

NEWSLETTER

of

The INTERNATIONAL HUMIC SUBSTANCES SOCIETY

Number 15

DECEMBER, 1995

CHANGES AND ELECTIONS

Professor Nicola Senesi of the University of Bari takes over the Presidency of the International Humic Substances Society on January 1, 1996.

On that date Dr. M.H.B. Hayes moves to the position of Past President of IHSS.

Professor Russ Christman has finished his term of appointment on the Board of IHSS. Members of the Board wish to thank Russ for his contribution to the development and advancement of the Society during his period of nine years as a Member of the Board (Vice-President, President, and Past President) of the Society.

There will be an election for the Vice Presidency of IHSS. This position becomes vacant on January 1. There are two candidates:

Dr. James J. Alberts, The University of Georgia, Marine Inst., Sapelo Island, Georgia 31327, USA; and

Dr. Fritz H. Frimmel, Department of Water Chemistry, Institute for Water Chemistry, University of Karlsruhe, Karlsruhe, Germany.

Information relevant to the candidatures of Drs. Alberts and Frimmel are included in Pages 3, 4, and 5 of this Newsletter.

Ballot Papers are enclosed with this issue of the Newsletter. Members are asked to complete the Ballot and return, as directed on the Ballot Sheet, to Professor Senesi.

The Closing Date for the Receipt of Ballots is March 22, 1996

MEMBERSHIP DUES FOR 1996

IHSS MEMBERS ARE REMINDED THAT DUES FOR 1996 ARE PAYABLE ON JANUARY 1.

Persons who joined the Society in November/December, 1995, and who paid their dues when they joined are considered to be 'paid up' members for 1996.

Dues are payable to the Coordinators of the National Chapters

IHSS NEWSLETTER NO. 16

The next issue of the Newsletter will be on May 1, 1996. Please send notes of Advances in Research, Notices of Meetings, and Items of News, News of Chapters, etc., to Dr. T.M. Miano, Inst. di Chimica Agraria, Univ. of Bari, Via Amendola 165/A, 70126 Bari, Italy. FAX (+) 39 80 544 2813

Items of News

TRAVEL BURSARIES FOR ATTENDANCE AT IHSS CONFERENCES

Prior to completing his term as a Member of the Board of IHSS, Professor Russ Christman made a generous contribution to a fund to enable Research Students to take part in the International Conferences of IHSS.

Professor Christman's contribution has been matched by an anonymous donor, and also (collectively) by the Board Members. In addition, a significant contribution will be made from interest from investments of Society funds.

In order to be eligible for an award, a candidate must be registered as a student and actively engaged in research in the humic sciences which will be presented as a thesis or dissertation as part of his/her requirements for a submission for a higher degree.

Successful candidates for an award will be required to present a paper or a poster at the 8th International IHSS Conference in Wroclaw, Poland in September, 1996.

Candidates for an award are asked to present their CV, and a short paper (not more than 2 pages) covering the topic which they wish to present at Wroclaw, and a breakdown of the expenses they will incur in order to take part in the conference.

Applications should reach the President of IHSS

Professor Nicola Senesi, Inst. di Chimica Agraria, Universita di Bari, Via Amendola 165/A,
70126 Bari, Italy

Tel (+) 39 80 544 2853. Fax (+) 39 80 544 2813

on or before April 15 1996

Distinguished Awards for Two Honorary Members of IHSS

We have pleasure to announce that Morris Schnitzer and Frank J. Stevenson, both of whom are Honorary Members of IHSS, have been awarded the Wolf Prize in Agriculture. This prestigious award is made annually by the Israeli Wolf Foundation.

Morris Schnitzer is now an Emeritus Research Scientist at the Centre for Land and Biological Research of Agriculture Canada. He was born in Germany, and studied at McGill University where he was awarded the BS, MS, and Ph.D degrees.

Frank Stevenson was born in Logan Utah, was an undergraduate at Brigham University, and was awarded the PhD degree at the Ohio State University in 1953. He has spent his working life since 1953 at the University of Illinois.

I first met Morris at the ASA Meetings in Chicago in December 1960, and I have always looked forward to listening to the contributions from his alert mind at meetings around the world since then. I first met Frank at a special SSSA meeting in Purdue in June 1954, and a couple of years later I was fortunate to be awarded the Research Assistantship which he had held at Ohio State a few years before. Then, as now, I was greatly influenced by his approach to studies of the humic sciences.

Frank and Morris were honoured for their pioneering work on the chemistry of soil organic matter, the behaviour of nutrients and hazardous organic chemicals in soil, and the application of this work to agriculture.

Both men have been at the forefront in applications of new technologies and in introducing new ideas to the studies of the chemistry and applications of humic substances. In the early 1950's Frank introduced applications of moving boundary electrophoresis to our field, and I still consider that his work in that area had an enormous impact on the thinking of those who sought to tackle the problem of polydispersity in humic substances. For me, the work which Morris carried out on the degradation of humic substances had enormous significance. At last we were able to see an approach that could be used and adapted to allow us to work out the component species in the macromolecular structures.

However, I must emphasize that it would be very wrong to suggest that the contributions of these two outstanding scientists could be encapsulated. Their communications in the scientific literature, and in their books and reviews have been inspirational for me, as has their friendships throughout the years.

M.H.B. Hayes

A MESSAGE FROM THE PRESIDENT

It is a great honour and a pleasure for me to assume the Presidency of the International Humic Substances Society for the next term of office.

I would like in the first instance to thank all of the members of the Society who have entrusted me with the important tasks which are always incumbent on the holder of this prestigious position. As I take up "the reins of office" I would wish to acknowledge the great work done by my predecessor, now past President Michael Hayes, and by the Treasurer, Ed Clapp. They have expended vast amounts of time and energies dealing with the affairs of the Society, and especially in reorganizing and enlarging the membership, and in strengthening the concept of National Chapters of the Society, and in establishing strong financial and administrative platforms for the Society. It is my firm intention to continue to advance the interests of the Society, and I know that I can rely on the close involvement of new Secretary, Teddy Miano, and on the entire membership of the Board of Directors of IHSS.

My priority aims and commitments will be to foster, facilitate, and to promote the general aims of IHSS, and to contribute substantially to the achievements and the progress of the Society. In particular I will devote major efforts to:

1. Fostering unity and harmony among the various Groups and interests that comprise the membership of the Society, i.e. scientists with interests in soil, water, and sediments, those with involvements with agriculture and the environment, and those whose interests are in fundamental and applied aspects of the humic sciences;
2. Promotion of the growth of the Society, the increasing of the active membership, and the encouragement of the birth and organization of strong National and Regional Chapters;
3. Canvas the views and hope for the favour of the membership for the possible establishment of an official IHSS Journal;
4. Promote the Reference and Standard collection of IHSS, where relevant to increase its range, and to improve the management and distribution of information about the Collection;
5. Increase the involvement of IHSS in multidisciplinary research programmes in Agriculture, Geosciences, and the Environment, and scientific and professional cooperation with the other Scientific Societies and International Organizations;
6. Reinforce International Meetings, increase the scope of the Newsletter, and improve communications and exchange between members of the Society;
7. Explore opportunities for funding, especially for the support of the scientific development of student members, and to encourage these to participate at the International Meetings of the Society; and
8. Advance the image, and to increase the 'visibility' of the Society by improving public awareness, and by focusing interest in and attention on the Humic Sciences by members of the international scientific community.

In order to realise this ambitious Programme it will be necessary to have the active involvement of the Board and the entire membership.

I look forward to meeting with all our members at what promises to be an excellent 8th International Conference of IHSS in Wroclaw in September.

Nicola Senesi.

THE EIGHTH INTERNATIONAL CONFERENCE OF IHSS

'The Roles of Humic Substances in the Ecosystem and in Environmental Protection'

September 9-14, 1996, Wroclaw, Poland

Details of the Conference Programme have been Circulated by the Organizers.

Early registrations would suggest that support (in the form of attendees) for this conference could exceed that for the Bari symposium in 1992 (where 300 attended). For further details, please contact Professor Jerzy Drozd, Inst. of Soil Science and Agricultural Environment Protection, The Agricultural University of Wroclaw, Grunwaldzka 53, 50-357, Wroclaw, Poland. E-Mail, ihss@OZLAR.WROC.PL

complex systems can be tackled, and described in new dimensions. We should not think of humics as 'dirt' or as 'unresolvable chaos'. Several recent fine papers have pointed to ways that we might follow.

We should be introducing humic substances to the scientific community as essential stores for life that are being studied by the most modern procedures and instrumentation (such as time resolved spectroscopy, high performance chromatography, mathematical modelling, etc.) that are available in order to understand the nature of the material. Combining the results from soil and water samples with those from well defined model experiments will aid in our understanding of the biological, chemical, and physical properties of humic substances. It is essential, however, in addition to pursuing the fundamental awareness of structure and reactivity, not to lose sight of the impacts which humic substances have on daily life. It is important, therefore, to consider the interactions of humic substances with synthetic chemicals, and to give emphasis to the ways in which biogenic and xenobiotic materials interact. It is very important, for example, that we have a better awareness of the nature of bound residues in soils, and of the formation and biological consequences of disinfection byproducts in water. Anthropogenic humic substances in sludges, composts, and wastewaters are other very important relevant areas for study.

The importance of humic substances in the environment is beyond doubt, and it is essential that there is a better awareness of the role of these substances in sustainable development.

In short, I want to use the well known logo of the International Humic substances Society (IHSS) to make sure that it is also an

**Innovative
Honourable
Scientific
Society.**

A well organized Institute, and a dozen lively PhD students will help me to achieve our aims.

IHSS and the Web

We are grateful to Board Member, E. Michael (Mike) Perdue for putting our Society on the WEB. Mike is loud in his praises of Research Student Jian (Jenny) Li who did much of the information finding and programming that was needed to put IHSS in the WEB. Please consult the WEB for details about the Society, about the services it offers, about forthcoming meetings, etc. etc. We are very much in the 20th century!

The Web address is: [HTTP://WWW.GATECH.EDU/IHSS/IHSS.HTML](http://WWW.GATECH.EDU/IHSS/IHSS.HTML)

The Mollisol Soil Fulvic Acid Standard of IHSS

The stock of the original soil fulvic acid standard (taken from a Mollisol soil) has been depleted. However, a new sample is now available, taken from the same Mollisol soil. There were two operational changes in the procedure used to isolate the new sample. In this instance the soil was dispersed using a semi-submersible pump, and the HCl/HF treatment was omitted. Instead, the samples were filtered through 0.2 μm Sartorius membranes in order to remove clay sized contaminants.

Orders may be placed with the Treasurer of IHSS,

Dr. C.E. Clapp, Department of Soil, Water, and Climate,
The University of Minnesota, St. Paul, Minn. 55108, USA

Tel. (+) 612 625 2767; Fax (+) 612 625 2208. E-Mail eclapp@soils.umn.edu

Natural Organic Matter (NOM) Standards

It has become evident that there is a need among water scientists for standard NOM materials. Thus Dr. E.M. Perdue (Georgia Tech) and Dr. M.H.B. Hayes (Univ. of Birmingham) propose to make a set of standards available this Summer. These standards will be from a variety of watersheds, some of which will be pristine, and some will be taken from major rivers.

It is proposed to isolate NOM samples from sites in the British Isles, and from selected sites in the continent of Europe, and from the USA.

NOM standards may be purchased through the outlet for the IHSS Standard and Reference samples

Further details will be provided in the next issue of the IHSS Newsletter.

MEMBERS HAVE BEEN SLOW TO PROVIDE COPY AND NEWS FOR THE IHSS NEWSLETTER. THE Newsletter provides a forum for members to express their views on all matters relevant to the Society and to Humic Research.

An International Conference Convened Under the Auspices of
The International Humic Substances Society

at

Georgia Institute of Technology, Atlanta
August 27 - September 1.

Review by Barbara Watt

This was a great meeting, the kind of meeting that should be a model for others to come.

The organizers had in mind presentations by experts with a variety of techniques and approaches that could be applied to the Humic Sciences. The net was cast wide, and not all who presented their skills and expertise were connected with humic research.

Each speaker held the stage for an hour, and I noted that there was never a drooping eyelid in the audience during the course of the lectures. That does not mean that all lectures were supreme, but in no case did the topic or the speaker cause the audience to invoke Morpheus. Some came close, but the prospect of the performance to follow was enough always to keep expectations focused.

The first Session dealt with 'Chemical and Physical Characteristics of Humic Substances', and for me the highlight of the morning was the smooth and convincing performance of Jim Rice who dealt with 'Desorption mass spectrometry techniques for the characterization of fulvic acid'. Jim invariably gives great value. His enthusiasm is catching, and his presentations are always flawless. If anyone can get this technique to 'fly' for humic substances, it will be Jim.

I was fascinated by the Session on 'Industrial Concerns about Humic Substances' and Tony Perrotta brought the Bayer Process to life for me in his presentation. 'Role of organic matter in the Bayer process'.

There was a huge interest in the Session on 'Photochemical Processes Involving Natural Organic Matter', and the presentation by William Miller on 'Photochemical transformations of organic matter in natural waters' taught me far more than I could have hoped for in an hour about this important natural process.

The Session on the 'Effects of Complexation on Bioavailability of Metals' brought "on stage" a man whose impressive personality had caught my attention from the beginning. Rufus Chaney's delivery of 'Factors influencing bioavailability of soil metals to plants' was, needless to say, as convincing as I was told to anticipate.

The penultimate session on 'Natural Organic Matter in Less-Studied Environments', brought us to contemplations of outer space with the performance by Gene McDonald (from Carl Sagan's Lab at Cornell) on 'Organic macromolecules in extraterrestrial environments'. I found my mind wandering to travels in space with Carl Sagan, and my younger colleagues had visions of heroics with Captain Kirk in 'Starship Enterprise'. Nonetheless we all learned a lot about macromolecules that can form in primeval environments. The final Session, on the same theme, was chaired by our President. It was a fitting end to a great week, climaxed by fascinating presentations by Mike Thurman and Diane McKnight. The young ladies were totally focused on Mike's presentation on 'Transport and origin of dissolved organic matter in shallow ground water: from herbicides to humic substances'. For many, this was the performance of the meeting. But if so, Diane was not far behind with her spellbinding treatise on 'Aquatic fulvic acids in Antarctic and Alpine lakes'. Some of us wondered as we saw the breathtaking scenes of Antarctica, if Diane had partaken in the traditional swim that is the denouement of all successful scientific excursions to Antarctica.

The dinner was great, held in an old church with 'Franciscan-style' waiters. I wondered, during our President's address, how he might have fared as a Franciscan Abbot. (Were the Franciscans spared?).

Mike Perdue, the epitome of Southern Gentlemanry, did a wonderful job in organizing this conference. His co-organizer, Jim Alberts, in his different way, must surely have done his share. Where would you find two gentlemen to do better?

Can anyone please try to match their great work, say four years from now?

Humic Substances in Soils, Peats, and Waters: Implications for Plant Growth, Industry, and a Sustainable Environment.

An International Conference sponsored by the British and Irish Chapter of IHSS
The Agriculture and Environment Group of the Society of Chemical Industry
The Agriculture Group of The Royal Society of Chemistry
The British Society of Soil Science

Review by Tom Hayes

Dublin in September was everything that the organizers claimed. The weather was balmy, the University College Dublin campus (where the meeting was held in the Kellog Building for the Agricultural Sciences) was verdant and relaxing for the 75 or so participants, and the local arrangements by Dr. Jim Collins and his students of Soil Science (at UCD) were flawless.

The Academic Proceedings commenced with a presentation by our IHSS President (we were pleased that he had resisted the temptations of the Running Track and Gaelic Football pitches outside where rumour has it he spent far too much of his time when an undergraduate at UCD) on 'Advances on our awareness of humic structures' in the section on 'Composition and Structures of Humic Substances'. This was followed by David McGrath's treatise on Organic matter in Irish soils and by Martin Cheshire's presentation on the 'Effect of ascorbate reduction on the electron spin resonance spectra of humic acid radical components'.

The second Session dealt with the 'Influences of Organic Amendments, Including sewage Sludge, on Soil Sustainability', the third Session was on the 'Influence of Organic Amendments on Plant Growth', and the fourth session dealt with 'Humic Substances and Dissolved Organic Matter'.

There were a number of keynote papers, and many of these caught the imagination of the attendees. I liked John Meredith's paper on 'Soil organic matter: Does chemical or physical stabilization predominate?', and the paper by Dr. A.S. Ball on 'The effects of atmospheric CO₂ on soil decomposition processes' certainly increased our meagre awareness of this topic.

Ian Dixon and Ellen Norman may not have matched Tony Perotta's performance in Atlanta on 'Humic substances and the Bayer process' but they came close. There was appropriate attention on the environmental and soil amendment effects by E.G. O'Riordan of Co. Meath and by Yongmin Yeo of Belfast, and another classic performance by A.E. (Johnny) Johnston of Rothamsted who this time dealt with 'Peat, a valuable amendment for soil productivity'. Other papers of academic and environmental interest dealt with animal slurry amendments (J. Humphreys), cheese whey (M.V. Ross), and 'Organic farming in Ireland' (by Mary Lynch).

R.F. Hammond has prepared a classical monograph on Irish Peatlands, and his presentation on 'Classification and mapping of peatlands' was in his style, and was gratifying.

The presentation by T. Reidy and H. Lyons of Tralee on the 'Use of peat in treating effluent' highlighted some further uses for peat products, and the presentation of Declan Little on 'Organic matter of podzols under oak woodland in Ireland' was hugely interesting for anyone with an interest in humics in podzols.

My friends from Birmingham were (maybe too) often "on stage", but at last I now know what my colleagues are doing.

We compliment chief organizer, Dr. Bill Wilson (University of Essex), on a great overall organizational performance.

The Proceedings will be published by the Royal Society of Chemistry, Cambridge.

Disaggregation of Humic Substances by Interaction with Organic Acids Followed by Size Exclusion Chromatography

An Extended Abstract of a Paper submitted for Publication By

Alessandro Piccolò, Serenella Nardi, and Giuseppe Concheri
(Dept. di Scienze Chimico-Agrarie, Univ. di Napoli, Via Università 100)

INTRODUCTION

Accurate knowledge of pollutant-humic substances (HS) interactions is fundamental to understanding the environmental role of these substances. There have been a number of proposals with regard to the sizes and shapes of humic macromolecules. One thesis that has support suggests that HS are not single molecules but are associations of molecules of different natural origins. This might be interpreted to indicate that HS in solution form mixed aggregates or micelles, and that the aggregates are held together by weak bonding mechanisms, such as H and pi bonding, and by hydrophobic interactions.

There is evidence, for example, to show that acetic acid added to humic macromolecules led to the breakup of the macromolecules into dialyzable materials that stimulated plant nitrate uptake, as well as ATPase and hormone-like activities. These results are significant because of the considerable amounts of acetic acid exuded by plant root systems. In the study summarised here, low pressure size exclusion chromatography was used to follow the changes of molecular size distribution of HS after their treatment with different mineral and organic acids.

EXPERIMENTAL

The HS used were a mixture of humic and fulvic acids (HA, FA) extracted from earthworm casts by common alkaline extraction procedures. The HS were dialyzed against distilled water and then freed of metals by elution through cation exchange resins, and freeze dried. The dried HS were dissolved in 0.02M $\text{Na}_4\text{B}_2\text{O}_7$, pH 9.2, and applied to a Sephadex G-100 column. Elution was with 0.02M $\text{Na}_4\text{B}_2\text{O}_7$ and the HMW material (in the void) volume was separated from the retained material. The HMW material was dialyzed against distilled water and freeze dried. Then 114 mg of the dried HMW material was resuspended in 150 mL of distilled water, dissolved by addition of 0.5M KOH to a solution pH of 11.8, and stored under N_2 . Inorganic (HCl, H_2SO_4 , H_3PO_4) and organic (mono, di, and tricarboxylic) acids (to give pH values in the range of 0.9 to 2.3), alcohols and phenols were added to adjust the pH. A 1 mL aliquot of each mixture was then applied to a Biorad P100 Biogel column, and eluted with 0.02M $\text{Na}_2\text{B}_4\text{O}_7$ (0.02M). Absorbance of eluates was monitored at 280 nm using a continuous flow spectrophotometer.

RESULTS

HS dissolved in alkali eluted in the void volume. Similar chromatograms were obtained when the pH was brought to 2 by additions of the mineral acids.

When the pH was brought to 2.1 by adding carboxylic acids of progressively larger chain lengths, monocarboxylic acids gave a shift of the chromatographic peak to elution volumes close to the total column volume. The shift was the same for all concentrations of acid used. Dicarboxylic acids generally produced a similar shift, and tricarboxylic citric acid (1.5M) gave an absorbance shift to the lower molecular sizes regions. Alcohols and phenols did not give changes.

The disruption of HS configuration in the presence of organic acids is interpreted as evidence of a micelle-like macromolecular structure of HS. The change to lower MW substances is explained in terms of the formation from a single large micelle of a number of small micelles which enter the pores of the gel.

This configurational change took place only when the HS were treated with organic chemicals containing relatively strongly acidic carboxyl groups. The hydroxyl groups are not acidic enough to supply the negative charges that, at the elution pH, would disperse the large micelle by overcoming the inner hydrophobic arrangement of the humic material.

In studies with citric acid, the lower the citric acid concentration the greater was the amount of HS eluted in the void volume, indicating that the total disaggregation of the original humic micelle-like aggregate may be achieved only at relatively high carboxylic acid concentrations.