
CAN LONG-ESTABLISHED SCIENTIFIC SOCIETIES SURVIVE THE DIGITAL AGE?

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Abstract

Can long-established, narrow-niche scientific societies such as the Biological Society of Washington survive the digital age? The Society was formed in 1880, primarily as a forum for Washington-based biologists to meet and discuss current biological research and to publish those discussions and other submitted articles in the Society's journal, the *Proceedings of the Biological Society of Washington*. A few years later, there was a general trend toward emphasizing the journal over the meetings, and toward moving from general aspects of biology to the specific topics of systematics and taxonomy. This trend culminated in the late 1950s with the stated purpose of the Society to be: "For the furtherance of taxonomic study of organisms and for diffusion of biological knowledge among interested persons." This purpose served the Society well through the 1990s. Perhaps associated with the decline in support for systematics and taxonomy by the U.S. academic community, the membership of the Society has been in slow decline since 1993. This decline, combined with competition from the new (2001) journal *Zootaxa* (an electronically produced and distributed journal dedicated to animal taxonomy), and younger scientists' preference for PDF files of publications over hard copy, sounded an alarm to the elected Officers and Councilors of the Society. Deliberations resulted in the undertaking of major changes in the management and delivery system of the Society's publications together with activities to garner new members and institutional subscribers. The actions taken are recent and it is too early to assess whether they will be successful or hasten the demise of the Society.

THE BIOLOGICAL SOCIETY OF WASHINGTON has had an intimate relationship with both the Washington Academy of Sciences and the Smithsonian Institution (Aldrich 1980 gives an excellent summary of this history and is the basis for the following synopsis of these relationships).

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Smithsonian Secretary Spencer Baird invited the organizing committee of the Biological Society of Washington to meet in the Regents Room of the Smithsonian on 26 November 1880. Baird subsequently offered the Smithsonian as a meeting place for the Society. Meetings were held from 1887-1942 at the Cosmos Club. Otherwise, all meetings have been held at the Smithsonian Institution.

In 1888, the Biological Society of Washington, the Philosophical Society of Washington, and the Anthropological Society of Washington formed a "Joint Commission" representing a number of related scientific groups for the purpose of supplying services for the good of all (Aldrich 1980:11). This Joint Commission, after several years, resulted in formation of the Washington Academy of Sciences on 18 February 1898. The Biological Society of Washington's role was much stronger in the first half of the history of the Washington Academy of Sciences than it is currently.

Historical Trends and Events

The primary purpose of the Biological Society of Washington is entirely different now than when the Society was formed. The founding objectives were "to encourage the study of Biological Sciences and to hold meetings at which papers shall be read and discussed (Aldrich 1980:5)." The membership was rather small at first (30-40) and the primary purpose of the Society was for biologists in Washington, DC, to get together to discuss the latest findings of all areas of the biological sciences. The publications of the Society were almost an afterthought. However, shortly after the Biological Society of Washington was formed, a dynamic tension developed between maintaining a generalized philosophy of biology versus specialization along biological sub-discipline lines. Separate societies were founded, which resulted in a reduction of support for the Biological Society. First, the entomologists split off, forming the Entomological Society of Washington in 1884. They were followed by the Botanical Society of Washington in 1901, the Helminthological Society of Washington in 1910, and the Society for Experimental Biology and Medicine, District of Columbia Section, in 1934. One of the responses to this specialization was the placing of more emphasis on publication of biological papers rather than meetings. In the 1920s there were membership problems, and President A. D. Hopkins proposed that specialized papers be left to specialized societies and that

the Biological Society concentrate on publishing general subjects that would be of interest to all of the more specialized societies.

Attendance at meetings generally declined after the early years. In 1953, the Council voted to have only two meetings per year with an effort to have more meaningful programs at those meetings. Since 1960, there has been only one meeting per year almost entirely dedicated to Society business with no scientific presentation(s) given.

There have been major shifts in publication frequency by subject and taxonomic grouping (Figure 1). There was a protracted transition of the publication of papers from all branches of biology to papers dealing with taxonomically defined research, and more emphasis through the second half of the history of the Society on systematics and taxonomy. In the late 1950s, the purpose of the Society was restated in response to post-World War II declining membership. The Membership Committee, headed by Henry Setzer, sent circulars to biology departments of universities and museums throughout the US explaining the opportunity Society members had for rapid publication of short papers on plant and animal systematics, offered by few, if any, other journals. Fifty new members (from a low of 270 in 1958) were added. This redefined purpose was codified with adoption of a revised constitution in 1970 that stated: “for the furtherance of taxonomic study of organisms and for the diffusion of biological knowledge among interested persons.” This remains the stated objective of the Society in the current version of the constitution.

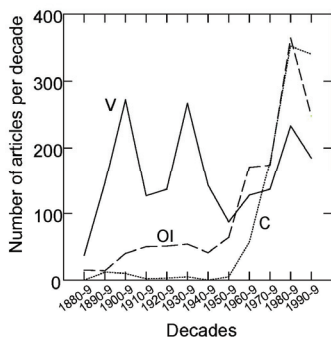


Figure 1. Numbers of Crustacea (C), Other Invertebrates (OI), and Vertebrate (V) articles by decades from 1880-1999.

There have been notable changes in the numbers of publications by major taxonomic grouping over time. Vertebrate papers dominated from 1880-1959 and were overtaken by invertebrates, in general, in the decade of 1960-1969, then by crustaceans as a category from 1970 to the present (Figures 1, 2). The emphasis on taxonomic papers was obviously a major part of the increased health of the Society as reflected in the total number of papers published from 1960 through 1999 (Figure 3).

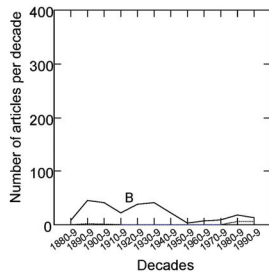


Figure 2. Numbers of Botany (B), and Other (dashed line) articles by decades from 1880-1999.

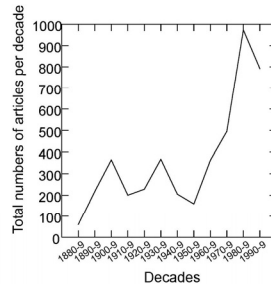


Figure 3. Total articles per decade from 1880-1999.

At least since the 1970s the Council has placed emphasis on disseminating our publications as economically as possible to authors and members. The Society allows its members to request a waiver of page charges of up to 12 pages per year. The membership dues were raised from \$7.00 per year to \$10.00 in 1980, \$15.00 in 1983, and were set at \$25.00 in 1993 through 2006.

The Smithsonian/Biological Society relationship was also responsible for the financial stability of the Society during the period of growth in the 1960-1990s period. In 1968, the Smithsonian Institution ceased publication of *Proceedings of the United States National Museum*, its outlet for small (< 30 manuscript pages) scientific papers. The National Museum of Natural History compensated for this lack of publication outlet by paying for page charges in journals that required them. Several Smithsonian authors took advantage of the Biological Society of Washington to publish their taxonomically related papers.

Society Health Warning Signals

The Society was as healthy as it had ever been throughout its history in the 1970s through the 1990s (Figure 3) up to and including the year 2000. However, there seemed to be some signs that the publishing landscape was changing for the Society. Examination of key annual figures since 1976 suggests certain changes started to unfold as early as 2001 (Figure 4).

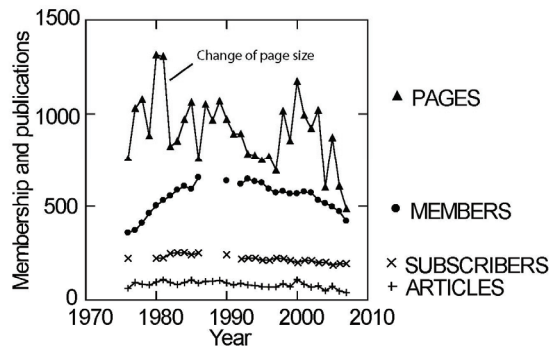


Figure 4. Drop in number of pages between 1981-1982 due to increase of page size.

The missing data for membership and subscribers (Figure 4) underscores the general informality of the administration of the Society. For most of its history, the duties of each office were passed on orally. Whereas the office of Treasurer has always been responsible for keeping track of new, old, and non-renewing members and subscribers, some Treasurers did not include this information in their annual reports, nor was this information included in the materials they selected to place in the official Society archives. Fortunately for purposes of this exercise, the missing data do not appear to be critical (Figure 4).

One apparent trend in a noticeable drop in number of pages published per year between 1981 and 1982 has a benign explanation. The printed page size of the Proceedings was changed from the 6"x9" format used from the very beginning to a 7"x10" format; hence, fewer pages were needed to produce the equivalent quantity of published manuscripts.

During the period illustrated (Figure 5), there is no evidence that increasing either membership dues or subscription rates had a negative

effect for all increases through the \$15/year membership category, with a slight trend of decreasing membership during the \$25/year period. The most significant cost increase was instituted in 2007, when the membership fee went from \$25 to \$50 per year and subscriptions went from \$50 to \$100 per year. Between 2006 and 2007, membership declined by 51 members but the number of subscribers (194) did not change. It is likely that the increase in membership fee accounted for many, if not most, losses of memberships.

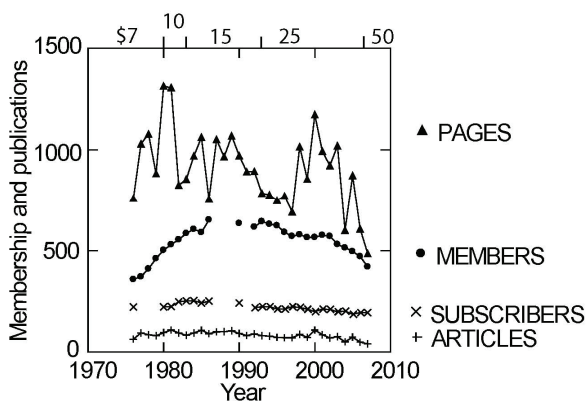


Figure 5. Impact of membership fee increases.

There are two factors that are critical to the success of the Biological Society of Washington: adequate annual revenue to publish 500 plus pages per year and an adequate number of manuscripts being submitted to result in 500 printed pages per year. Starting around 2003, the officers and Council Members became uneasy with some signs that we might be witnessing a downturn in memberships and what impact that might have on the revenue stream and number of manuscript pages being submitted for publication.

There is a statistically significant correlation between numbers of articles and number of pages published in the *Proceedings*. For the larger page format, 1982-2006, $r = 0.851$, $p = 0.000$. This relation is not sufficiently strong for the number of pages to be used as a proxy for number of articles, or vice versa, as 28% of the variation is due to some other factor or factors. Thus, the elected officials of the Society must

consider both number of articles and number of printed pages to evaluate trends.

The most disturbing trend is the seeming decline in membership that began in 2002-2003 and the related concern of whether this would have a negative impact on manuscript submission. The possible causes discussed were all plausible, but essentially speculative. They include the following, which are considered to be the most serious.

1. Unbalanced age distribution of systematists/taxonomists in the United States. As the Biological Society of Washington is supported primarily by US citizens, the drastic loss of taxonomists/systematists in the US scientific community has an impact in that systematists/taxonomists are being produced at a much smaller rate than was true 40-50 years ago. Although there has been a hue and cry about the loss of this expertise within the United States and the international scientific community (e.g. Hopkins and Freckleton, 2002; Zanetell and Rassam, 2003), the plain fact is that nothing of substance is being done about it. The shift from organismal to molecular biology in U.S. universities resulted in a great loss of jobs for systematists/taxonomists in academia. Taxonomists/systematists jobs are now concentrated in the positions supported by museums and federal agencies. Even museums are not hiring scientists whose focus is on systematics/taxonomy. Museums are seeking new hires that deal with research questions that will result in publication in "high impact" journals. The impact to the Biological Society of Washington is that almost all of our members are over 50 years of age and there are not enough young systematists/taxonomists being trained to replace the number of Society members that are dying each year.

2. Impact of the digital age. There has been a pronounced change in the way that accessing research information is done by scientists. It was not too many years ago that the only way to access peer-reviewed research was by obtaining hard-copy of published papers. Scientists typically subscribed to the journals of their research specialty as a way of keeping abreast of their science. Today, such information is usually accessed through the computer internet system, rather than going to a university or other research library. The new generation of scientists prefers to maintain copies of publications as PDF files rather than maintain a library of hard copy books and reprints. This youthful indifference (or worse, disdain) of the printed page likely translates to a loss of interest in joining an organization that publishes journals in order to obtain those journals. How

can the Biological Society of Washington survive when most of its members presumably (given the age structure) want printed copies of the *Proceedings* whereas the few young systematists/taxonomists being trained only want PDF copies of the articles in which they are specifically interested?

3. Competition. There are two recent potential competitors that might negatively impact the submission of manuscripts to the *Proceedings of the Biological Society of Washington*. As indicated in the preceding section, early in the history of the Society entomologists split from the Biological Society of Washington. They began publishing their own journal and siphoned off most of the entomological papers that were produced in the greater Washington D.C. academic and government agencies. The creation of the Crustacean Society in 1980 (with much of the impetus coming from the Smithsonian) would have been predicted to have some level of negative impact on the number of crustacean papers submitted to the Biological Society of Washington. The data are not at all clear as to whether the creation of the Crustacean Society has had a negative impact on the Society (Figure 6).

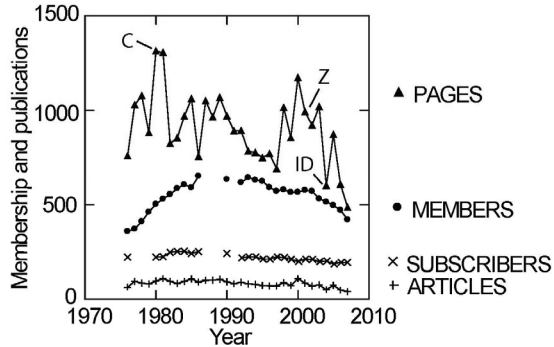


Figure 6. Possible impact of formation of Crustacean Society (C), *Zootaxa* (Z), and publication of an intelligent design article (ID) on the Biological Society of Washington.

The second competitor is the journal *Zootaxa* that commenced publishing in 2001 (Figure 6). *Zootaxa* has been phenomenally successful in garnering and publishing a huge number of taxonomic/systematic papers. The stated purposes of our Society are exactly the same as those espoused by *Zootaxa*. Whereas our Society prides itself on rapid turn-

around time for publishing articles in the *Proceedings*, turn-around time is usually much faster in *Zootaxa* due to its primary production of papers as PDF files within days after an article has been accepted for publication. Few hard copies of *Zootaxa* are printed, only for authors who wish them and to fulfill the publishing requirements of the International Code of Zoological Nomenclature relative to publication of new taxa. In addition, *Zootaxa* (a) requires no membership; (b) does not make an author pay anything to get an article published, including unlimited color illustrations; and (c) provides the author a high quality PDF file of the publication that can be distributed by the author over the internet in response to individual requests. I personally think that the seeming negative trends occurring in the Society are associated with *Zootaxa* being perceived as a more attractive publication outlet for taxonomic/systematic papers by authors than publishing papers in the *Proceedings* of the Biological Society of Washington.

4. Editorial problem. An irregular editorial process resulted in publication of an “Intelligent Design” article in Volume 117, issue 2 of the *Proceedings* in 2004 (Figure 6). One of the goals of the Intelligent Design movement was to have an Intelligent Design paper get published in a refereed scientific journal. The Biological Society of Washington received much publicity regarding the article, almost all of it negative as far as the elected Officers and Council of the Society were concerned. The Officers and Council had much discussion of what the response of the Society should be. In these discussions, there was great concern that there would be a significant number of member resignations and/or drop in number of articles submitted for publication in the *Proceedings*. The available data are not clear as to the impact of the paper. Would the number of members have stabilized or increased following 2004 if the article had not been published?

Given the four warning signs described above, with no clear evidence of which, if any, were the primary cause in the perceived loss of membership and revenue in particular, the Officers and the Council concluded that they needed help from outside the Society.

Actions Taken

Institutional subscription costs for hard copy journals have risen over the past couple of decades at a rate greater than many institutions could afford. The result was that many libraries selectively dropped subscriptions to journals that were perceived of lesser importance to their

constituencies. A response from the publishing community was to package groups of publications together and make the contents available with annual subscriptions to institutions only in electronic format. The institutional users are able to view the contents of the journals and download PDF files of individual articles for their personal use. The electronic version subscriptions are offered at a significantly lower cost for the entire group of journals in the package. In fact, the costs are such that the electronic only subscription package is attractive when subscribers determine there are only some of the publications in the package that their constituents need on a regular basis.

The Society spent considerable time evaluating the costs and benefits to joining one of these electronic publishing packages, BioOne. The perceived advantages to the Biological Society of Washington were (1) some level of new income, as there is a revenue sharing plan established by BioOne; and (2) the *Proceedings* would be available to institutions that had not been subscribers (equivalent to getting new subscribers). The perceived disadvantages to the Society were (1) current institutional subscribers to both the *Proceedings* and to BioOne would likely drop their individual subscription to the *Proceedings*; and (2) a factor in the payout from BioOne is based on the number of “hits” on articles for the individual journals. It was unclear whether the additional funds coming in from BioOne would offset the number of current subscribers who would drop their subscriptions to the Society journal and only maintain electronic access to the journal. The decision was finally made to join BioOne and the Society sent a request to BioOne for inclusion. The Society was informed that BioOne was not accepting new members, however. BioOne was exploring creation of a new set of publications to be offered for electronic format subscription. The result was that BioOne became BioOne.1 and a new core of journals was bundled together as BioOne.2. The Biological Society of Washington started its affiliation with BioOne.2 starting in 2007. At the end of the first year of the BioOne.2 affiliation, there were no cancellations of institutional subscriptions. The full impact of this decision will not be known at least for the next couple of years.

A main concern about the long-term viability of the Society is the age structure of its members and the seeming lack of interest of the younger generation in joining the Society. In contrast to the successful Setzer effort in the late 1950s to bring new members into the Society, the arguments he used are perceived by the current elected officers of the

Society to no longer be persuasive within an academic community that has shifted from organismal to molecular biology.

Allen Press recognized that problems experienced by our Society were also being experienced by other societies for which Allen Press printed and distributed scientific journals. Allen Press recognized that without some changes, it was likely that they would lose some of their customers because the scientific societies involved would have to cease publication due to financial constraints. Allen Press began development of a new joint publishing option with individual contracts between Allen Press and individual societies. Under this arrangement, Allen Press takes on increased responsibility for management of finances and publication of the journal and provides complete electronic submission, review, and acceptance procedures for individual articles. One of the activities undertaken by Allen Press in the joint publishing agreement is that of putting resources into retaining current members and subscribers as well as gaining new members and subscribers. Although systematic and taxonomic science is in decline in the United States, these activities have been on the rise in countries that have adopted the Convention on Biological Diversity initiated on 29 December 1993. Many of the countries involved do not have sufficient resources to fully support the new biodiversity efforts, however, there are some countries that are placing significant new funds into their scientific infrastructure to support biodiversity inventories and publications. China is such a country for which Allen Press is much better positioned to solicit new subscriptions to our Proceedings than is our Society.

Given the entire picture, a considerable majority of the elected officials of the Society decided that although entering a joint publication agreement with Allen Press involved risks, the alternative (status quo) was more likely to lead to dissolution of the Society in the next few years. The Society entered into a co-publishing agreement with Allen Press starting in 2008.

Can We Learn Anything from Our Daughter Societies?

One way of assessing the future of the Society is to compare purposes and resources of our organization with other Washington D.C., based biological societies, namely the Entomological Society of Washington, the Botanical Society of Washington, and the Helminthological Society of Washington (Table 1).

The Entomological Society of Washington has supported two activities throughout its history: meetings, held monthly except during summers; regular publication of the *Proceedings of the Entomological Society of Washington*, and the publication of occasional large manuscripts in the *Memoirs of the Entomological Society of Washington*. The *Proceedings* publishes “original contributions dealing with all phases of entomology, but especially taxonomy (Gurney, 1976:225).” The meeting presentations cover the entire breadth of entomology from field experiences and chemical communication, to biographical presentations on key entomologists (entomology.si.edu/EntSocWash/ESW_meetings.pdf). In 1976 there were 496 members (Gurney, 1976:229); the current number is 315.

The purpose of the Botanical Society of Washington is to hold monthly meetings and to arrange field trips (e-mail message from Stanwyn Shetler, 27 December 2007). The meetings cover many aspects of botany, but primarily floristics, systematics, and natural history. The long-term viability of the Botanical Society of Washington is due mainly to the strong participation of amateurs as well as professionals. A journal focus would be likely to knock out most of the amateur participants. There were (and continue to be) several publication outlets for taxonomic/systematic botany papers based on the east coast of the US. Thus, there has never been a need for the Botanical Society of Washington to publish its own journal (pers. comm., Stanwyn Shetler, 8 January 2008). The current paying membership is 84.

Table 1. Key comparisons among Washington DC based scientific biological societies.

	Primary Purpose(s)	# of members in 2007	# of subscribers in 2007	Recent membership trends	Endowment fund amount in 2007
Biological Society of Washington	<ul style="list-style-type: none"> • Publish taxonomic/systematic journal 	420	194	Declining	\$107,000
Entomological Society of Washington	<ul style="list-style-type: none"> • Hold meetings featuring invited speakers • Publish taxonomic/systematic journal on insects/spiders 	289	177	Steady	\$153,000
Botanical Society of Washington	<ul style="list-style-type: none"> • Hold monthly meetings featuring an invited speaker • Organize and execute field trips 	84	NA	Steady	None
Helminthological Society of Washington	<ul style="list-style-type: none"> • Hold 5 business/scientific meetings per year • Publish taxonomic/systematic journal primarily of parasitic worms 	311	139	Declining	\$130,000

The Helminthological Society of Washington, like the Entomological Society of Washington, maintains two purposes: the holding of regular meetings (usually 5 per year over recent history, some business, some scientific) and the publication of a journal. The proceedings of the first through fifteenth meetings were published in the journal *Science*, starting on 3 February 1911 through 11 April 1913. The separately published *Proceedings of the Helminthological Society of Washington* began with Volume 1, issued in September 1914 through Volume 67, January 2000, at which juncture the name of the journal was changed to *Comparative Parasitology* but maintained continuity of volume numbering – the first issue with the name of *Comparative Parasitology* was published as Volume 67(1) in January 2000. The reasons for the change of Journal title were stated as: “It was recently observed that perhaps the current name of the Journal (*Proceedings of the Helminthological Society of Washington*) did not reflect adequately the diversity of our membership. Moreover, broader recognition may be hindered because many individuals have considered us to be parochial and geographically limited. The situation is reflected in a limited readership, a gradually declining membership, and a perception that the Journal is

restricted to helminthology, although manuscripts by protozoologists and acarologists are sporadically published (Hoberg and Hendrix, 1998).” The change of journal name has not led to an increase in members or subscribers (S. Hendrix, pers. comm. e-mail of 31 December 2007).

The Botanical Society of Washington appears to be the healthiest society of the four in terms of financial stability. As the Society does not publish a journal, it is not dependent on a moderately large membership to sustain its activities.

A working hypothesis which was a reason for comparing the Washington-based societies was that there might be greater allegiance of members to the societies that are organism-group based. The Biological Society of Washington’s focus on taxonomy and systematics may not inspire the same dedicated allegiance among biologists as occurs among individuals interested in insects, for instance. The steady recent membership of the Entomological Society of Washington supports this hypothesis, whereas the recent pattern of declining membership in the Helminthological Society of Washington does not.

The Helminthological Society of Washington joined BioOne.1 in 2004 and has found that the BioOne revenue income has more than offset loss of institutional subscriptions, which is encouraging news for the Biological Society of Washington.

The similar size of the endowments for the three societies that publish journals are adequate to provide cushions for unexpected shortfalls but are inadequate to guarantee the existence of the Societies if there is a series of years when income does not cover expenses.

All-in-all, the three journal publishing Washington-based biological societies seem to be in the same boat and there is no obvious successful strategy that is evident in any one society that could be adopted by the other societies.

Outlook

As it stands now, the future of the Biological Society of Washington depends on the success or failure of the publishing agreement with Allen Press initiated on 1 January 2008, together with some options that, if initiated, would also carry a risk of losing some members/subscribers. The new promising aspects for the publishing contract and options discussed during the negotiation of the publishing contract include:

1. Allen Press's new and renewal membership and subscriber activities may at least stem the current declining trends, if not bring the membership up to the levels typical of the 1980-1990s. Chinese institutions would seem to be the best target for new subscribers.
2. The Biological Society of Washington has the option to have electronic publishing only for members and subscribers. The alternative is significantly less expensive than continuing hard-copy publication. Under the electronic publishing option, individuals could pay extra for individual articles or issues ordered through the Biological Society of Washington web site. The elected Officers and Council members are concerned that an unacceptable number of members would cancel their memberships if this option was taken without membership input. Allen Press is working with the Biological Society of Washington to send a questionnaire to the membership to determine whether a significant number of members would continue their memberships under the electronic publishing option.
3. The previous change in page size resulted in printing savings. The Editor has proposed going from the current 7"x10" format of the *Proceedings* to the 8.5"x11" format currently used for the *Bulletins* of the Biological Society of Washington. It is not clear whether this change would result in savings as the new publishing contract has a minimal number of pages we are required to publish per year, which might not be met by the larger page-size format.
4. There has been some discussion about changing the emphasis of the content of the publications, hearkening back to the early stated purpose of the Society to publish papers of general interest to biologists rather than emphasizing systematic/taxonomic content.
5. In many respects, *Zootaxa* is a more attractive publishing option than the *Proceedings of the Biological Society of Washington* to many authors. There is one strength the Biological Society of Washington has that is a weakness of *Zootaxa*. Many of the *Zootaxa* editors are not native English speakers and this is reflected in poor grammar that obscures meaning in *Zootaxa* papers submitted by non-native English speakers. The editorial review process for the Biological Society of Washington results in high quality English clarity and grammar by reviewers who know the specialized terminology of the taxonomic group involved. This may be a useful argument to entice foreign authors to become

members of the Biological Society of Washington and publish in its outlets.

The next 5-10 years will determine whether recent and possible additional actions will be sufficient to re-establish a vigorous Biological Society of Washington.

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The first mathematician was Adam,
Who took apples from those trees that had 'em,
He took one from Eve,
And said, "I believe
We should multiply fruitfully, Madam".

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