Dipartimento di Biologia e Chimica Agro-Forestale e Ambientale) of the University of Bari by Dr. M.H.B. Hayes, formerly of the Chemistry Department of the University of Birmingham, England, and now an Emeritus Professor ([michael.h.hayes@ul.ie](mailto:michael.h.hayes@ul.ie)) in the Department of Chemical and Environmental Sciences in the University of Limerick, close (60 km) to his farm on the waterfront of the Shannon Estuary near Labasheeda in his native Co. Clare, Ireland. Mike was the fourth President of IHSS, and is an Honorary Member of the Society.

The lectures dealt with the principles involved in the modern procedures for the isolation and fractionation of humic substances, with the mechanisms which give rise to the digest products formed during chemical degradations of the substances, with extrapolations from the digest products identified to plausible component molecules in the humic structures, and with modern spectroscopic procedures for studies of humic compositions and aspects of structure. He gave especial attention to the contributions which modern NMR procedures are making to our changing appreciations of composition and structure in the humic sciences.

The lecture series was characterized by lively discussions centered around concepts that are still controversial. Persons who will have studied chapters 1 and 24 of 'Humic Substances II: In Search of Structure' (Hayes, MacCarthy, Malcolm, Swift) will know that Mike and his colleagues were strong proponents of the macromolecular concepts of humic structures. It seemed from his series of lectures that 'A Road to Damascus' event had influenced Mike in this area, because he seemed to be taken by the concept of 'Molecular Associations' involving humic molecules. Certainly his presentation of proofs of 'Associations' would cause many of the 'older guard' to think again. These associations, he stressed, would inevitably involve humic molecules, but major binding (association) influences are likely to be brought about through associations with non-humic 'prosthetic' substances such as fatty acids/esters, suberins, long chain hydrocarbons, etc. When asked what had caused him to have support for the 'Association Theory', he stated that his present day thought processes were initiated by a seminar in Birmingham about 1993 by Professor Jeremy Saunders of Cambridge who dealt with molecular associations in organic chemistry.

Later, a lecture by Professor Alessandro Piccolo at a meeting of the Italian Chapter in Bari almost exactly six years ago had caused him to think seriously about the notion of molecular associations. Since then the ultra lively discussions that have taken place in the IHSS/SSSA Workshop in Anaheim in 1997, at the annual Northeastern Symposia since then which have had the sponsorship of the American Chapter of IHSS, the presentations and discussions at the IHSS international conferences in Adelaide and in Toulouse, and the contributions at these various meetings by persons such as Pellegrino Conte, Bob Wershaw, and Ray vonWandruska have caused him to dwell deeply on the subject. But most of all, he has been swayed by the evidence from the applications of ultramodern NMR instrumentation in work that has involved himself and is led by Dr. Andre Simpson, his last student in Birmingham, and who has more lately worked with Professor Billy Kingery of Mississippi State, and now with Professor Pat Hatcher of the Ohio State University.

"Will you", he was asked 'ever be able to persuade Roger Swift, your first student in Birmingham, of these concepts"? Roger, the second President of IHSS is champion of the random coil solution conformation of humic acids, based on classical work carried out over 30 years ago by himself and Alan Posner and their colleagues in the University of Western Australia. Their work indicated that the humic acids which they had carefully fractionated had molecules ranging in size from less than 2000 to almost 1.5 million Da. Mike's reply to this was that the data obtained in that work will stand, and more intricate explanations of the behaviour of the systems may yet be found, but that will require extensive re-investigations of the procedures utilizing the quantum leap in instrumentation applications that have been made since that time. Furthermore, the random coil model has had an enormous influence on our concepts of processes and mechanisms of interactions with humic molecules, but in actual fact the logic arising from that concept can be applied, and almost equally

well, to explanations of interactions involving the 'Association Model'. There is, however, Mike stressed, no reason at all why we cannot have some high molecular weight humic material in the mixture, and indeed the evidence from the latest Piccolo work shows that some such material is present in the humic mixtures that he has dealt with. If, after all, one major mechanism of the genesis of humic substances would involve biological (or other) oxidations of lignin molecules, that oxidation could well involve functionalities that need not necessarily lead to cleavages of the 'backbone' structures, as well as others that will cleave the 'backbone'.

Mike is as involved as ever with work in the humic sciences. He believes that it is no longer appropriate for 'island cultures' to operate in the field. The instrumentation demands are now far too great for one team to have all the equipment and skills needed for work at the 'cutting edge'. He is still closely involved in studies with Ed Clapp, his friend and colleague from their days at Cornell nearly 50 years ago, and he has ongoing collaboration with Andre Simpson, of course, and with Jim Burdon and Colin Graham of Birmingham, with Boashan Xing, Jingdong Mao, Billy Kingery, Alessandro Piccolo, and soon he will be involved again with some work with Roger Swift that will complement the discussions they have had over the years and the projects they shared when Roger was in Reading University. He has been impressed by the attitudes, the work ethic, and the equipment of the Bari Group of Senesi and his colleagues. He has had contact with this Group through work involving Ed Clapp, but there is now scope for considerable collaboration in the future.

Mike has been dismayed by the ways in which modellers have made inroads into the realms of soil organic matter and the humic sciences, and have made pronouncements (without due fundamental proof) that are having wide implications in considerations of greenhouse gas emissions, for example. He is in no doubt about the fact that our soils can be made better sinks of carbon when we have an improved awareness of the ways in which different plant source materials are transformed and how the various transformation products interact with the inorganic components in any particular soil system. That will require a better understanding of agrarian practices and of the nature and composition of the organic matter in all soil types and climates. Thus, he says, the emphasis must be taken from modellers and the resources must be diverted to fundamental studies of soil organic matter, and to considerations of conservational agronomical procedures. Such an investment will bear huge dividends for future generations.

He did emphasize, however, that soil and humic scientists are diligent in the work that they do, but unfortunately they are not loud in their protestations about the ways in which their findings are undervalued, and often ignored. The future, he says, is in the hands of 'fiery' young idealists who are good humic scientists. Maybe we should try to entice to the field more such intelligent young 'firebrands' who will calm the winds from the sails of those whose pronouncements are based on 'hot air', and cause politicians to see that their breed (and the rest of us) can supply the information that is so badly needed if our soils are to continue to be the vital sinks for carbon, and the providers of food and fibre for the future generations.

## LIFE HISTORIES OF SENIOR IHSS MEMBERS

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### MEMORIES OF CHARACTERIZING HUMIC NITROGEN 50 YEARS AGO

by *John M. Bremner*, Curtiss Distinguished Professor Emeritus Iowa State University, Ames, Iowa, USA

I graduated from the University of Glasgow in Scotland in 1944 with an honors degree in organic chemistry and spent another year there as a Carnegie Research Scholar synthesizing compounds for cancer research. I was then persuaded by the Director of Rothamsted Experimental Station in Harpenden, England, to join the Chemistry Department at Rothamsted to initiate a program of research to characterize the organic substances in soil. I should have had my head examined !

Rothamsted had a wonderful science library and I spent many hours there reading everything I could find concerning the organic material in soil. I was very disturbed to discover that less than 1% of the organic material in soil had been identified chemically despite more than 100 years of research and to realize that none of the techniques available to organic chemists at that time were likely to be of significant value if applied to the humic acids and other complex organic materials in soils. And it was very discouraging to find numerous USDA Bulletins reporting failure to isolate more than very small amounts of identifiable organic compounds from very large amounts of soil. By good fortune, the techniques of paper and gas

chromatography were developed in England shortly after I started to work at Rothamsted, and I decided to try to adapt these techniques for research on soil organic matter.

No equipment for paper chromatography was available when I started to investigate the potential value of this technique for research on soil organic matter and most of my early work was conducted using primitive equipment, including large drain pipes and long sections of glass tubing modified to serve as troughs for organic solvents and hold the edges of large sheets of Whatman filter paper. It was not possible to handle these large sheets without assistance, and I had no laboratory assistant at that time. I had, however, a very talented girl friend, Mary Williams, who worked in the Microbiology Department at Rothamsted, and she provided valuable assistance when help was needed in my chromatographic work. During this work we were exposed many times to air saturated with collidine, lutidine, and other organic solvents later classified as dangerous chemicals, but we survived, got married in 1950, and are still around more than 50 years later. We thought we had discovered a new method of fingerprinting when we sprayed two-dimensional paper chromatograms with ninhydrin to locate amino acids and found that our fingerprints on the paper showed up very clearly on the sprayed chromatograms, but a couple of researchers in London were faster in reporting this observation. Recent TV news programs indicate that ninhydrin is still being used for fingerprinting in criminal cases.

My plan was to hydrolyze the protein material in soils with 6N HCl and identify the amino acids thus released by paper chromatography. The major problem was that the inorganic material in soil hydrolysates prevented application of paper chromatography, but this problem was overcome by a technique that permitted removal of salts without loss of amino acids and I was able to obtain excellent chromatograms from all soil hydrolysates studied. Rothamsted was famous at that time for its many visitors, and one day I had a visitor - I did not catch his name - who had heard that I was using paper chromatography. Being full of enthusiasm about this technique, I gave him a pep talk on its potential value. I saw him later that day at afternoon tea on the lawn of Red Gables at Rothamsted and was mortified to learn from a colleague that my visitor was one of the inventors of paper chromatography (he subsequently received a Nobel Prize).

During 1948 and 1949 I studied the amino acid composition of 10 different soils by paper chromatographic analysis of acid hydrolysates of these soils. The following 20 amino acids were detected in every hydrolysate examined and estimated semi-quantitatively: phenylalanine, leucine, isoleucine, valine, alanine, glycine, threonine, serine, aspartic acid, glutamic acid, lysine, arginine, histidine, proline, hydroxyproline,  $\alpha,\epsilon$ -diaminopimelic acid,  $\alpha$ -amino-n-butyric acid,  $\beta$ -alanine,  $\gamma$ -aminobutyric acid and tyrosine. Glucosamine and methionine sulfoxide were detected in most of the hydrolysates. No free amino acids could be detected in any of the soils studied.

The detection of glucosamine suggested that a significant amount of the nitrogen in soils and humic acids might be in the form of amino sugars. To investigate this possibility, I initiated work with Ken Shaw to estimate amino sugar-N in acid hydrolysates of soils by two techniques, and this work showed that 5-10% of the nitrogen in the soils examined was in the form of combined amino sugars (J. Agr. Sci. 1954, Vol. 44, pp. 152-159). I published my work on the amino acids in soils in a 1950 issue of the Biochemical Journal (Vol. 50, pp. 123-145). This publication created a great deal of interest in Europe and I received invitations to visit and work at several research centers. I accepted an invitation by Professor Wolfgang Flaig to initiate research on humic acids using paper chromatography at the Institute for Soil Biochemistry in Volkenrode, a research center near Braunschweig in West Germany, and my wife and I spent four happy months there in 1954. I then made a tour of German research centers and was astonished by the tremendous interest in humic acids there because there was very little interest in Britain at that time. Two publications concerning humic acids emerged from my work in Germany. I started work to identify the nitrogen in humic acids in 1949 and published preliminary results of this work in 1952. A full report of the work was published in the Journal of Agricultural Science in 1955 (Vol. 46, pp. 247-256). In this publication I reported research to characterize the nitrogen in humic acids isolated from 11 soils by the customary sodium hydroxide extraction procedure and by the neutral pyrophosphate procedure I introduced in 1949 (J. Agr. Sci. 39:274-279). I determined the amounts of total N,  $\alpha$ -amino acid N, amino sugar N, and ammonia N in 6N HCl hydrolysates of these humic acids and identified the amino acids in the hydrolysates by paper chromatography. This work showed that humic acids isolated from alkali and pyrophosphate extracts of the same soil differed markedly in total nitrogen content and in nitrogen distribution after acid hydrolysis. The alkali-extracted preparations had a higher N content and a higher proportion of acid-soluble N and  $\alpha$ -amino acid N. At least 31-48% of the N in the alkali-extracted preparations and 20-35% of the N in the pyrophosphate-extracted preparations was in the form of amino acids, and 3-10% of the N in the preparations was in the form of amino sugars. Paper chromatographic analysis of acid hydrolysates of the preparations indicated that the protein materials in humic acids extracted from different soils by alkali or pyrophosphate were similar in their amino acid composition. The following nineteen amino acids were detected in every hydrolysate examined: phenylalanine, leucine, isoleucine, valine, alanine, glycine, threonine, serine, aspartic acid, glutamic acid, lysine, arginine, histidine, proline, hydroxyproline,  $\alpha$ -aminobutyric acid,  $\beta$ -alanine,  $\gamma$ -aminobutyric acid and tyrosine. Amino sugars and oxidation products of cystine and methionine were also detected in every

hydrolysate examined and a substance provisionally identified as  $\alpha,\epsilon$ -diaminopimelic acid was found in some of the hydrolysates.

I concluded in 1955 that the nonhydrolysable nitrogen in humic acids must be largely, if not entirely, in the form of heterocyclic nitrogen compounds. I did not attempt to identify this nitrogen because no techniques were available for such an investigation and I saw little prospect of techniques being developed in the near future. I speculated on possible structures of these compounds and how they may be formed in soils in a chapter on organic nitrogen in soils I wrote for the monograph entitled "Soil Nitrogen" published by the American Society of Agronomy in 1965.

During my early years at Rothamsted I devoted a considerable amount of my time to development of reliable analytical techniques for research on soil organic matter because no such techniques were available at that time. In searching the literature for potentially useful techniques I came across the publications of Donald D. Van Slyke, who developed numerous methods for blood analysis while working at the Rockefeller Institute in New York. I greatly admired his work because he subjected the methods he developed to very rigorous tests for both accuracy and specificity and was an exceptionally thorough researcher. He developed a highly specific and accurate ninhydrin method for determination of  $\alpha$ -amino acid nitrogen in blood, and I adopted this method for determination of  $\alpha$ -amino acid nitrogen in hydrolysates of soils and humic acids. He had a big influence on my career because his work inspired me to try to develop numerous methods clearly needed for research on soil organic matter. He worked at the Rockefeller Institute in New York and I regret that I did not have an opportunity to meet him when I arrived in New York in 1957 with a Rockefeller Fellowship allowing me to spend one year visiting research centers in the USA. During that year I was offered a tenured position at Iowa State University and I have not worked on humic acids since that time.

Dr. Bremner's current address is: 228 Green Mountain Drive, The Lakes Country Club, Palm Desert, CA, USA 92211.

## IHSS STANDARD AND REFERENCE COLLECTION

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*By Paul Bloom*

### **New Humic Materials Available from IHSS**

#### **Reference Minnesota Peat HA and FA**

Humic and fulvic acids were obtained from a fibric bog peat from a bog dominated by sphagnum moss. This peat represents the bog lands common to northern latitudes. These bogs are a major source of the color in the brown waters common in these areas. The price for the humic acid, 1R107H, is \$15 for 100 mg and the price of the fulvic acid, 1R107F, is \$30 for 100 mg.

#### **Nordic Aquatic NOM**

Natural organic matter was extracted from a water supply reservoir at Skarnes Norway using reverse osmosis. Extraction and sample preparation was by a team led by Egil Gjessing and the NOM was made available to the IHSS by the Nordic IHSS chapter. The reservoir water had a DOC of 10.7 mg L<sup>-1</sup> and a pH of 5.8. The water was treated with a Na<sup>+</sup> saturated ion exchange resin during sampling and the NOM has 41.4 % ash. The price for the NOM, 1N102, is \$20 for 100 mg.

#### **Nordic Aquatic HA**

The Nordic IHSS chapter supplied more aquatic HA to replace the recently depleted supply of 1R106H. This HA is from the same sample lot as the original sample.

## PhD Thesis

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### Experimental characterization and calculation of the interactions between phenols and dissolved organic matter in aqueous solution

**Gerd Ohlenbusch**, PhD-Thesis at Universität Karlsruhe. *Supervisor: Prof. Dr. F. H. Frimmel*

Engler-Bunte-Institut, Division of Waterchemistry, Engler-Bunte-Ring 1, D-76131 Karlsruhe, Germany

*Summary:* Dissolved organic matter (DOM), that is present in surface, pore and ground waters, determines the fate and transport of organic pollutants. For a better understanding of the behavior of pollutants in the environment the knowledge of the sorption processes and the sorption constants is necessary. But the measurement of sorption constants between organic contaminants and DOM is still an analytical challenge. The main problem is to avoid an interference with the sorption equilibrium during the measurement.

The aim of this work was the determination of the sorption constants of various phenols to DOM of different origin by solid phase microextraction (SPME). The SPME proved to be an attractive method for sorption measurements. The extraction amount is very small and therefore it is reasonable to assume that no relevance disturbance of the sorption equilibrium is induced. To validate this new method a comparison between SPME and the fluorescence quenching method was performed with the substances phenanthrene and 9-aminophenanthrene. As sorbents the DOM of a brown water lake (HO13) and a commercially available humic acid (Aldrich-HA) were used. The results showed that there was no influence of concentration of the polycyclic aromatic compounds (PAC) on the binding constants determined with both methods, which indicates that there were no limitations of binding sites for fast interaction in the investigated PAC concentration range. For phenanthrene both analytical methods showed no long term effects. The reaction equilibrium between DOM and phenanthrene established within the first hour. In contrast, in addition to the fast binding a slow reaction within days was found for 9-aminophenanthrene indicating specific interactions between DOM and the amino group. For both PAC the binding constants determined by the fluorescence quenching methods ( $\log K = 4.5 - 5.1$ ) were larger compared to the SPME results ( $\log K = 3.6 - 4.2$ ). This difference was explained by different interaction processes detected by the two methods. In the non-invasive fluorescence quenching approach all PAC molecules, even the ones in the *outer sphere* of the DOM, were quenched and hence detected as "bound". On the other hand, the SPME approach is an invasive technique. PAC molecules in the *outer sphere* of the DOM were extracted like "free" molecules and thus resulting in lower sorption constants. These results show, that it is always necessary to specify the method while mentioning sorption constants.

After this method comparison the sorption of 22 different phenols was investigated. The sorption equilibrium between the phenols and DOM was established within a few hours and there was no indication of further slow specific interactions between the OH-groups and the DOM within the next 4 days. To the natural DOM of a brown water lake and a compost extract no sorption could be determined. To the Aldrich-HA a slightly sorption with logarithmic sorption constants between 2 and 3 was observed. A strong sorption could be measured to the protein bovine serum albumin (BSA). The  $\log K_{\text{DOM}}$  were between 2 and 6 which is quite in the range of the sorption of PAC to DOM.

These results indicate that the fate of phenols is not that strongly influenced by the DOM as the fate of the hydrophobic PAC. On the other hand, in boundary layers where the DOM has a high percentage of proteins the sorption process to DOM can be a important factor in the fate of phenols.

Due to the large number of chemicals and the experimental effort for the evaluation of the sorption constants the development of predictive models for an estimation of sorption constants is most attractive. Therefore some correlation models were tested for their suitability. A linear free energy relationship (LFER) model showed a good correlation between the sorption constants and the  $\log K_{\text{OW}}$ -values with correlation coefficients of  $R = 0.910$  and  $R = 0.878$  for the sorption of phenols to Aldrich-HA and BSA, respectively. Even better results were obtained with a linear solvation energy relationship (LSER) model. With this model correlation coefficients of  $R = 0.950$  and  $R = 0.911$  were obtained. The LSER model also provided information on the driving force of the sorption process. The sorption to DOM was mainly driven by the difference in cohesion between DOM and water. A decrease of sorption was caused by strong hydrogen-bond interactions between the phenols and water.

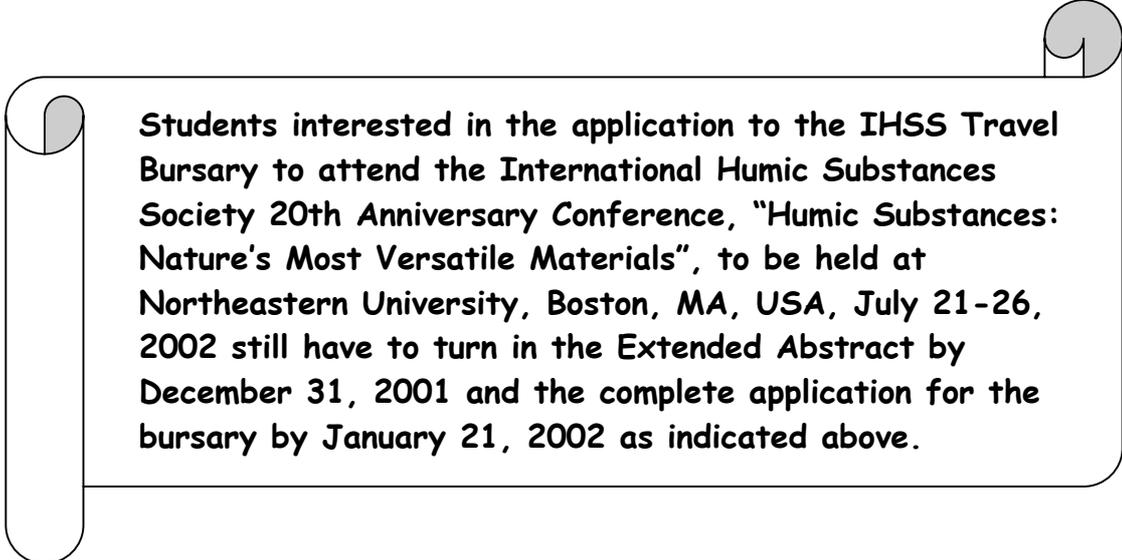
#### Literature:

- Doll, T. E.; Frimmel, F. H.; Kumke, M. U.; Ohlenbusch, G.: Interaction between Natural Organic Matter (NOM) and Polycyclic Aromatic Compounds (PAC) – Comparison of Fluorescence Quenching and Solid Phase Microextraction (SPME). *Fresenius Anal. Chem.* 304, 313-319 (1999).
- Ohlenbusch, G.; Kumke, M. U. Frimmel, F. H.: Sorption of Phenols to Dissolved Organic Matter Investigated by Solid Phase Microextraction. *Sci Tot. Environ.* 253, 63-74 (2000).
- Ohlenbusch, G.; Frimmel, F. H.: Investigations on the Sorption of Phenols to Dissolved Organic Matter by a QSAR Study. *Chemosphere* 45, 323-327 (2001).

## IHSS TRAVEL BURSARY GUIDELINES

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1. Travel bursaries will be given only to students. Investigators who have completed their Ph.D. degrees are not eligible for bursary awards.
2. A committee consisting of the IHSS President and at least two other IHSS members appointed by the IHSS President will evaluate applications for travel bursary awards.
3. The deadline for receipt of the applications is **six (6) months** prior to the IHSS International Meeting with evaluations and notifications of awards given to the applicants **four (4) months** prior to the IHSS International Meeting.
4. Applications must contain a letter of application, recent curriculum vitae including a record of classes taken and grades received, a letter of evaluation from the applicant's major professor and a manuscript of the paper to be presented. Three (3) copies of the application are to be sent to the President of IHSS (Prof. Yona Chen) so that they are received before the submission deadline.
5. Awards will be based primarily on the quality and originality of the scientific content of the manuscript and the applicant's record of scientific achievement. It should be clear that the student has had a major part in designing and conducting the research and wishes to pursue a career in a field in which humic substances science is important.
6. The number and amount of the awards will be determined by the President in consultation with the Treasurer and members of the travel bursary selection committee.
7. Travel bursary award recipients will be honored at the conference banquet with their cash award, a certificate acknowledging their status as an award winner and a one (1) year membership in IHSS.
8. **Malcolm Award** - in the judgment of the travel bursary selection committee, the top applicant for a travel bursary award will be designated the Malcolm Award winner. This individual will be recognized with a certificate and cash award of 250 US\$ in addition to the normal travel bursary.



**Students interested in the application to the IHSS Travel Bursary to attend the International Humic Substances Society 20th Anniversary Conference, "Humic Substances: Nature's Most Versatile Materials", to be held at Northeastern University, Boston, MA, USA, July 21-26, 2002 still have to turn in the Extended Abstract by December 31, 2001 and the complete application for the bursary by January 21, 2002 as indicated above.**

## IHSS BYLAWS CHANGE 2001

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To allow for Society officials to conduct Society business more effectively, it is suggested that the restriction on consecutive terms for officers be extended from one additional consecutive term to two. This change will allow more continuity on the Board, but will not change the total amount of time that a single person may serve on the Board.

These are the proposed changes to the Bylaws unanimously accepted by the Board of Directors after thorough discussions. Members will be asked to vote on it in the upcoming election.

### ARTICLE V. OFFICERS AND DUTIES

#### Current wording:

Section 4. An officer, except the President and the Vice President/President Elect, may hold the same office for no more than one (1) additional consecutive term. No officer may serve more than twelve (12) consecutive years on the Board of Directors.

#### Proposed change:

Section 4. An officer, except the President and the Vice President/President Elect, may hold the same office for no more than two (2) additional consecutive terms. No officer may serve more than twelve (12) consecutive years on the Board of Directors.

## ELECTIONS OF IHSS BOARD MEMBERS

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Enclosed with this Newsletter you will find the information on the election of the new members of the IHSS Board of Directors: **1)** Vice President (= President Elect), **2)** Board position and **3)** Treasurer.

According to the Bylaws, the Nominating Committee was comprised of four (4) members: **Dr. Gregory Korshin** (*Chair*), Department of Civil Engineering, University of Washington, Seattle, USA; **Dr. Paolo Sequi**, Research Institute for Plant Nutrition, Ministry of Agriculture and Forestry, Rome, Italy; **Dr. Gerd Gleixner**, Max-Planck-Institute for Biogeochemistry, Jena, Germany, and **Dr. Kaye Spark**, CSIRO Land and Water, PMB 3, Griffith, NSW 2680, Australia.

The Nominating Committee under the guidance of Gregory Korshin has done an excellent job in selecting able and active members of our Society as candidates for all officers. Unfortunately, the events of September 11 led to some delay, but the election is now to be announced officially.

Please find in this Newsletter the CVs and statements of the candidates. Within the next days the members will receive a letter containing the **ballots** and an **envelope** addressed to **Dr. Gregory Korshin**. The deadline for returning them to him is **January 15, 2002**.