



NEWSLETTER

INTERNATIONAL HUMIC SUBSTANCES SOCIETY

Number 22

Spring, 1999

200 YEARS OF STUDY ENTERING THE YEAR 2000

Fellow IHSS Members, Colleagues, Friends, and Guests:

It is a pleasure for me to have this opportunity to speak with you on the occasion of the 9th International Meeting of IHSS. The conference organizers deserve our sincerest appreciation and thanks for bringing together such a distinguished group of researchers and creating a stimulating and dynamic professional meeting. Naturally, it helps to have pleasant surroundings, such as Adelaide, as a venue. It is also most enjoyable to revisit colleagues and friends with whom we can share our recent experiences and research, while meeting new people who share our common interests. It is the collegiality and friendly interactions of the IHSS meetings that make them rather special. But then, I believe IHSS is a special organization.

To my knowledge, the earliest publications that actually talk about complex natural organic matter were by Achard in 1798, who used base extraction of soil to obtain a darkly colored solution for his studies. Shortly thereafter in 1806, Berzelius published on humic substances isolated from Porla, a spring in Sweden. Thus, the studies of humic substances in terrestrial and aquatic environments have been conducted for about 200 years.

During those two centuries, investigation of these diverse substances have continued and expanded, until now we are gathered at the 9th International Meeting of IHSS. An organization that was conceived and brought into being a mere 15 years ago. Judging by the number and diversity of presentations at this meeting, it is obvious that from those distant beginnings two centuries ago, our science continues to expand on what surely is a logarithmic growth curve. The founders of IHSS understanding the development occurring within humic substances research and its importance had a grand vision: to provide a forum in which scientists from very diverse backgrounds and scientific disciplines could meet to discuss their common interests. They correctly believed that such a gathering would stimulate the formulation of ideas and sharing of knowledge which would lead to a greater scientific understanding of these extremely complex materials.

I believe that by being a focal point for scientific inquiry, the IHSS has made contributions to our understanding of humic substances far in excess of what could be expected from its short history or been accomplished by individual investigators without active interaction with their peers. The exchange of ideas and collaborative efforts resulting from these meetings has led to a rapid expansion, even explosion, of our knowledge of humic substances. Rapid assimilation and use of modern analytical techniques and the ever-expanding use of computers in these studies have led to a tremendous propagation of ideas, and yes, controversies in our science. These are not necessarily bad, but we must always be on guard against being swept away by the marvels of new shiny black and gray boxes and dazzling, ever-improving resolution of color monitors and printers. It should be a caution sign that with all of the analytical advances, we are still debating the questions of molecular weight and size distributions of these compounds. With all our analytical advances, have we kept pace with the most important analytical tool, namely our minds, or are we falling into complacency brought on by technology and desperation for more publications and grants? It is only through exercising our gray matter that we will be able to utilize these powerful devices to address the complexities of humic substances.

From its rather humble beginnings, IHSS:

1. has grown to over 800 members with 40 Regional Chapters;
2. has assembled and maintained a broadly comprised and well characterized set of standards and reference materials;
3. has chosen international meeting venues that attest to the global scope of the organization;
4. has captured and compiled the ideas and progress of our science over the recent past in an impressive collection of volumes; and
5. has begun to nurture the future of our discipline through financial support of students, which allows them to become full partners in our journey towards increased knowledge.

While these are significant positive steps, we can and must do more.

We are now poised at the start of a new millenium. The year 2000 is only 15 short months away. It is time we consider how the IHSS can continue as the focal point of humic substance research, while expanding its contributions to our world community. That challenge rests with us. The founders of IHSS had the vision and pointed the way, but we must now accept the challenge and ensure a robust organization that serves the needs of its members and our global society.

Sadly, one of those founders will not be with us to help, nor to have the pleasure of seeing the organization that he was so instrumental in creating continue to explore the horizon of humic substance research. Ron Malcolm was dedicated to the study of humic substances and the IHSS. He made many contributions to both, but I feel his greatest efforts came in his never relenting attempts to aid young scientists into the field of humic substances research. I believe that Ron's greatest wish would be for the IHSS to continue that effort and renew it with even greater vigor. The future of our science is in the young. Without them, the lines of investigation will disappear and much of the progress made in the last 200 years will have to await a new birth of scientific exploration. We can not afford to let the new millenium proceed without a firm grasp of the knowledge gained in the past 200 years.

As I think of the coming years, it occurs to me that we must not only bring more young scientists into the field and embrace new techniques and technologies, but we must reassess our roles in science and the global society in which we live.

Academically, the study of humic substances is fascinating. Why else would intelligent, educated adults continue to struggle with these materials? Often our findings are confusing and frustrating. Every answer seems to bring several more questions. Yet we continue because as scientists and human beings, we are enamored and intrigued with the mysteries of humic substances and seek the personal gratification, which accompanies sorting out its secrets. Let's be honest, we do it because we like it.

However, the real importance of humic substances does not arise from our academic curiosity. It is the result of the vitally important roles these compounds play in human society. Would soil scientists and agronomists have spent all those years studying these materials without some feeling for their importance in soil fertility? Studies of aquatic humic substances were in decline for lack of general support until the discovery of their importance in drinking water processing and general water quality.

The true importance of humic substances is in the interactions that occur between these ubiquitous materials and the natural and manmade processes that effect the human condition on this planet. It is this understanding that we must take with us into the next millenium. It is this knowledge upon which we must expand and for which we must become outspoken advocates of humic substances research.

Expanding public and political awareness of the importance of humic substances to the quality of human life will require us to expand our own thinking. Traditional lines of study will continue. Crop yield enhancement and soil fertility retention will not become passe. Improved water quality and hygienic standards of drinking water will be in even greater demand by the public. Knowledge of structure, composition and the mechanisms of formation and decomposition of humic substances are essential to an accurate predictive model of these materials. However, even as these and other fields progress, we must become aware of the less well understood aspects of humic substances that impact the human condition. Industrial processes, biological metabolism, health concerns are but a few of the areas that warrant greater effort of exploration. As members of IHSS, we need to encourage and foster new exploration, while exposing and damning the obvious charlatans.

To fulfill the potential of IHSS in the years to come, we need to realize that the scientific standards of research on humic substances must be maintained at the highest possible levels. We must continue to push the frontiers of innovative thought in our quest to understand the puzzles and applications of these materials. Finally, we must promote all legitimate humic substances research whenever possible. We can no longer permit old and sometimes petty arguments to intrude on our ability to further our knowledge. We must unite as a scientific society and demonstrate our worth to the global community. We will all benefit as humic substance research is increasingly recognized for its importance to Society.

With all the above in mind, we must remember and retain the combination of scientific rigor and personal collegiality, which have made the IHSS successful in the past. We must remember that we are an international organization of scientists and colleagues.

I have had the privilege of your confidence and support as President of IHSS. I hope to retain that confidence during the coming year. I promise that I will do my best to accept the challenges I have put forward to you today. I anticipate and will work towards an expanding and vigorous future for IHSS well after my term and into the 21st century. The goal of IHSS should be the quest of the most reputable scientific inquiry for the advancement of basic knowledge and the betterment of humanity. I accept that goal and challenge. If you agree with me, then I will expect you to contribute to its achievement.

Thank you.

*Dr. James J. Alberts, President IHSS
President's Message at the 9th IHSS International Meeting in Adelaide*

IN MEMORIAM

By M.H.B.H. & E.C.C.

Ronald L. Malcolm

On July 24, 1998, Ronald L. Malcolm, 60, lost his brave battle against cancer at his home in Morrison, Colorado. His condition was diagnosed four years previously, shortly after he had made his usual high quality academic contribution in St. Augustine, Trinidad, to the Proceedings of the 7th International Conference of the International Humic Substances Society (IHSS).

Ron Malcolm was born on October 6, 1937, and raised on the family farm in Kenova, West Virginia. He maintained an excellent Junior and High School record in academics and in football (as a linesman) while making also a major contribution to completing the usual daily chores that still are essential to the running of a dairy farm. He was the outstanding Senior in Agriculture when he graduated from West Virginia University in 1959, and he went on to earn a Master of Science Degree in Agronomy and Biochemistry in 1961. He was then awarded a NSF Research Assistantship at North Carolina State University and worked under the direction of Dr. R.J. McCracken, and was awarded a Doctor of Philosophy Degree in 1964. A part of his dissertation focused on



'Canopy Drip: A Source of Mobile Soil Organic Matter for Mobilization of Iron and Aluminum', and that study may well have kindled his interest in humic substances which became his academic passion for the last 20 years of his research involvements. Immediately after finishing the requirements for the Ph.D. degree Ron joined the U.S. Geological Survey, and initially worked on stream sediments and discharge measurements under the direction of Howard Reeder in Raleigh. Later, under the direction of Vance C. Kennedy, and under the administrative direction of E.A. Jenne, he was involved in studies in Northern California of the rate of cation exchange of reference clays and stream sediments, and in the inorganic geochemistry of the Mattole River. His successes soon won him the title and position of Project Leader for an Organic Geochemistry Project designed to determine the amount and distribution of the organic matter transported by major streams in the United States. This project was later redirected to studies of various methods for fractionating and purifying stream organic constituents, and also a study of organic aspects of deep-waste storage was initiated. Inevitably he was led, at Wilmington, North Carolina, to the intensive study of waste disposal, and in the 1973-1974 period his research was confined to a waste disposal project. During that period (1974) he won the 'Best Paper of the Year' Award of the Ground Water Journal. His predicted reactivity and study approaches for organic waste disposal are still widely used in waste studies.

For some years after 1974, Ron's research efforts focused on the development of techniques for the systematic isolation and identification of unknown organic solutes in water. Such studies had an urgency because Rook had shown in Holland that waters containing humic substances give rise on chlorination to trihalomethanes, many of which are mutagenic, and some were later shown to be carcinogenic. His work led to the development of the XAD-8 and XAD-4 resin-in-tandem technique for the isolation of humic fractions from waters, and even from waters, such as some ground waters, with very low levels of dissolved organic carbon (DOC, a term introduced by Ron which is now in common usage). Development of techniques which allowed large volumes of water

to be processed allowed studies of the variations of dissolved aquatic humic substances with season, climate, vegetation and stream discharge. During the mid-eighties he led his team to processing more than 30 000 liters of ocean waters from the Mid-Pacific deep ocean using the XAD resin technology. He showed that essentially all of these substances could be classified as fulvic acids with only a trace that are in the humic acid category. The analytical data indicated that these were of marine and stream origins and with radiocarbon dates of 3500 B.P. Another milestone from his mid-eighties work was his ^{13}C characterization study of the humic substances from the 10 soil orders.

At the 11th International Conference of the International Society of Soil Science (ISSS) in Edmonton (1978), Ron, with Pat MacCarthy from the Colorado School of Mines, introduced those in soils with interests in humic materials and soil organic matter to the techniques of resin separations. Their efforts were enthusiastically received, and it was agreed that in order to make progress in the field it was important to establish a set of well-characterized humic standards from soils, peats, lignite, and waters. Such standards would make it possible for scientists from different laboratories to apply their techniques to the standards and to their own isolates and in that way have confidence in their characterization procedures. Ron, with the enthusiastic support and backing of Bob Averett, secured funding from USGS to set up a Standard and Reference collection and then called a meeting of humic scientists from around the world to discuss the source soils and waters from which the Standard and Reference materials would be isolated. After agreement had been reached on technical matters it was decided to found the International Humic Substances Society (IHSS). Thus this Society, with the motto 'To Advance the Knowledge, Research and Applications of Humic Substances' was founded in Denver on September 11, 1981, and Ron Malcolm was unanimously elected as its first President, and made an Honorary Member in 1992.

As a part of the Department of the Interior, scientists in the U.S. Geological Survey normally confine their activities to the USA. Strangely, Ron had not been outside North America before he attended the 12th International Conference of the International Society of Soil Science in New Delhi in 1982. Since then he was invited extensively to bring his science to several parts of the world, and he visited and conducted collaborative projects with scientists in Australia, Canada, China, England, France, Germany, Ireland, Italy, Norway, Russia, Spain, and Portugal. His techniques have been shown to be applicable to the isolation of humic substances from soils as well as from waters, and his efforts are germane to the striking progress that has been made in the humic sciences during the past decade. There has been huge international recognition for his work and talents, and the Honorary Doctorate awarded to him by the University of Linköping in Sweden was the first of what would have been many.

Those who knew Ron well are aware of his immense energies, of his dedication to his subject, of his unquestionable academic talents, and of his eagerness to see that the fundamental environmental importance of humic substances are appreciated widely. He maintained that zeal to the end. Even after his disease had been diagnosed as fatal he engaged in strenuous work in England, France, and Norway in order to encourage the completion of projects that he considered to be important. In these, as in earlier visits, he trained young scientists in the advances in his techniques. He was quick to appreciate interest and involvement, and he had no time for those who invested minimum effort and hoped for career rewards. He was a man of extraordinary generosity, and those who knew him well, appreciated his unique wit.

Ron had total support from his wife Mollie Jane who was his High School sweetheart, and whom he married in 1958. It was plain to all that they had retained the sparkle for each other and for life, and they were the closest of friends. They were blest with four talented children Gregory, Susan, Jeffrey, and Janet. He is also survived by his sister Gwenlyn and her family of Kenova.

Ron was a man of deep Christian faith and his knowledge of the gospels could match his awareness of the humic sciences. He would discuss both with equal fervor. He was laid to rest in the Hillcrest Cemetary, in his much loved Kenova.

Those wishing to make memorial contributions might be reminded of Ron Malcolm's zeal in promoting interest in the humic sciences among the young, and especially students. Thus, contributions will be welcomed to the Dr. Ronald Malcolm Scholarship Fund (for students to travel to IHSS meetings). c/o Dr. J.J. Alberts, President of IHSS, Marine Institute, University of Georgia, Sapelo Island, Georgia 31227.

ONE-TIME CHANGE IN GENERAL ELECTIONS

At the IHSS General Meeting in Adelaide last September 1998, it was proposed to the membership present that the elections of Secretary and Board Member-at-Large scheduled for 1998 be postponed until 1999. Both of the current office holders, Teddy Miano and Mike Perdue, have agreed to serve an additional year until the new elections are finalized in 1999.

The reasons for this request are based in the fact that the original plan for the elections, as state in the by-laws, was to hold elections every two years and that certain officer and board positions would overlap to provide continuity of leadership. Thus, the Society would only have elections every two years. This schedule was disrupted and we are now facing elections every year, sometimes for only one position. This situation is burdensome, confusing and costly. Therefore, the Board proposed to the membership the simplest mechanism to readjust the schedule and to allow us to be in accord with the by-laws. That was a one-time extension of the two positions mentioned.

I assure you that the Board did not make this suggestion lightly. We are committed to the efficient and legal operations of the Society as outlined by the by-laws. To that end, the proposal was made to the membership present at the business meeting and was overwhelmingly approved. Therefore, the 1999 elections will be for Vice-President/President Elect, Secretary and Member-at-Large, all for full terms.

All members are invited to send their indication of potential nominees for the positions of Secretary and Board-at-Large. They are also invited to present nominees for the Vice President position which will be ending this year 1999. Letters with nominees should be sent to Dr. Geoff Davies, Chairman of the IHSS Nominating Committee at Barnett Institute, 341 Mugar Hall, Northeastern University, Boston, MA 02115, USA.

IHSS Pins are available.

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1999

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International Humic Substances Society on the World Wide Web

!!!!!!! The Web page address has changed !!!!!!!

Visit our home page at:

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

Prof. 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 for more information.

LIST OF NATIONAL CHAPTERS COORDINATORS

Dear colleagues,

at the last Meeting in Adelaide, the Board of Directors of the IHSS agreed: a) to reinforce contacts with national coordinators in order to improve the membership structure; b) to reduce the number of very small chapters; and c) to hasten the process of updating and completing the general membership list. After a thorough and accurate discussion concerning increased numbers of national coordinators and needs of the continuous updating process, it was decided to merge all chapters **with less than 5 members** into a Rest of the World Chapter. The Secretary, Dr. T.M. Miano, was nominated temporarily as General Coordinator of the R-o-W Chapter. Further, the Board unanimously agreed on a 25% increase of membership dues. The additional income will be entirely devoted to enhance funding for the IHSS Travel Bursaries for young scientists. The General Assembly of the IHSS, held during the 9th Meeting of the IHSS, accordingly approved.

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MEMBERSHIP DUES (1999)

25 US \$ / year (12.5 US \$ for students):

- Argentina
- Australia-New Zealand
- Brazil
- Canada
- European Union (including Norway)
- Indonesia
- Israel
- Japan
- Malaysia
- Mexico
- Philippines
- South Africa
- Switzerland
- Taiwan
- United States
- Venezuela

7 US \$ / year (3 US \$ for students):

- Croatia
- Czech R.
- Egypt
- Hungary
- Poland
- Slovakia R.
- Slovenia
- Developing countries in Africa, Asia and Central and South America

1 US \$ / year:

- former USSR countries, including Baltic republics
- Bulgaria
- Romania
- Albania
- P.R. China

National Coordinators should collect the fees from members of their chapters in local currencies, deduct 20-25 % out of the fees (postage, copying, etc.), and then send the balance in US \$ to the Treasurer, Dr. C.E. Clapp, Univ. Minnesota, St. Paul, MN, USA.

Coordinators from 7\$-group chapters are invited to collect dues for two years (\$14, and save converting to US \$ not so often) and are allowed to keep up to 50% of the fee. Coordinators from 1\$-group chapters can keep the entire fee.

Members of the R-o-W Chapter should send their fees directly **to the Secretary** (in US \$).

IHSS Members are reminded that membership dues are payable at the beginning of each year directly to their National Coordinators.

CONGRATULATIONS

It is a great pleasure to announce that Dr. Egil T. Gjessing has been elected an **Honorary Member** of the International Humic Substances Society. Egil joins only five other recipients of this honor and is truly deserving. He has a long history of research in the field of humic substances in aquatic environments, particularly with respect to drinking water quality and the effects of acidification on natural organic matter. His dedication to the society and the study of humic substances is well known. Recently retired from the Norwegian Institute for Water Research (NIVA) and now a faculty member of Agder College in Kristiansand, Norway, he remains active in studies of aquatic organic matter and as the Nordic Chapter Coordinator of the IHSS. Egil will be formally recognized as and **Honorary Member** of IHSS at the Nordic Chapter meeting this June at Agder College. Please join the Board of Directors in wishing Egil sincere congratulations.

James J. Alberts, President, IHSS

IHSS STANDARD AND REFERENCE COLLECTION

News Concerning the IHSS Collection of Humic Materials

By P. Bloom

Changes in Prices of IHSS Humic and Fulvic Acids.

Prices of some samples changed effective 1 June, 1998 to better reflect their value to IHSS. The prices of the Suwannee River Humic Acid Standard *increased* from \$150 to \$175 for 100 mg lots. For the Nordic Aquatic Humic Acid Reference the price *increased* from \$100 to \$125. For the Suwannee River Fulvic Acid Standard the price *decreased* from \$150 to \$125 and for the Suwannee River Fulvic acid Reference the price *decreased* from \$100 to \$75 for 100 mg lots.

The Leonardite Humic Acid Standard will continue to be sold at \$5 for 100 mg lots but in addition we are offering 5 g lots at \$100. We have a large reserve of this material and want to offer it to soil, water, and plant scientists and engineers at a price that makes it attractive for conducting research or preliminary studies.

Suwannee River Humic Acid Reference Sample is No Longer Available. The supply of Suwannee River Humic Acid Reference was recently exhausted. This material will not be replaced.

New E-mail Address. Effective 1 June 1998, the e-mail address for communication concerning the collection is IHSS@soils.umn.edu. E-mail is the preferred method of communication for ordering from the IHSS collection. For more details see the IHSS web site at www.ihss.gatech.edu.

MEETINGS

Northeastern Seminar on Humic Substances III, Boston, USA, March 22-23, **1999**. The Seminar will be held at the Northeastern University (first-class facilities; 5 miles from Logan Airport (pick-up available); great historical location; hub of Northeast, downtown, museums and many sites nearby). Geoff Davies and Elham Ghabbour, Barnett Institute, 341 Mugar Hall, Northeastern University, Boston, MA 02115, USA. Phone: +1.617.3734818; fax: +1.617.3732855; e-mail: pmitzman@lynx.neu.edu. **See you there!**

4th National Meeting of the Italian Chapter of the IHSS, Sassari/Alghero, Sardinia, Italy, May 26-28, **1999**. Meeting Chairman is Prof. Salvatore DEIANA, Professor of Soil Chemistry and Director at the Institute of Agricultural Chemistry of the University of Sassari, Sardinia, Italy. The Annual General Assembly of the Italian Chapter of the IHSS, which counts now approximately 120 members, will also be held during the Meeting.

7th Nordic Meeting on Humic Substances in Soil and Water, Agder College, Kristiansand, Norway, June 6-9, **1999**. Who to contact: Egil Gjessing, Agder College, N-4604 Kristiansand, Norway. Phone: +47.38.14.15.61, Fax: +47.38.14.10.11, e-mail: egil.t.gjessing@hia.no

Northeastern Seminar on Humic Substances IV, Boston, USA, March 22-24, **2000**. Call for Papers. Oral and poster papers on the structures, properties and uses of humic substances are invited. New work only, please. The proceedings will be published. Registration limited to 120: US Residents \$100. US students \$50. All others \$75. Special nearby hotel rates available. Deadline for abstracts and registration December 30, 1999. For additional information please contact Dr. Elham Ghabbour, Barnett Institute, 341 Mugar Hall, Northeastern University, Boston, MA 02115, USA. Phone: +1.617.373.7988; fax: +1.617.373.2855; e-mail eghabbou@lynx.neu.edu; web: <www.barnett.neu.edu> under Current Events. Kindest regards, Geoff & Elham.

ARTECH COMMERCIALIZES HUMIC ACID

ARTECH, a Virginia (USA) based company (voice: 703-22-0280, e-mail: analytic@arctech.com) has recently received several patents for commercializing proprietary applications of products based on humic acid.

ARCTECH is pursuing application of humic acid that will address challenging environmental needs including the successful development of a novel adsorbent (HUMASORB-CS™) that is based on a water-insoluble polymer derived from humic acid. This novel adsorbent has been shown to remove both inorganic and organic contaminants from in a single treatment step. HUMASORB-CS™ is currently being evaluated as a low-cost subsurface barrier to remediate contaminated groundwater. A patent has been applied for.

ARCTECH has successfully demonstrated applications of its humic acid-based ACTODEMIL™ technology for recycling of nitrogen-containing energetics from conventional munitions into usable fertilizers. This fertilizer product has met all regulatory requirements and was approved for use by the Nevada Department of Environmental Protection for application on forage crops in that state. Recently, the U.S. Army selected the ACTODEMIL™ technology for further evaluation as a safe method of disposing of chemical munitions (U.S. Patent 5,538,530; Method for Safely Disposing of Propellant and Explosive Materials and for Preparing Fertilizer Compositions).

Finally, The MicGAS™ technology (U.S. Patent 5,670,345; Biological Production of Humic Acid and Clean Fuels from Coal) is based on a process for the biological conversion of coal to produce a clean fuel gas while reducing the CO₂ emitted into the atmosphere. This innovative process is based upon natural microorganisms that are adapted to convert coal into clean fuels under anaerobic conditions. Unlike conventional coal gasification, the solid residue from the anaerobic MicGAS™ process is not a waste, contains high concentrations of humic acid. This residual material from this treatment can be further subjected to an aerobic/anoxic biochemical process for subsequent extraction of humic acid.

At its production facility located in Sterling, VA, ARCTECH scaled up a pilot-production facility to produce humic and then formulates it into commercial actosol® fertilizer products. Actosol® fertilizer is being successfully marketed in the U.S. for application on golf courses and agricultural crops such as corn, wheat, and soybean, use in landscaping and erosion control. In the Middle East actosol® is being applied to alfalfa, palm trees, and in the greenhouse production of vegetables.

"Announcements of commercial products are for the information of the members of IHSS, but are in no way meant as an endorsement by the Society for their use."

IHSS VOLUMES (and related publications)

HUMIC SUBSTANCES IN TERRESTRIAL ECOSYSTEMS. (675 pp). Edited by A. Piccolo. Elsevier, 1996. **ISBN 0-444-81516-3**

HUMIC SUBSTANCES IN SOIL AND WATER ENVIRONMENTS. *Characterization, Transformations and Interactions*. Proceedings 7th Int. Meeting of the IHSS. St. Augustine, Trinidad, 1994. 1996 (493 pp). Edited by C.E. Clapp, M.H.B. Hayes, N. Senesi, and S.M. Griffith and published by IHSS. **ISBN 1-889365-00-9**

HUMIC SUBSTANCES, PEATS AND SLUDGES: Health and Environmental Aspects. Edited by M.H.B. Hayes & W.S. Wilson. The Royal Society of Chemistry, Cambridge, 1997. Special Discount Price £38.68 (\$72.80). **ISBN 0-85404-699-2**

THE ROLE OF HUMIC SUBSTANCES IN THE ECOSYSTEMS AND IN ENVIRONMENTAL PROTECTION. Selected Papers of the 8th Int. Meeting of the IHSS. Wroclaw, Poland, 1996. (1002 pp.). Edited by J. Drozd, S. Gonet, N. Senesi, and J. Weber. PTSH & Polish Chapter of IHSS, Wroclaw, 1997. **ISBN 83-906403-2-5**

HUMIC SUBSTANCES: STRUCTURES, PROPERTIES, AND USES. (259 pp.). Edited by G. Davies and E. Ghabbour, Royal Society of Chemistry, Cambridge, England, 1998. **ISBN 0-85404-704-2**