AMERICAN ARACHNOLOGY

The Newsletter of the American Arachnological Society

No. 39 **April 1989**

1989 Annual Meeting in Indianapolis

The 1989 annual meeting of the American Arachnological Society will be held at Butler University in Indianapolis, Indiana on June 20-24. Information regarding the meeting is in the November, 1988 issue of the American Arachnology, and all North American members have received registration forms. If you want more information, contact the host: Jim Berry, Department of Biological Sciences; Butler University, Indianapolis, IN 46208. Telephone: (317)-283-9344 (office) or (317)-283-7179 (home).

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SOCIETY ELECTIONS

This year a new member of the Board of Directors and the Society Secretary are to be elected. Very brief curricula vitae for the candidates appear below. Also, four changes in the By-Laws and Constitution have been proposed. Please mark your ballot, which is included in this newsletter, and return it to Robert J. Wolff by June 1.

<u>Candidates for Director</u>

Petra Sierwald

M.A. 1982, and Ph.D. 1985. University of Hamburg, West Germany; Postdoctoral work at Smithsonian Institution and by DSFG in Florida

Currently: Research Associate at the Delaware Museum of Natural History and the National Museum of Natural History

Most recent publication: 1988. Spiders of Bermuda. Nemouria 31:1-24.

Graeme Wilson

O.D. Optometry, Glasgow College of Technology, 1962. Ph.D., Physiological Optics, University of California, Berkeley, 1972.

Currently: Professor, Chairman and Director of Graduate Studies, Dept. of Physiological Optics, School of Optometry, Univ. of Alabama at Birmingham.

Most recent publication: 1989. Spectral sensitivity in jumping spiders (Araneae, Salticidae). J. Comp. Physiol. A 164:359-363.

<u>Candidate for Secretary</u> (incumbent)

James W. Berry

M.S. Virginia Polytechnic Institute, 1958. Ph.D., Duke University, 1966.

Currently: Professor of Biological Sciences, Butler University,

Most recent publications: 1988. Four new species of <u>Paratheuma</u> (Araneae:Desidae) from the Pacific. (with J.A. Beatty). Journal of Arachnology 16:339-347.

Proposed changes in the By-Laws and Constitution are indicated by underlining.

Section 5: Associate membership for low income workers or for countries where it is not possible to send money will be gratis and must be bestowed by <u>two-thirds</u> vote of the Executive Committee.

<u>Section 6:</u> <u>Life memberships shall be 25 times the regular membership fee, paid in one sum or in two annual installments.</u>

<u>Section 7:</u> Records pertaining to Society funds shall be open to any member at any time.

Article VI, Section II. Mail-in ballots shall be returned to the Nominating Committee for counting. [(delete) <u>which shall be included in the following year's Spring issue of the Newsletter</u>]

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Back Issues of <u>American Arachnology</u>

Back issues of all numbers (some original and some photocopies) of <u>American Arachnology</u> are available at US$2.00 per copy. Send your request and payment in US currency to the editor, Jim Berry; Dept. of Biological Sciences; Butler University, Indianapolis, Indiana 46208

Update on Platnick's Catalog

Norman Platnick's new book, a supplement to Brignoli's catalog, was offered at a discount price to members of the Society in the Fall issue of the newsletter. Manchester University Press has informed him that the book has now been printed, but he has not yet received his copies of the book. The books ordered by Society members will be shipped in bulk to the U.S. and then mailed by the Society Secretary to the members. At this time we cannot estimate when the books will be delivered.

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Pseudoscorpion Catalogue

With the assistance of the British Arachnological Society, Manchester University Press intends to publish <u>A Catalogue of the Pseudoscorpionida to 1988</u> by Mark S. Harvey. Although Dr. Harvey has amassed a large amount of the literature, he would appreciate receiving copies from authors of any papers dealing with pseudoscorpions (including all aspects of their biology and systematics) that have not already been forwarded to him. In addition, anyone who may be able to assist by xeroxing some older papers (that are not available in Australia) is requested to contact Dr. Harvey for details of titles still needed. [Mark S. Harvey, Western Australian Museum, Francis Street, Perth, Western Australia 6000, AUSTRALIA]

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Book on Chinese Spiders

Song Da-xiang. 1987. [Spiders from agricultural regions of China (Arachnida: Araneae)]. Beijing: Agriculture Publishing House. 376 pages. In Chinese.

This is an identification handbook. After an introductory chapter on spider morphology and natural history and a key to families, the bulk of the book is descriptions of more than 200 species. Line drawings of at least the genitalia are provided for most of these. There are indices to scientific and Chinese common names. The book is sold out in bookstores, but a few copies are still available from the author. Send $20, remitted through the Beijing branch of the Bank of China to: Song Da-xiang, Institute of Zoology, Academica Sinica, 7 Zhongguancun Lu, Haiten, Beijing, China. Unfortunately, the bulk of the cost is taken up with the postage, which is now extremely high from China. At the Academica Sinica you can get a copy for about $8. [Christopher Starr, University of Georgia College of Agriculture, Athens, GA 30602]

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Arachnology in the USSR

K. Mikhailov of the Zoological Museum of the Moscow State University reports that the Second All-Union Arachnological Conference was held at Perm State University in March, 1988, and 36 arachnologists from the USSR were present. Twenty seven papers were presented, and preliminary work on the compilation of a Catalogue of USSR Spiders was completed. The Conference approved a list of arachnids to be included for the first time in the USSR Red Book (3rd Ed.). They recommended that specimens collected by USSR arachnologists be deposited in the Zoological Institute of the USSR Academy of Science (Leningrad), the Zoological Museum of the Moscow State University (Moscow), or in the Dept. of Invertebrate Zoology of Perm State University (Perm). The Third Arachnological Conference will be held in 1992.

American Arachnology is the newsletter of the American Arachnological Society and is sent only to members of the Society.

For information on membership, write: Dr. Norman Platnick, Membership Secretary, The American Arachnological Society; Department of Entomology; The American Museum of Natural History, Central Park West at 79th St., New York, NY 10024.

The Journal of Arachnology is the official publication of the Society. Manuscripts submitted for publication in the Journal of Arachnology should be sent to Dr. Jerry Rovner, Associate Editor, Department of Zoological Sciences, Ohio University, Irvine Hall, Athens, Ohio 45701 U.S.A.

NASA, SPIDERS AND I

Peter Witt

1623 Park Drive
Raleigh, NC 27605

In the summer of 1988, a group of science teachers asked me to talk about spiders. When I inquired about their special interest, they all mentioned the experiment with spiders in space. Suddenly I realized that it was about 20 years since the first plans for that experiment had been worked out. Apart from the results, the why and how of that event seemed to make it worthwhile to reminisce about it. As time goes by, there remains only the report on results by Witt et al. in the Journal of Arachnology 4: 115-124, 1977, which does not try to deal with the frustrations of my dealings with the National Aeronautics and Space Administration (NASA). Here is a summary of the events which surrounded the "Spider Web Building in Outer Space". For the quantitative results of measurements and observations one has to consult the earlier "Evaluation of Records from the Skylab Experiment" in the Journal of Arachnology.

NASA began around 1968 to plan for a laboratory outside the Earth's atmosphere, where experiments could be carried out which would clarify the effects of space on various earthly processes. As I perceived it, one of the main goals was an analysis of the consequences of weightlessness on biological systems. Nobody had experience which would predict how we would stand up to long exposure to weightlessness, and to whatever other forces and radiation which existed outside the Earth's atmosphere. Scientists, laboratories and universities received a call soliciting proposals for experiments to be carried out in a future space laboratory. [One of the conditions for the acceptance of the proposal was that the experiment should occupy little space, that it needed no human operator, and that the results could be transmitted to Earth.]

At the time I had nearly 20 years' experience in the analysis of spider web geometry; I had tried to learn to read web patterns, measuring the geometry to learn the inner workings of their builders. To clarify questions about gravity, I had actually pasted lead weights on the back of cross spiders (Araneus diadematus Cl.). The webs built with the weights were compared to webs built by the same animals before and after the weights. The main finding was that weight-webs were built with a shorter thread than those without the extra weight. When the web material was measured through nitrogen analysis of the web protein, my friend David Peakall could establish that it was about equal for control and weight webs.

We concluded that the heavier spider, which extruded a thicker silk strand, was now able to let itself down on its thread without risking rupture. One can only speculate in what way the spider became aware of its own body weight and acted accordingly. The experiment showed that spiders were sensitive to weight changes and could therefore become interesting candidates for experiments in the space laboratory. All our webs were longer than wide, of oval shape. How would that change when there was no up or down? The webs could be photographed in the space laboratory, and the pictures and animals could be brought back to Earth for measurement and observation.

The proposal to enter spiders into the Biosatellite Program was entitled: "Effects of weightlessness on web-building behavior of spiders". NASA accepted the proposal, and they sent technical personnel to Raleigh to learn how to handle spiders. During the following months cages were developed which would fit into the space laboratory, and which would permit spiders to build full-sized webs. The spiders could travel with the astronauts and could be released by them on arrival. In preliminary investigations spiders were exposed to vibrations and to a special oxygen-nitrogen atmosphere, and their webs were monitored before and afterwards. These webs were to serve as controls which established that the launch alone would not affect web-building and that the web changes observed in the space laboratory were due only to the peculiar conditions there.

The preliminary efforts were followed by a chain of events which taught me more about the difficulties of dealing with a large government organization than about spiders. In the end the Biosatellite Program was never flown. The personnel which had worked on the preparations and become familiar with the handling of spiders left NASA. My continued inquiries remained unanswered.

About three years later, in 1972, I learned from the newspaper that the people who worked on Skylab II had adopted a proposal from a high school student, Judith Miles, from Lexington, Mass. to send a spider into space and watch its web construction there. The neglected NASA had tried to gain popularity through involving high school students in their planning. When they had received the spider proposal from Lexington, they found it convenient to use the results of previous efforts with spiders, but under no circumstances wanted it attributed to an adult scientist. The girl had generated her plan after reading an article in the National Geographic Magazine of 1971, in which there were pictures and a discussion of my methods of web measurement.

There were efforts underway now to learn more about measuring webs without giving credit to anybody but NASA and Judith Miles. I was more interested in the outcome of the experiment than in getting credit, but I wanted to keep my fingers in to see the webs as early as possible and get a chance to measure them. I accepted a request from NASA to train Judith Miles in the Raleigh laboratory to handle spiders. She appeared with her mother, who turned out to be the driving force, asking all the questions and observing spiders. They spent a week in Raleigh, during which time I learned about the embarrassment caused by a pushy parent. I believe that I succeeded only in exchanging a few short asentences with Judith. After that I became completely dissociated from the project, while the Miles family dealt with NASA and the preparation of the spider experiment in space. When photographs came back from Skylab, a fact which I learned from newspapers, I was not granted permission to look at them. I was informed that for two years Judith would have exclusive rights to the pictures.

But there was an opportunity to learn about the behavior of spiders long before the end of the two years. I had written to Walter Cronkite of CBS TV news whether it would be possible to direct the camera in Skylab at the spiders. They showed daily pictures of astronauts brushing their teeth or eating; I suggested that the cameras could do more important work. It was common knowledge that most of the photographic equipment had suffered damage when the laboratory had been exposed for some time to high temperatures, due to a defect in its insulation. We might never see web photographs, but could we at least see samples of the animals' behavior? A telephone call informed me that spider pictures would appear on the evening news at the end of August 1973. Our local station taped the scene, and I obtained a chance to look many times at the strange behavior of the animals in space.

Seeing the spiders in space was for me very exciting and worth all the years of waiting. Two animals had made it all the way into Skylab; and at the time the pictures were taken, one had been several weeks in the frame, the other was just released. The first animal moved quickly around the cage, using the existing silk for support. The new animal floated slowly through space. When it touched the frame, it bounced back and floated in the opposite direction. Its legs were extended and hardly moved. The silk, which one could observe coming from the spinnerets at the end of the abdomen, wafted in wide waves through the air. It would have been stretched tight by the spider's weight on Earth. The spider obviously missed its usual clues, on which it would have descended, holding on to the tight thread. It could no longer handle the situation in an appropriate way and presumably waited for what would happen next. I saw something which no human eye had ever observed before: one spider's ability to cope with weightlessness after a few weeks of trial and error, and the new animal's helplessness. Thanks to the kindness of the people at the local TV station, I looked at this 12 times over. I quote from old notes:"... the spider newly put in tumbled, its movements were head-over-heels, as never seen before; the animal rotated in space while moving in one direction, bounced off the frame and moved back. In contrast, the first spider ran very competently along the strands to escape from the astronauts." It was concluded that there is a transition time during which spiders gradually acquire the skill to move "competently" under weightless conditions.

Nearly two years later, in April 1975, I received without any explanation a large package from NASA. It contained flight protocols, photographs and spider carcasses. The protocol permitted us to fix the dates at which things happened. The photographs, though very poor in contrast and too small to see the outline of the web, permitted measurements. We compared those measurements to web measurements from webs of the same species and age group of spiders in our laboratory. As far as I know Judith Miles (or her mother) had never measured the photographs.

There were only 5 photographs of control webs built by the two space spiders before the launch. This meant that only severe changes could be identified. Luckily, some of the changes exceeded anything that had ever been observed on Earth. In my opinion the most significant result was the observation that large geometric orbs had been built at all in space. The spiders had managed to cope with conditions which neither they nor any of their ancestors had met before, and they had constructed a large, functional trap for food in the absence of cues they normally receive through gravity. Adaptation had occurred in a few days.

When the spiders appeared on the TV film on August 23, they had been away from Earth since July 28, more than four weeks. They had had different experiences: one had been out of the transport vial and in the cage since August 4, the other just came out when the film was taken. The two behaviors differed significantly. At some later time the concerned astronauts, who had again received a message from me via Walter Cronkite, had given small pieces of their steak to the animals. The reports indicate that the spiders rejected these, cutting them out of the webs. Soon afterwards web-building ceased completely, which did not surprise me. The late webs, of which we have sample photographs, were small and irregular. They were probably built by starving animals. We have no evidence that any other deleterious conditions prevailed, or that they suffered from the long stay in space.

Mrs. Mabel Scarboro, who had had experience with web measurements in my laboratory for years, extracted whatever information was possible from the incomplete photographs. The webs had actually been larger than the pictures, and we were unable to measure whether their size was in excess of Earth webs. But we could judge the angle sizes between radii in the space webs and compare them with known data, which had been determined from hundreds of webs on Earth. While on Earth, there is a distinct difference in size between the angles in the upper part of the web and the lower part, the space webs showed no difference. The bottom angles, which are normally smaller than the ones on top, were now equal (as far as any "bottom" could be established). It seems that when there was no gravity as a cue, the north-south web symmetry disappeared.

Only part of the spiral could be measured in the space webs. In the first webs there was no difference in regularity as compared to controls; later the spirals became highly irregular. Twenty years earlier I had measured spiral distances and speculated about their logarithmic spacing. The conclusion at that time had been that the orientation was according to the shortest distance from radius to radius, which means that the spider uses the perpendicular from one radius to another. This is a relatively easy and quick way of orientation, which results in a logarithmic spiral (Behaviour 4: 172-189, 1952). When absence of gravity showed no influence on the logarithmic spiral, the earlier surmise was confirmed. It had taken 20 years until new evidence confirmed the old assumptions.

We found fewer turning points in the space spiral, in distinction from the Earth spirals. This may have had to do with the roundness of the space web, which filled a frame which was closer to a square. The measurements of thread thickness, which could only be made approximately on photographs (by David Peakall), rather than on the threads themselves, showed the expected thinner threads built in space. It could be the opposite effect of the one we found with weighted spiders on Earth. It confirms my earlier guess that spiders can perceive their body weight and regulate the thickness of extruded thread accordingly.

The most frequently asked question is: what can we really learn from the spider experiments in space?? This always reminds me of all the missed opportunities, which were the result of a lack of communication with NASA, and the poor photography. Then I remember how admirably the two spiders performed in space, and how that increased my respect for the small animals. They were brought into a foreign environment where some of the cues, which they and their ancestors had always used, were missing. Under such adverse circumstances they had constructed a large, efficient trap for prey, a slightly changed but still effective geometric orb web. Only a few days of trial and error were required to adjust to the abnormal environment. Under other circumstances they would have survived by catching the accustomed airborne prey. As in experiments before, I had found that backup mechanisms made their behavior much more flexible than usually expected.

A lesson can be learned from the interaction between NASA and myself: a large organization which is changing sources of support is an awkward partner in the preparation of experiments. The only person who had been able to cut twice through the red tape was a well-known TV anchorman, not a scientist. I was probably less surprised than many others when later preparations for a launch into space went wrong. In decision making and planning many minds do not necessarily function better than one. Through patience and diligence we finally obtained some new insights into spider behavior. Much more could have been learned if closer coordination between the Earth laboratory and the astronauts could have been achieved.

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THE AMERICAN ARACHNOLOGICAL SOCIETY
FINANCIAL STATEMENT
First Quarter, April 11, 1989

Balance from 29 December 1988		$19,997.84
DEPOSITS		
Membership dues	9161.00	
Sales of Platnick and Brignoli Volumes	5570.00	
Sales back issues	45.00	
Spider Genera, note cards, Linyphiids	605.50	
Donation from Jim Berry	190.00	
Page charges	863.75	
Interest	278.50	
Subtotal:	$16,713.75	
EXPENSES		
Texas Tech JA 16(2)	7132.95	
Texas Tech JA 16(3)	5903.80	
Texas Tech, mailings and "Instructions" reprint	245.35	
Postage, Dept. Zool, UT, back issues	75.80	
Postage, Jon Reiskind	51.40	
checks returned from sales	20.00	
Subtotal	$13,429.30	
Total Assets:		$23,282.29

Gail Stratton, Treasurer

More Information on Collecting in Mexico

Linden Higgins
Ciudad Universitaria, Mexico

Mexico can provide many opportunities for both the ecologist and the systematist of arachnids. Although regulations have become stricter in recent years, especially for collection in the national parks, the "tramites" should not inhibit the exploration of the incredible diversity of habitats in this country. Current research is being conducted on arachnids in Nuevo Leon, Baja California, Jalisco, Michoacan, Puebla, Veracruz, and Chiapas by investigators associated with the National Autonomous University of Mexico (UNAM) and other Mexican institutions. Many of these sites are very peculiar, such as the National Park Tehuacan (Puebla), a high-altitude desert possessing tropically-associated fauna and flora, and the forests of Chamela (Jalisco), the driest tropical forest yet studied (less than 1 m rain per year). Except in Baja California and Chiapas, the non-acarid arachnological fauna is almost unknown and the results of a few days spent collecting can be very exciting (19 families collected in two months in Los Tuxtlas, Veracruz; 21 families collected in three months in Chamela, Jalisco).

There are several options for conducting research in Mexico. The Instituto de Biologia, UNAM, has two field stations which are well equipped (air conditioned laboratories, small libraries, resident staff) and easily reached by bus from the City of Mexico, Chamela, Jalisco and Los Tuxtlas, Veracruz. Visits to these stations are arranged by submitting research proposals and dates to the Secretaria Tecnica (Instituto de Biologia, UNAM, A.P. 70-233, Ciudad Universitaria, C.P. 04510). A second option is through SEDUE, the Mexican national park system. This is an option with the most paperwork, but is the only access to the various national parks and is that described by Marsha Conley in the November 1988 newsletter. To deal directly with SEDUE, one corresponds with the Secretaria de Desarrollo Urbano y Ecologia (Av. Constituyentes No. 947, Edif. "B", Col. Belen de las Flores, Mexico, D.F., C.P. 01110). As described by Dr. Conley, association with a Mexican institution or investigator is one of the requirements. However, this requirement suggests a third and, I believe, preferred alternative: direct association with a Mexican researcher. There are many arachnologists currently working in Mexico, especially in taxonomy and mites, and there is a growing interest in ecology and behavior. Several of these researchers are members of the AAS or of the Mexican Entomological Society (Sociedad Mexicana de Entomologica, A.P. 7-1080, Mexico, D.F.; C.P. 06700), and can be contacted through these societies. I do suggest that all correspondence be sent in duplicate to avoid confounding problems by lost letters.

Even if one decides to work independent of a Mexican institution, I strongly suggest that visiting researchers take time to visit, perhaps to give a seminar. Relationships have been strained in part by the lack of direct communication of information gathered by foreigners that visit, and the best way to reduce these problems is through visits. The local researchers are enthusiastic, helpful, and can provide information on when to find specific animals.

U.S. and Canadian arachnologists should not immediately reject the idea of research in Mexico. It is a wonderful and rich country, with a rich diversity of habitats and cultures that more than compensate for the paperwork sometimes required. And one additional benefit of arachnological research in Mexico is that most sites of arachnological interest are close to sites that are of archeological and/or anthropological interest, greatly increasing the value of one's trip. I am willing to provide further information about various sites, the logistics of working in Mexico with or without private vehicle, the "tramites" of visas, equipment (anything electronic can cause difficulties), SEDUE and the Instituto de Biologia stations. Send correspondence to: Centro De Ecologia, UNAM, Apartado Postal 70-275, Ciudad Universitaria. C.P. 04510.

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RESEARCH REPORT

William G. Eberhard
Escuela de Biologia; Universidad de Costa Rica
Ciudad Universitaria, Costa Rica

My major upcoming spider project is an article for Ann. Rev. Ecol. Syst. on "Function and phylogeny in spider webs", and I would like to take this opportunity to ask those of you who have papers and/or manuscripts on these topics to please send me copies so I can include as much of the relevant literature as possible (and not neglect to cite papers by friends). Thanks.

Other projects under way include a study of the attack behavior of my favorite species, <u>Leucauge mariana</u>, combined with a study of the escape behavior of one of its prey (a sepsid fly), and the mating system of several species including <u>Gasteracantha cancriformis</u> (currently in the midst of a huge population explosion on the Pacific side of Costa Rica — once again the stable tropics prove not to be so stable), <u>L. mariana</u>, <u>L. argyra</u>, and perhaps a pholcid (the idea is to check on the importance of female spermathecal anatomy in determining male behavior). I continue to be interested in the function of genitalia and copulation in general. Extra-arachnological projects include coital courtship behavior and genital mechanics in several beetles, the medfly, and earwigs, the evolution of bacterial plasmids, and the functional anatomy of male earwigs' forceps.

ON CARL CLERCK'S SPIDER COLLECTION: Translation of Åke Holm's "Om Carl Clerck's spindelsamling"

Translated and adapted by
Kathryn S. Victory
(El Centro Community College, Dallas, Texas 75202)
and
James C. Cokendolpher
(Department of Agronomy, Horticulture, and Entomology
Texas Tech University, Lubbock, Texas 79409)

With the proposal to copy the plates of Clerck's "Svenska Spindlar" (see notice elsewhere in newsletter), it appears appropriate that we now provide an English translation of Ake Holm's (1978) enlightened article on Clerck and his spider collection. We have annotated [in brackets] and adapted the translation to what we hope is an easily read, but correct, rendering of Dr. Holm's article. We do not here include three, unnumbered, black and white figures used in Holm's paper: (1) title page from Clerck's "Svenska Spindlar," (2) plate I from Clerck's "Svenska Spindlar," and (3) Clerck's signature in the student register of the University of Uppsala dated 5 May 1726. At the close of the article we include as Appendix 1 a listing of all species described by Clerck and the currently accepted names. Any errors in this section are ours alone and not those of Dr. Holm. Dr. Holm and Dr. Norman Platnick kindly read this article and offered many valuable comments.

One of the most beautiful books printed in Sweden during the eighteenth century is "Svenska Spindlar" or "Aranei Svecici" (Swedish Spiders) by Carl Clerck, a 48-year old Stockholm tax collection officer. At that time, being the foremost work done on this animal group and because of the accurate descriptions and figuring of a large number of species, this publication became the fundamental basis for spider systematics. On the initiation of Linné [Carolus Linnaeus] the work was published by the Royal Science Society in Uppsala in 1757. Only the previous year, Clerck had become a member of the Society. In the book [Clerck, 1757], containing 152 pages in quarto, Clerck gave the descriptions of 67 spider species [Appendix 1], in Swedish and Latin [top half of pages in Swedish, lower half in Latin], with information on their habitats, behavior, web construction and appearance. [Also one pseudoscorpion and one opilionid are illustrated but neither are named nor described.] The text is accompanied by six copper-engraved plates with beautifully hand-colored illustrations. The names given by Clerck have been for the most part conserved because he applied the Linnaean system of binomial nomenclature. This is the first zoological work to use binomial nomenclature. From recent observations, 55 species described by Clerck are still considered valid the remaining 13 are only variations in color and design [see Appendix 1].

When Clerck's "Aranei Svecici" was published in 1757, the printing of the 10th edition of Linné's "Systema Naturae" had proceeded so far that the Clerckian species could not be included. There were only 37 species of spiders in Linné's work and the majority had different specific names than those given by Clerck. The rules concerning the validity for zoological nomenclature were accepted at a zoological congress in Moscow in 1892. The congress determined that the 10th edition of "Systema Naturae" and the date 1 January 1758, established the starting point for zoological nomenclature. Consequently, Clerck's species names of spiders were considered invalid and thus many of them had to be changed in accordance with the rules. Those who supported Clerckian nomenclature, "clerckists," kept strongly opposing the ruling until the meeting in Paris, 1948, of the International Commission of Zoological Nomenclature. At that time, the commission granted priority to Clerckian nomenclature and decided to consider Clerck's work "Aranei Svecici" as being published prior to 1758. [see Direction 104-Grant of the status of availability to the names published by C. A. Clerck in 1757 in the work "Aranei Svecici" and addition of the title of that work to the official list of works approved as available for use in Zoological Nomenclature. Bull. Zool. Nomenclature, Vol 17. pts. 3-5 pp. 89-91. 1959. However, it should be noted that the 3rd edition of the "International Code of Zoological Nomenclature" arbitrarily sets the date of publication of Clerck's book as 1 January 1758, the same as Linné's 10th edition of the "Systema Naturae." Although the 3rd edition of the ICZN recognises that Clerck's names have priority over those of Linné, it disregards historical fact by setting back the date of publication.]

When Thorell (1856) published his fundamental revision of the spiders described by Clerck, Linné, and De Geer, he did not know that Clerck's spider collection still existed. Later Thorell was informed by Professor Boheman that a cabinet with Clerck's insect and spider collection had been donated in 1784 to the Royal Academy of Sciences in Stockholm by Professor P. J. Bergius and since then it had been kept in the botanical institute of the Bergian Garden.

In an essay published in 1859, "Om Clerck's original spindelsamling" [On Clerck's original spider collection], Thorell reports on the spiders in Clerck's collection and the names applied to them. The collection was kept in one of the 48 drawers of Clerck's cabinet. The majority of the specimens were pinned. Thorell described the condition of the collection and the necessary actions which he made for the preservation of the collection as follows: "When I first saw this collection it was by insects and verdigris so severly damaged that it sooner or later would be destroyed if left in its present condition. For the sake of science, the specimens that remain in the collection must be saved - it is unique and perhaps the oldest existing collection of this animal group. The study of which has been so severely neglected because of the problems encountered when preserving this group. I have placed into spirit all the pinned as well as the loose specimens and determinable fragments. As a result of this, the collection is now kept in glass flasks, 87 in number, which as before, are stored in the Bergian Horticultural School."

Of the original 87 glass vials that contained Clerck's spider collection, there are now only 34. All the vials have, pasted to

[Table 1] The catalogue of the remaining specimens in Clerck's spider collection.

[Names and numbers published by Thorell, see text]	[Name accepted by Holm, (!)= identified by Holm, see text]
1. _Epeira umbratica_ (Clerck) (34) 3♀♀	_Chinestela umbratica_ (Clerck)
2. _Epeira patagiata_ (Clerck) (40) 1♀	_Cyphepeira patagiata_ (Clerck)
3. _Epeira cucurbitina_ (Clerck) (41) 1♂ 2♀♀	_Araniella cucurbitina_ (Clerck)
4. _Epeira x-notata_ (Clerck) (65) 2♀♀	_Zygiella atrica_ (C. L. Koch) (!)
5. _Theridium sisyphium_ (Clerck) (30) 1♀	_Theridion sisyphium_ (Clerck)
6. _Theridium sisyphium_ (Clerck) (30) 1♀	_Theridion sisyphium_ (Clerck)
7. _Theridium lineatum_ (Clerck) (43) 1♀	_Enoplognatha lineata_ (Clerck)
8. _Theridium lineatum_ (Clerck) (56) 3♀♀	_Enoplognatha lineata_ (Clerck)
9. _Theridium cellulanum_ (Clerck) 1♀	_Nesticus cellulanus_ (Clerck)
10. _Linyphia triangularis_ (Clerck) (53) 2♂♂ 2♀♀	_Linyphia triangularis_ (Clerck)
11. _Tegenaria civilis_ Walckenaer (42) 1♂ 3♀♀ 1 juv.	_Tegenaria domestica_ (Clerck)
12. _Tarentula fabrilis_ (Clerck) ? 1♂	_Arctosa perita_ (Latr.) (!)
13. _Tarentula taeniata_ (C. L. Koch) ? (10) 1♀	_Alopecosa cuneata_ (Clerck) (!).
14. _Lycosa monticola_ (Clerck) (22) 3♂♂ 1♀	_Pardosa palustris_ (Linné) (!)
15. _Lycosa paludicola_ (Clerck) 2♀♀	_Pardosa paludicola_ (Clerck)
16. _Lycosa amentata_ (Clerck) (1) 1♀	_Pardosa paludicola_ (Clerck) (!)
17. _Lycosa amentata_ (Clerck) (26) 1♂	_Pardosa amentata_ (Clerck)
18. _Lycosa amentata_ (Clerck) (27) 3♂♂ 5 ♀♀ 1 juv.	_Pardosa amentata_ (Clerck)
19. _Lycosa pullata_ (Clerck) 1♀	_Pardosa paludicola_ (Clerck) (!)
20. _Potamia piscatoria_ (Clerck) (14) 1♂ 1♀	_Pirata piscatorius_ (Clerck)
21. _Dolomedes fimbriatus_ (Clerck) 1♂ (Ekeberg)	_Dolomedes fimbriatus_ (Clerck)
22. _Attus striatus_ (Clerck) 1♀	_Sitticus pubescens_ (Fabricius) (!)
23. _Attus terebratus_ (Clerck) (48) 3♂♂	_Sitticus terebratus_ (Clerck)
24. _Attus falcatus_ (Clerck) (var. _flammatus_) 1♀	_Evarcha falcata_ (Clerck)
25. _Dendryphantes hastatus_ (Clerck) (36) 1♀ [specimen destroyed between 1859 and 1978]	_Dendryphantes hastatus_ (Clerck)
26. _Xysticus cristatus_ (Clerck) (51) 2♀♀	_Xysticus cristatus_ (Clerck)
27. _Philodromus aureolus_ (Clerck) (37) 3♀♀	_Philodromus cespitum_ (Walckenaer) (!)
28. _Thanatus formicinus_ (Clerck) (29) 1♀	_Thanatus formicinus_ (Clerck)
The following species are not described by Clerck:	
29. _Anyphaena accentuata_ (Walckenaer) 2 juv.	_Anyphaena accentuata_ (Walckenaer)
30. _Drassus 4-punctatus_ (Linné) 1♂	_Scotophaeus quadripunctatus_ (Linné)
31. _Segestria senoculata_ (Linné) (103) 1♀	_Segestria senoculata_ (Linné)
32. _Lycosa tarsalis_ (Thorell) 2♀♀	_Pardosa palustris_ (Linné)

the outside, a label with a species name written by Thorell. Moreover, most of the vials have been assigned a number, also on the label. According to Thorell, these numbers originally were to be found on a square piece of paper which was placed on the pin that was stuck through the dried specimen. In some cases, the papers were folded into boxes and loose specimens were kept in these boxes. The numbers do not correspond to the numbering of the species in Clerck's "Svenska Spindlar" nor in Linné's "Fauna Svecica" or "Systema Naturae". The numbers refer most likely to a species written by Clerck which Thorell had no success in locating. The names on the vials are according to Thorell's determinations.

After Inge Persson rediscovered Clerck's collection (see Fauna och Flora, 3Q1978) I examined the spider specimens in their vials with cork stoppers and found them dry as the spirit of course had evaporated long ago. To make the crumbly specimens more flexible, I first wet the specimens with drops of ethylacetate and then added 50% alcohol; after a couple of days, the 50% alcohol was replaced with 80% alcohol. The cork stoppers were exchanged with cotton stoppers; immediately afterwards the vials were placed upside down in glass jars filled with 80% alcohol. Thorell's labels remained on the outside of the vials, the glue not being soluble in alcohol. A label with the same name and number as the exterior label, together with the scientific name, was placed in each vial. Each label was also provided with the notation "Collectio Clerck" and a number which, henceforth, refers to the number in the accompanying catalogue [Table 1] of the remaining Clerckian spider collection. For each species the name that was given by Thorell is listed in the left column. Also in some cases, the Clerckian number and the number of specimens that are included in the vials are listed. The order of succession between the species is the same as that of Thorell's cataloging (1859:146-148). Listed in the right column is the currently [in 1978] accepted name of the species. In some cases, the name given was determined by myself [Åke Holm] and is marked with an exclamation point (!) after the name. These names differ from those of Thorell. It should be noted that my determinations have been principally made through research of the epigyna of the specimens - the majority of the specimens in the vials are females and I am able to make more precise observations than Thorell because of the highly advanced optics of today.

According to Thorell (1859) there were 61 species in Clerck's spider collection; 50 of them described by Clerck [see Appendix 1]. In Thorell's cataloging, there is, however, one of the latter, Dendryphantes hastatus [Salticidae] (number 25), that has not been listed. Now there remain specimens of only 20 of the Clerckian species in the collection. Thorell pointed out that the collection also contained nine Swedish species which were not described by Clerck, as well as two exotic species, Sarotes leucosius (Walckenaer) [Sparassidae] and Nephila sp. [Araneidae]. There remain four of the former (29-32) [Swedish species], but both of the latter [exotic species] have been lost.

Above, it has been demonstrated that there are deviations from Thorell's identification of several species [numbers 4, 12, 13, 14, 16, 19, 22, 27 (in Table 1)]. Since the above specimens were never labeled by Clerck and we do not know if they are types for Clerck's descriptions there are no reasons for making any name changes. Each change of Thorell's identifications of the Clerckian species would create a lot of confusion, since the Clerckian species names have been used for such a long time. A certain hesitation remains concerning Araneus striatus Clerck. Only one of the two specimens which Thorell identified as this species remains in the collection. Thorell (1859:151) redescribed the species under the name Attus (Euophrys) striatus (Clerck) and his description can also be found in Westring (1861:568). Bonnet (1957:2284) places it into the genus Icius and synonymizes it with Icius striatus (Walckenaer). Roewer (1954:1410) only states that the species is not interpretable.

The remaining specimen of Araneus striatus is an adult female with a hard dried abdomen. By loosening one side of the epigynum and placing the specimen in Oil of Wintergreen, I was easily able to establish that the inner structure of the epigynum entirely agreed with that of Sitticus pubescens (F.). In her revision of the genus Sitticus, Marie Harm (1973) took the position on this nomenclatural problem (following Article 23 (a-b) in the international rules on nomenclature adopted by ICZN (International Commission for Zoological Nomenclature) in favor of the suppression of Araneus striatus Clerck which accordingly was regarded as a senior subjective synonym of Sitticus pubescens (F.).

The Clerckian arachnid collection is of course still of great scientific significance. In the case of specimens in the collection that belong to species described by Clerck, we should consider them as holotypes, respectively syntypes, which ought to be taken into consideration by those undertaking taxonomic revisions. It is of course to be regretted that this arachnid collection of great scientific information and historical interest went through such unfortunate circumstances that damaged a part of the collection. At the same time, it is fortunate that the few remaining specimens now are kept in the Naturhistoriska Riksmuseet [Swedish Museum of Natural History, Stockholm] in a manner that will preserve them for the future.

Appendix 1—Spider names listed in order presented by Clerck in "Svenska Spindlar"

Name given by Clerck	Currently accepted name and Family
Araneus angulatus	Araneus angulatus Clerck Araneidae
Araneus diadematus	Araneus diadematus Clerck Araneidae
Araneus quadratus	Araneus quadratus Clerck Araneidae
Araneus marmoreus	Araneus marmoreus Clerck Araneidae
Araneus umbraticus	Nuctenea umbratica (Clerck) Araneidae
Araneus pyramidatus	Araneus marmoreus Clerck Araneidae
Araneus ocellatus	Larinioides patagiatus (Clerck) Araneidae
Araneus patagiatus	Larinioides patagiatus (Clerck) Araneidae
Araneus cornutus	Larinioides cornutus (Clerck) Araneidae
Araneus sericatus	Larinioides sclopetarius (Clerck) Araneidae
Araneus virgatus	Araneus angulatus Clerck Araneidae
Araneus sclopetarius	Larinioides sclopetarius (Clerck) Araneidae
Araneus cucurbitinus	Araniella cucurbitina (Clerck) Araneidae
Araneus segmentatus	Meta segmentata (Clerck) Araneidae
Araneus litera x. notatus	Zygiella x-notata (Clerck) Araneidae
Araneus castaneus	Steatoda castanea (Clerck) Theridiidae
Araneus hamatus	Singa hamata (Clerck) Araneidae
Araneus lunatus	Achaearanea lunata (Clerck) Theridiidae
Araneus sisyphius	Theridion sisyphium (Clerck) Theridiidae
Araneus formosus	Theridion lunatum (Clerck) Theridiidae
Araneus ovatus	Enoplognatha ovata (Clerck) Theridiidae
Araneus redimitus	Enoplognatha ovata (Clerck) Theridiidae
Araneus lineatus	Enoplognatha ovata (Clerck) Theridiidae
Araneus cellulanus	Nesticus cellulanus (Clerck) Nesticidae
Araneus bucculentus	Floronia bucculenta (Clerck) Linyphiidae
Araneus montanus	Neriene montana (Clerck) Linyphiidae
Araneus triangularis	♂ Linyphia triangularis (Clerck) Linyphiidae ♀ Linyphia marginata C. L. Koch? Linyphiidae
Araneus domesticus	Tegenaria domestica (Clerck) Agelenidae
Araneus labyrinthicus	Agelena labyrinthica (Clerck) Agelenidae
Araneus pallidulus	Clubiona pallidula (Clerck) Clubionidae
Araneus fabrilis	Alopecosa fabrilis (Clerck) Lycosidae
Araneus aculeatus	Alopecosa aculeata (Clerck) Lycosidae
Araneus inquilinus	Alopecosa inquilinus (Clerck) Lycosidae
Araneus lignarius	Acantholycosa lignaria (Clerck) Lycosidae
Araneus monticola	Pardosa monticola (Clerck) Lycosidae
Araneus pulverulentus	Alopecosa pulverulenta (Clerck) Lycosidae
Araneus paludicola	Pardosa paludicola (Clerck) Lycosidae
Araneus amentatus	Pardosa amentata (Clerck) Lycosidae
Araneus trabalis	Alopecosa trabalis (Clerck) Lycosidae
Araneus cuneatus	Alopecosa cuneata (Clerck) Lycosidae
Araneus undatus	Dolomedes fimbriatus (Clerck) Pisauridae
Araneus nivalis	Alopecosa inquilina (Clerck) Lycosidae
Araneus piraticus	Pirata piraticus (Clerck) Lycosidae
Araneus piscatorius	Pirata piscatorius (Clerck) Lycosidae
Araneus fumigatus	Pardosa amentata (Clerck) Lycosidae
Araneus pullatus	Pardosa pullata (Clerck) Lycosidae
Araneus plantarius	Dolomedes plantarius (Clerck) Pisauridae
Araneus fimbriatus	Dolomedes fimbriatus (Clerck) Pisauridae
Araneus mirabilis	Pisaura mirabilis (Clerck) Pisauridae
Araneus hastatus	Dendryphantes hastatus (Clerck) Salticidae
Araneus muscosus	Marpissa muscosa (Clerck) Salticidae
Araneus scenicus	Salticus scenicus (Clerck) Salticidae
Araneus striatus	Sitticus striatus (Clerck) Salticidae
Araneus terebratus	Sitticus terebratus (Clerck) Salticidae
Araneus (litera) Y insignitus	Aelurillus v-insignitus (Clerck) Salticidae
Araneus (litera) V notatus	Aelurillus v-insignitus (Clerck) Salticidae
Araneus flammatus	Evarcha falcata (Clerck) Salticidae
Araneus falcatus	Evarcha falcata (Clerck) Salticidae
Araneus arcuatus	Evarcha arcuata (Clerck) Salticidae
Araneus vatius	Misumena vatia (Clerck) Thomisidae
Araneus margaritatus	Philodromus margaritatus (Clerck) Philodromidae
Araneus aureolus	Philodromus aureolus (Clerck) Philodromidae
Araneus formicinus	Thanatus formicinus (Clerck) Philodromidae
Araneus cristatus	Xysticus cristatus (Clerck) Thomisidae
Araneus roseus	Micrommata virescens (Clerck) Sparassidae
Araneus virescens	Micrommata virescens (Clerck) Sparassidae
Araneus aquaticus	Argyroneta aquatica (Clerck) Agelenidae

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Experiments With Spider Preservatives

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Taxonomists by nature are not experimentalists. As keepers of natural history collections they have tested very few curatorial procedures under controlled conditions. We had to learn by experience, for instance, that xeroxed labels and laser-printed labels cannot be used in alcohol because after three to four years the letters fall off and make alphabet soup in the bottom of the vial (contradicting Levi, 1966). While the typewritten specimen labels used by R.V. Chamberlin for his spider collections have remained legible since about 1920, old handwritten labels are often difficult to decipher even if not faded because handwriting styles have changed, as well as locality names (see also Levi, 1966).

Also it is general knowledge that for use in alcohol or other fluid preservatives, special paper is required for labels, as many papers tear easily when wet. At the MCZ for the spider collection we currently use 28 pound and 35 pound Resistal Ledger® made by Byron Weston. Other 100% cotton rag papers or Polypaper® (a plastic paper) are widely used in museums.

Regarding preservation, we have learned from experience that male spiders collected in ethylene glycol will have their palpi expanded. Preserving methods are reported in various manuals on invertebrates (e.g. Pennak, 1978; Steedman, 1976); they differ slightly for different groups of animals. Repeatedly, the question is raised whether alcohol with additives such as glycerin and acetic acid is an improvement over plain 80% ethanol for preservation of spiders. Some taxonomists, usually entomologists, swear by such mixtures. Kaston (1972) recommends adding some formalin to preserve colors, then removing the specimens from the fixing fluid after a day. Myriapodists put their faith in isopropyl alcohol (J. Coddington, personal communication). I recently examined a collection of spiders that had all the silver pigment washed out of the eyes and body. Did the collector use a special fluid to preserve the spiders before they were placed in alcohol? Pinned spiders specimens shrivel and, unless insect repellants are used, eventually are eaten by museum insects (e.g., Hentz's spider collection). There are ethanol-preserved specimens that are still in good condition after 170 years. Keyserling's many specimens from "New Granada" (a Spanish colony that ceased to exist in 1819), are still well-preserved in the British Museum; they seem to have been collected in alcohol. While most of us have had good and bad experiences with various preservatives, we do not know which is the best for spiders and no published answers based on experimental evidence can be found. (Preservatives are also discussed by W.L. Fink, et al., but the only experiments found were done by Lai, 1963, with fishes in an unpublished master's thesis.

While it is simple enough to set up an experiment, evaluating the results is not so simple. For instance, without a spectrophotometer, any judgment about disappearance of certain colors is subjective. And regarding brittleness, we would have to build a machine to measure the relative flexibility of leg joints.

METHOD

We collected spiders in an abandoned field in the town of Luquillo, Puerto Rico in March, 1988. The spiders were collected by sweeping or by individually picking them out of their webs or retreats. Most were specimens of araneid orbweavers Metepeira or Argiope. The spiders were dropped into five different fluids to kill and preserve them, and were examined in December 1988 to see whether differences in preservation could be found. The entire procedure was repeated in August, 1988, using mostly specimens of the cob-web spider Achaearanea tepidariorum collected in Pepperell, Mass. The vials were kept in my work-room at normal temperatures and light. The vials used were 25 ml screwcap vials containing 15-20 ml of the fluid being tested. An attempt was made to preserve five spiders or more in each vial:

Vial #1: 15 ml 10% formaldehyde without buffer; 7 specimens: 5 Metepeira, 1 Argiope and 1 Leucauge.
Vial #2: 15 ml 50% ethanol; 7 specimens: 5 Metepeira and 2 Argiope.
Vial #3: 15 ml 80% ethanol; 5 specimens: 4 Metepeira and 1 Leucauge.
Vial #4: 15 ml 80% isopropanol; 6 specimens: 5 Metepeira and 1 Argiope.
Vial #5: 15 ml 80% ethanol plus 5 drops of glycerin; 12 specimens: 11 Metepeira and 1 Argiope.
Vial #6: 15 ml 80% ethanol plus 5 drops of glacial acetic acid; 7 specimens: 6 Metepeira, 1 Argiope.
Vial #7: 15 ml 80% ethanol plus 5 drops of glacial acetic acid and 5 drops of glycerin; 8 specimens: 5 Metepeira, 2 Leucauge, 1 misumenid crab spider.

For examination, specimens were taken out of the preserving fluids and placed in 80% ethanol; afterwards they were returned to the preserving fluid.

RESULTS

All specimens, regardless of preservative, lost all red and green coloration. In addition, those preserved in formaldehyde lost all silver pigment of both the abdomen and the tapetum of the eyes. Specimens preserved in 50% ethanol had clouds of cottony material around their bodies and legs, possibly fungal mycelia. In the vial containing drops of glycerin, all specimens were slightly cleared. Such transparency, most apparent in the profile of the margins of the legs, is unacceptable for taxonomic research. The acetic acid did not consistently affect the appearance of the spiders. The specimens in isopropanol appeared to be slightly better preserved than those in 80% ethanol. Males preserved in isopropanol could have the ventral view of their palpi examined by just bending the palpus back without amputating it, a highly satisfactory effect. In contrast, the palpi of male specimens preserved in 80% ethanol sprang back to the flexed position, and would not stay unfolded for examination. (We used 80% ethanol, but for storage of fishes 85% is considered too concentrated; 70-75% is used. Higher concentrations cause soft parts of fishes to shrink [K. Hartel, personal communication].

The results of the specimens preserved in August in Pepperell were the same except that those in mixture #6 were shrivelled, and in some the soft tissues shrank away from the exoskeleton.

DISCUSSION

During the course of these experiments, I learned (by correspondence with the collector) that the specimens that lost their silver pigment had been collected into nine parts 70% ethanol with one part 37% formaldehyde, following the recommendation of Kaston (1978). My experiments demonstrated that formaldehyde removes silver pigment, including that of the tapetum of the eyes, seriously damaging specimens for taxonomic purposes.

Glycerin additive was much more damaging than expected, and because alcohol evaporates faster, the glycerin becomes more concentrated. The addition of glycerin also makes instruments, microscope and fingers sticky when working with the specimens. As glycerin is hygroscopic, its use may result in rust damage to instruments and metal tops if not carefully cleaned up. Also, specimens with glycerin are more likely to get moldy (various references).

Acetic acid, in the concentration used, did not damage specimens. However on the basis of my early experience at the Museum of Comparative Zoology, in 1956, I am wary of acid in alcohol. At that time I found all vials stoppered with rubber stoppers and some specimens shrivelled and black. Sulphur from the rubber had increased the acidity of the alcohol to pH 4.0 to 6.8 (depending on the stopper), damaging specimens, and sulphur crystals had precipitated out, sometimes enclosing small parts. At the time I tested (with Hydrion® paper) the pH of many preserving fluid samples from the MCZ spider collections and found that the pH of ethanol in neoprene stoppered vials was 8.5 to 8.7. For comparison, the pH of distilled water was 5.8; of Cambridge tap water, 7.35; of tap water and alcohol, 7.8; of distilled water and alcohol, 7.

Isopropyl alcohol appears to be a superior preservative. I used a higher concentration than is commonly used (concentrations as low as 50% solution in water are sometimes recommended). It is also less expensive and easier to obtain than ethanol, as it is of no interest to the Internal Revenue Service. Furthermore, it is less volatile and presents less fire hazard than ethanol. On the other hand, it is more toxic than ethanol (Merck Index, 1983) and has to be used "with adequate ventilation ... avoiding breathing the vapor" (Mallinckrodt Material Safety Data, 1987). The threshold limit value is 400 ppm in air, that of ethanol 1000 ppm (Center for Occupational Hazards, 1985). (The threshold limit value is the airborne concentration of a substance to which nearly all workers can be exposed repeatedly day after day without adverse effects). Many users find its vapor noxious. If spiders preserved in the isopropanol are examined in ethanol, observations are made difficult by convection currents of mixing fluids. Also it is known that delicate fishes moved back and forth between ethanol and isopropanol can be damaged by the changes (K. Hartel, personal communication).

Specimens lost color in all preservatives tested. The best way to preserve color of specimens is to photograph the living animal with Kodachrome film before preservation. Even photographs do not provide a permanent record of color, as slides may not keep longer than 80-100 years. (Coloration in fishes can be kept by using butylated hydroxytoluene, Ionol CP® ,Shell, an antioxidant, and nasty stuff to work with, K. Hartel, personal communication. As neoprene stoppers used in some museums leak antioxidants into alcohol without preserving the spiders' color, I doubt that antioxidant would work for spiders.)

Ethanol from most Latin American countries and parts of Europe smells different from the U.S. product. Ethanol in the U.S. is either a petroleum product or it may be grain alcohol made by fermentation. The pleasant fragrance of alcohol from some other countries apparently is due to residues of esters and aldehydes, and may indicate the alcohol was made by fermentation and perhaps is less refined. Specimens from museums in other parts of the world arrive with better color than ours. Could the better color preservation be due to chemical residues in the alcohol?

The next question to be answered is whether buffered formaldehyde also damages specimens. In addition, some experiments might be made to determine the best concentrations of ethanol and isopropanol. Also, it would be interesting to find whether color is better preserved in West Indian rum (or perhaps vodka or whiskey).

West Indian rum is said to be an excellent presentative (Chickering, personal communication), although it is only 80 to 84 proof (about equivalent to 40% ethanol).

SUMMARY

Preliminary experiments indicate that unbuffered formaldehyde or glycerin added to preserving fluid may damage spider specimens preserved in the solution. No benefits or consistent damage resulted from addition of acetic acid in the concentration used.

I would like to thank the following for contributing ideas, for rewording or for help with the literature: J. Coddington, G.B. Edwards, K. Hartel, A. Johnson, J. Kolchalka, L.R. Levi and D. Ubick.

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RESEARCH REPORT

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Comparative studies of web-building in the Negev and Namib deserts

Deserts offer an opportunity to study adaptations of arachnids to extreme climatic conditions. Although web-building spiders are not generally considered typical to desert habitats, a few species have invaded these habitats and judging by their local abundances, must be considered highly successful. For the past few years, I have investigated adaptations of the webs and of website selection behaviors to desert conditions in two unrelated groups of spiders, Theridiidae and Eresidae, the former principally in the Negev desert of Israel and the latter in the Namib desert of Southwest Africa/Namibia.

Two species of widow spiders, Lactrodectus revivensis and L. pallidus (Theridiidae), are common in the Negev desert. Both have similar web structures and are unusual in that the nests or retreats are exposed near the tops of shrubs and the capture webs are separated physically from the retreat and designed to capture strictly terrestrial arthropods. The former species is restricted to the Negev, while the latter has a wide geographic distribution throughout the Irano-Turanian parts of the Middle-East. Studies of these two species (in collaboration with M. Kotzman, S. Ellner and B. Pinshow) have shown that the placement of the retreat and its structure play important roles in temperature regulation during the hot, summer months and possibly in protection from predators. Our research focuses now on the physical and biotic factors that influence the spider's decision to remain at a website or to move to a new site.

In the Namib desert, I am working with J. Henschel at the Desert Ecological Research Unit, Gobabeb, Namibia, where we have been examining the factors that influence web design in Seothyra sp. nov., an erasid that burrows in sand dunes. As in the two desert Lactrodectus in the Negev, the prey of Seothyra consist of terrestrial arthropods. But, whereas the widow spiders are nocturnal, and avoid foraging during the hot parts of the day, Seothyra is primarily diurnal and will attack prey at sand surface temperatures of more than 60°C. We have found that a minimal burrow depth is necessary to escape high surface temperatures in the summer, and that the spiders shuttle between the cool burrow and the hot surface capture-web during prey capture episodes. We are currently investigating the influence of prey abundance and other factors on the structure and size of the capture web. Plans for future research include a comparative study of social and solitary species of Stegodyphus in Namibia and in Israel.

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RESEARCH REPORT

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Spider neurobiology continues to prosper in Frankfurt. I have received a 3-year grant to carry out our work on "Central and Peripheral control of motor behavior in spiders", and two PhD students, Christiane Bickeboller and Michael Kadel, joined my lab in the spring of 1988. Some of the main questions we have asked in the area of proprioception and motor control are: How do spiders perceive their own movements? How do they use proprioceptive and other mechanosensory information to control limb movement? What are the central-nervous correlates of "simple" motor behaviors in spiders and how are particular muscles used in a given behavior? Methods we have applied in our experiments are film and video analysis, extracellular and intracellular electrophysiological techniques, and neuroanatomical methods. Our main experimental animal is the Ctenid Cupiennius salei, a relatively large hunting spider from Central America that we breed in our laboratory.

Currently we are concentrating on an analysis of a relatively simple and stereotyped behavior of C. salei -- "body raising" upon stimulation of ventral tactile hairs. The behavior involves leg-muscle reflexes that are readily induced both in freely walking spiders and in tethered animals. We have used this reliable reflex response to search for the neuronal correlates of "body raising behavior". Simultaneous myogram recordings from particular muscles and from identified neurons in the leg ganglia have revealed local and intersegmental interneurons whose activity is correlated with the muscle reflex. This work, done in collaboration with Wolfgang Eckweiler, Jurgen Milde and Klaus Hammer, has allowed us a first glimpse at sensory-motor pathways in the central nervous system of spiders. These experiments are presently being continued by Michael Kadel.

Other work in receptor- and muscle physiology of spiders is closely associated with the neuroethological questions mentioned above. My main interest here concerns the process of stimulus transduction in multiply innervated, cuticular sense organs such as tactile hairs and slit sensilla. The techniques we have used include electrophysiological recordings, single cell staining (in collaboration with Brian P. Oldfield), SEM-studies and TEM-analyses (the latter with Werner Gnatzy). We have also begun to trace the specific afferent projections of identifiable leg sensilla into the central nervous system with cobalt chloride. Our long-range goal is to search for patterns of somatotopy and to provide a framework for future studies of synaptic connectivity in the central nervous system.

We have also recently completed a combined histochemical and electrophysiological study (in collaboration with Lothar Maier and Tom Root) of identified muscle fibers in C. salei. We found that skeletal muscle in spiders is surprisingly heterogenous and that the various types of fibers found in a particular muscle, such as the claw levator, can be used in quite different behavior patterns. Currently, Christiane Bickeboller is using similar techniques to examine the prosomal muscles that are involved in the "body raising" behavior mentioned above. An important complement to my work in the laboratory have been field studies of C. salei in its natural environment in Central America (previously done in collaboration with Friedrich G. Barth and Horst Bleckmann). In connection with my continuing interest in orientation behavior of spiders, I have been particularly interested in the natural activity cycles of C. salei, its prey capture behavior, the type of plants it inhabits, and the construction of retreats in these plants. I have been granted funds for a trip to Mexico in 1989; the study site there (in the state of Veracruz) was first pointed out to us by George Uetz. Besides collecting I hope to observe and examine the behavioral interactions of wandering spiders with various parasitic insects such as mantispids and pompelid wasps.

While attending the AAS-meeting at Harvard in 1987 and during subsequent visits to labs in the US, several colleagues encouraged me to apply for faculty positions in the US. As there are hardly any openings on the professorial level here in Germany, it is extremely difficult for people in my age group to advance. Hence I am trying to establish contacts with Biology Departments in the US that might be interested in my neuroethological work with spiders. Moreover, both I and my wife Harris, who is from South Carolina, feel that many aspects of living and working in the US could be very challenging and productive for us in the long run. Please inform me at the above address of any job openings at the assistant/associate professor level.

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Texas Tech Arachnid Collection Moved

The arachnid collection formerly housed at Texas Tech University has been transferred to the Texas Memorial Museum. The collection, although relatively small, contains many rare and unusual specimens from the southwestern U.S.A. and Mexico. Included are many specimens from the caves of Mexico. No holotypes are present, but many paratypes are included. Inquiries regarding the loan of material should be directed to Mr. James R. Reddell, Texas Memorial Museum, 2400 Trinity, The University of Texas, Austin, Texas 78705.

Charles Michel Oehler (1918-1987)

"Arachnologists in the Cincinnati area regret to announce the passing of Charles Oehler on December 9, 1987. Charles was Senior Scientist at the Cincinnati Museum of Natural History, and made a number of contributions to the scientific literature. Although self-taught, Charles Oehler conducted and participated in many research projects, and published two arachnological works: "The Medical Significance of Spiders in the Cincinnati Area", and "The Salticidae of the Southwestern Ohio Region". He also served as a research committee member for several University of Cincinnati graduate students, and is responsible for educating thousands of other young people - through his work on the Museum's exhibits, and by encouraging their interest in natural history, taxonomy, ecology and arachnology. We are all saddened by his death, and wish to recognize his contribution to our field, and honor his memory with this resolution of respect."

[passed unanimously as a resolution at the annual meeting of the American Arachnological Society, June,1988]

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INFORMATION REQUESTED ON JOHN CROMPTON

I am studying the life of John Battersby Crompton Lamburn, who, under the name of John Crompton, wrote six natural history books in England between the 1940s and 1960s. These books, which have recently been re-issued in the U.S., are: A Hive of Bees; The Hunting Wasp; The Spider; The Ways of the Ant; The Living Sea; The Snake. These were beautifully written books with a loyal group of readers. Crompton's books were written for a lay audience, and many of his assertions about insect and spider intelligence were scorned by most of the scientific community.

Much of Crompton's correspondence has been lost. I would like to know if anyone recalls Crompton's work, remembers some of the controversies that he was involved in, or perhaps even corresponded with him (and might wish to share the correspondence). I am interested in any reaction that the public (lay or scientific) has had, including that of younger members who may have come upon Crompton's work in more recent times. Did his books have any particular influence on them as students of natural history? Do they think he was overlooked? Do they take issue with what he wrote? I will be grateful to receive responses. [William Weinstein]

(660 Fort Washington Ave., #5F, New York, NY 10040, USA)

Do You Desire Photographs of Plates From Clerck's Book?

Clerck's 1757 book on Swedish spiders (see elsewhere in newsletter) is a relatively rare volume. The National Union Catalog Pre-1956 Imprints lists only seven copies in the U.S.A.: John Crear Library, Chicago; New York Public Library; Union Library Catalog of Pennsylvania, Philadelphia; University of California, Berkeley; University of Pennsylvania, Philadelphia; University of Wisconsin, Madison; and Yale University, New Haven. At least one copy is in a private collection in the U.S.A. and one copy is in the Department of Entomology, The American Museum of Natural History. If you are not lucky enough to be able to visit one of the libraries or prefer to read an old English version you should try to locate a copy of Thomas Martyn's translation (1793. Aranei, or a natural history of spiders including the principal parts of the well known work on English spiders by Eleazar Albin, as also the whole of the celebrated publication on Swedish spiders by Charles Clerck). Unfortunately, this too is a rare book and only one copy is listed in the National Union Catalog for the U.S.A.: The New York Public Library. Fortunately, the volume by Martyn is available on microfiche from Inter Documentation Company AG, Industriestrasse 7, 6300 Zug, Switzerland [order book no. F-2176, for Swiss francs 24 (includes shipping to the U.S.A. for prepaid orders)].

If you desire color, 35 mm photographic slides of plates from Clerck's book, these are now available. A set of seven photographs has been made and includes the six plates as well as the front cover. Although the original cover page is not in color, it will be included because of its usefulness in classroom presentations. These sets are priced at $7.00 (plus postage). "This price reflects the actual cost plus a small fee which will go to the the Society. Do not send payment with the order. An invoice including postage will be sent with the slides. Please order the slide sets from: James C. Colendolpher, Mail Stop 2134; Dept. of Agronomy, Horticulture, and Entomology; Texas Tech University; Lubbock, Texas 79409.

Program for Phylogenetic Analysis

Hennig86, a program for phylogenetic analysis, runs on PC-compatibles with 512K, needs no hard drive, coprocessor, or graphics monitor, can store thousands of trees, handles multifurcating trees and multistate characters, and never produces duplicate or arbitrarily resolved trees. Platnick (Cladistics, 1989) found it to be faster and more effective at parsimony calculations than any competitor. It can be ordered for $50 + $5 shipping and handling ($10 outside U.S.) prepaid from James S. Farris, 41 Admiral Street, Port Jefferson Station, New York, NY 11776.

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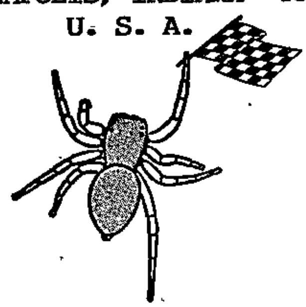

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