The following article by a Past President of the Virginia Academy of Science was published by The Association of Southeastern Biologists (ASB). It explores a subject which has been discussed for many years and is a source of continuning concern for many within and outside of the Academy. It is reprinted here with the permission of the author and the editor of the *ASB Bulletin*.

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PRESTIGE AND IMPACT VS. USEFULNESS IN BIOLOGICAL JOURNALS

OR

Am I Just a Regional Kind of Guy?

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ABSTRACT

The impact factor and citation half-life for scientific journals, as calculated by Science Citation Index, is used by some college administrators and department chairs to indicate the prestige of a journal, and thus the "significance" of articles published in these journals by faculty members. Regional journals, published by associations or societies interested in the botany or natural history of specific geographical areas, are likely to have lower impact factors and thus lower prestige than journals with national or international geographical coverage. Evidence is presented that from the standpoint that the journals (a) regularly have articles pertinent to one's research, (b) are likely to be cited in one's articles, (c) are likely to cite one's articles, and (d) are seen by a readership interested in one's research, regional journals may be as useful or even more useful to field biologists than some far more prestigious journals. Administrators and department chairs who are not aware of this need to be enlightened.

The merit review policy at the College of William and Mary has long required that faculty members show "evidence of continuing contribution to scholarship" through publication in peer-reviewed journals. Most of the Department of Biology faculty have been quite happily complying with that requirement, publishing from time to time in various journals, both alone and jointly with graduate or undergraduate students. Several years ago, all faculty members received a request from the Dean that they provide him with a ranking "in order of prestige" of the journals in their research area. The implication was clear. "Evidence of continuing contribu-

tion to scholarship" would no longer be meritorious in itself; one would now have to make this contribution through "prestigious" journals.

Difficulties arose immediately in trying to provide a ranking of journals in my field, for there is often a difference between the defined content of a journal and the usual content of its issues. The *American Journal of Botany* and *Botanical Gazette* are both prestigious general botanical journals covering many botanical subject areas. There are, however, relatively few articles in either dealing with forest vegetation (my primary area of interest). This is not because either refuses to accept vegetation papers, for excellent vegetation papers do appear (at long intervals) in both of them. However, custom and readership interest have directed their usual contents away from the vegetation area. Therefore, both in terms of finding articles directly pertinent to one's research and in terms of being assured of a readership particularly interested in vegetation ecology, these two journals would be less *useful* to a vegetation scientist than the general botanical journals *Bulletin of the Torrey Botanical Club*, *Castanea* (in the east) and *Madroño* (in the west), or the natural history journal *American Midland Naturalist*. These four journals are quite likely to have articles on vegetation in each issue, and on the assumption that this means an interested readership will see the article, vegetation ecologists may be more likely to submit their manuscripts to one of these four journals than to the first two.

Should the Dean be told that the *American Journal of Botany* is perhaps the most prestigious general botanical journal, but that I never submit vegetation articles there, thus perhaps giving him the impression that I don't think my work is of prestige quality? Should he be told that this is the most prestigious general botanical journal, but that it rarely publishes articles on vegetation, perhaps giving him the impression that my entire field is unprestigious? Should he be provided with an explanation of the difference between prestige and usefulness, even though this may be perceived as making lame excuses for my failure to even submit manuscripts to perhaps the most prestigious journal in my general academic area? None of these options is very attractive.

There are similar situations in other fields. *Ecology* would certainly be considered by any Dean as a prestigious outlet for any ecologist on his faculty. However, articles in the field of physiological plant ecology are far more likely to be published in general purpose botanical journals (like *Bulletin of the Torrey Botanical Club*, *Botanical Gazette*, or *American Journal of Botany*) than in *Ecology*. In fact, one very productive physiological plant ecologist whom I know has even discontinued receiving *Ecology* and *Ecological Monographs* because he feels they are so unuseful in his research area. Yet, a Dean might consider a specialty journal like *Ecology* more prestigious than general journals like these three botanical ones, and one would be hard-pressed, without invoking the usefulness argument, to explain why one's publications, however numerous, were rarely in *Ecology*.

A few years ago a committee charged with interviewing candidates for our Arts and Sciences deanship was told by one candidate, already an associate dean of a major southern state university, "We don't just look at the publication list of a faculty member. We look up how often the publications are cited in *Science Citation Index*, and that tells us how significant the publications are." Under that system, the

prestige of the journal in which the article appears is not so critical; what matters is how often other workers cite it.

While my students are frequently sent to *Science Citation Index* (SCI) to locate articles for their term papers or thesis research topics, we had not been using it as a mechanism to see whether work was "significant." The next day I stopped by the library to see how my work had fared. SCI did list some citations of articles I had authored or co-authored, but fewer than expected, and several citations I knew about were not listed. Further investigation revealed that those citations of my articles did not show up in SCI because they had been cited in the botanical journal *Castanea*, a journal SCI does not cover.

Inquiry to SCI revealed why *Castanea* isn't covered: its "impact" is to low. "Impact" or "impact factor" is the ratio of the number of citations of articles from a journal during the most recent two years to the number of articles published in the journal during that two years (SCI 1987). It is an attempt to measure the likelihood that articles in the journal will be cited by other researchers. A journal with a high impact factor is providing articles that other researchers feel a need to cite in their writing, so it clearly is useful to a large number of researchers. In fact, "impact" as measured by SCI is sometimes used as a means of determining prestige among journals. Numerical value of the impact factor for a given journal varies from year to year, and thus the journal's rank based on impact may vary also. For instance, *American Journal of Botany* had a higher impact factor in 1987 than *New Phytologist, but in 1986 these were reversed; and in 1987 the Bulletin of the Torrey Botanical Club* had a higher impact factor than *Botanical Gazette*, while in 1986 the reverse was true (SCI 1986, 1987). However, if over a period of years a journal's impact factor is so low that SCI doesn't even include the journal in its coverage, then that journal is unlikely to be called "prestigious," and is probably not very useful either- or so one might think. *Castanea* is not alone in falling into this low impact category. Other journals used by field botanists, such as *Sida, Madroño, Southwestern Naturalist*, the long important systematics journal *Brittonia*, and even the venerable botanical journal *Rhodora* are likewise omitted from SCI's coverage because of their lack of "impact." Citation of one's work in articles published in these or other such (largely regional) journals will therefore not be picked up by SCI.

It should be noted that there is a time element in the calculation of the impact factor; cited articles more than two years old do not enter into the calculation. For convenience I will refer to this element as "quickness," related to how soon after publication articles are cited. On reflection, one would hardly expect a lot of "quickness" in journals in which the primary subject matter is field and museum or herbarium systematics or field ecology. It takes a long time to gather data in studies of this type, and such studies don't lend themselves to periodic progress report articles. Thus, when an article is ultimately published, it is unlikely to cite previously published progress reports of the just preceding years. Therefore, even if a newly published article inspires a researcher to start a related study, it will likely be more than two years before the second study is completed, written up, and shepherded through the review process to publication. By this time, citation of the first, initiating article is too late to count toward the impact factor for the journal in which it was

published. Field biology journals thus might be expected to have lower impact factors.

On the other hand, the data published in field, herbarium, and museum studies does not quickly become obsolete, so an article may be worthy of citation many years, and even decades, after the original publication. Thus, even if an article is rarely cited in the first two years after publication, this does not mean it is unimportant or lacking in significance, for other articles in which it will ultimately be cited it may still be years away from publication. The lag in "quickness" in systematics and field ecology studies may well be compensated for by long-time worth in articles in those disciplines.

The New Phytologist, trying in its advertising circular to persuade botanists to subscribe, reports that it has the "most favorable half-life" of broad-spectrum botanical journals. Half-life in this case refers to the median number of years since publication of the articles cited in the journal (SCI 1987). A short half-life would presumably mean that the authors publishing in that journal are keeping up on the very latest literature and cite mostly very recent articles. No doubt this is the point the editors of *The New Phytologists* had in mind. The other side of this, however, is that a short half-life may mean that in the fields covered by a journal, the information in articles more than a few years old is usually so outmoded that there is no reason to cite those articles. Such early obsolescence is not often the case in field biology studies. Therefore, journals which regularly publish articles on systematics or field ecology would be expected to show frequent citation of older articles, and thus a long half-life.

In the 12 papers I have authored or co-authored in this decade, 34 out of 173 entries in the "Literature Cited" were less than five years old at the time of citation. However, more than half the entries were more than 15 yr old when cited, and almost a quarter (22.5%) were over 30 yr old. The half-life of cited articles is greater than 15 yr, well beyond the $\geq$ 10 yr cutoff for "unfavorable" half-life of SCI. In contrast, the median half-life for all CSI citations is 6 yr, and less than 5% of the citations are older than 30 yr (CSI 1988). In my articles older entries were cited not because of unfamiliarity with more recent work, but because, despite the passage of years, the information in the older articles was still pertinent to the studies being done. Is a long half-life "unfavorable" in this case? Probably not.

No matter what its prestige or impact to other parts of the biological research community, a journal is *useful* to the individual researcher only if it regularly publishes articles which help that researcher keep up with the latest developments in his or her specialized field. There are, for instance, certain journals of which I have chosen to receive personal copies (by becoming a member of the professional societies which publish them). I want my own copies of those journals because any issue is likely to contain articles pertinent to my research and teaching. Other journals which may, from time to time (but not regularly), contain articles pertinent to my research I generally choose not to subscribe to. Rather, I depend upon occasional examination of the copies in the University library to keep up with any articles in my research field published in those journals. Interestingly, many of the journals I choose to receive, because they are most useful to my research, are not high impact journals. Prestige as measured by SCI's impact figure does not neces-

TABLE 1. Sources of articles cited in twelve articles authored or coauthored by S. Ware 1980-1989 (journal citations only; books, theses, documents excluded). An asterisk means the journal is not covered by SCI.

Scientific journal (N = 21)	Number of times cited (N = 116)
Ecology	23
Ecological Monographs	19
*Castanea	15
Bulletin of the Torrey Botanical Club	14
American Midland Naturalist	12
*Virginia J. of Science	7
*J. Elisha Mitchell Scientific Society	4
*Jeffersonia	3
Vegetatio	3
American Naturalist	2
*ASB Bulletin	2
J. Forestry	2
*Rhodora	2
8 others, each	1

sarily coincide with *usefulness* as I have judged it in selecting which journals to receive.

In an effort to get some quantitative measure of which journals have been most useful in my research, frequency of citation of various journals in the 12 papers of mine mentioned earlier were examined (Table 1). While *Ecological Monographs* and *Ecology* are high impact journals by SCI's measurement, the third most frequently cited journal is one with such low impact that SCI doesn't even cover it and this is also true of the sixth and seventh journals. In contrast, the prestigious (higher impact) botanical journals *American Journal of Botany* and *Botanical Gazette* and such prestigious European ecological journals as *Oecologia, Oikos*, and *Journal of Ecology* did not make my list. There was not a single citation from any of those five journals. This of course does not mean that these journals are not useful to me. I consult all of them regularly, and even receive a personal copy of *American Journal of Botany*. Still, there clearly is not a good correlation between SCI's "impact" in botany or ecology as a whole and usefulness as measured by citation in my published research.

The sample on which Table 1 is based is very biased, since 11 of the 12 papers dealt with forest vegetation. The remaining article dealt with the other area of plant ecology in which I do research, rock outcrop ecology. To get a view of what the most useful journals might be in that research area, the sources of literature cited in a recent review chapter (Baskin and Baskin 1985) dealing with autecology of rock outcrop plants were examined (Table 2). The greater representation of *American Journal of Botany, Botanical Gazette*, and *Canadian Journal of Botany* in their cited literature, and the relatively lower representation of *Ecology* and *Ecological Monographs* than in Table 1 is consistent with the earlier suggestion that articles on

TABLE 2. Sources of articles cited in a review chapter on rock outcrop plant ecology by Baskin and Baskin (1985).

Scientific Journal (N = 36)	Number of times cited (N = 89)
Bulletin of the Torrey Botanical Club	12
Ecology	7
American Midland Naturalist	5
Evolution	5
J. Ecology (British)	5
American J. of Botany	4
Botanical Gazette	4
Canadian J. of Botany	4
Castanea	4
J. Agriculture Research	4
J. Tennessee Academy of Science	4
Contributions of the Gray Herbarium	3
New Phytologist (British)	3
Oecologia	2
Weed Research	2
Ecological Monographs	1
Science	1
19 others, each	1

physiological plant ecology are more likely to appear in one of the general purpose botanical journals than in these two ecological journals. In this case also, usefulness as measured by frequency of citation and impact as measured by SCI do not correlate well. Only two journals are cited more often than *American Midland Naturalist*, which has only a moderate SCI impact factor. The regional journal *Castanea* is cited as often as *American Journal of Botany*; the *Journal of the Tennessee Academy of Science* is cited as often as *Botanical Gazette*. *Science*, regarded by many as the most prestigious American journal, provided only one citation.

Journals are useful not just for the information they provide a researcher, but also for the interested readership they provide for the researcher's writings. Now that almost all researchers have easy access to a photocopying machine, it is probable that a smaller percentage of biologists request reprints than was once the case. Still, if the number of reprint requests per article is any indication of the size of the interested readership, then *Castanea* (a low impact journal), *Bulletin of the Torrey Botanical Club* (intermediate impact), and *Ecology* (high impact) are of approximately equal usefulness in providing interested readers for my work.

Perhaps a better indication that a journal provides an interested readership is the more frequent citation of one's articles in that journal. If this is true, *Bulletin of the Torrey Botanical Club* and *Castanea* (in that order) are providing the best readership for my work, *American Midland Naturalist* is third, and *Ecology* and *Virginia Journal of Science* are competing for fourth.

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Two years ago I underwent a periodic (six-year) re-evaluation, which is required of all tenured faculty in my department. The evaluation committee (composed of five of my colleagues) decided my performance merited by continuance and they even gave me some mild praise for my "continuing contribution to scholarship. " They commented, however, that too many of my publications were in regional journals. The implication was, of course, that however meritorious my "continuing contribution" was, it would be even more so if more of it were in national and international (read "more prestigious") journals. It was no false accusation that I had been publishing in regional journals. The journals published in most often are *Castanea* (6), *Bulletin of the Torrey Botanical Club* (5), *Virginia Journal of Science* (5) and *Ecology* (3). *Castanea* plainly states that it invites articles relating to the flora and vegetation of the southern Appalachians and the southeastern United States, because that is the field of interest of its readership. The *Virginia Journal of Science* has no stated geographical limitations on its subject matter, but in practice its content, like that of most state academy journals, is heavily weighed toward the field biology and field geology of that state.

Why publish so often in these regional journals? I have long been interested in the distribution, abundance, and phytosociology of vascular plants (particularly of forest trees) and in the environmental factors which control these. Climate, geology, topography, and their interactions usually control the distribution and phytosociology of forest trees. Since climate, geology, and topography all vary from region to region, vegetation also varies from region to region. While certain general principles are applicable everywhere, the details of relative abundance and phytosociological relationship among species are often only valid for a given region. It is risky to extrapolate findings in one region to another region where the levels of the controlling factors are different. Thus, vegetation studies, like studies of flora and fauna, tend to be regional in extent and in applicability, at least at the level of detail, and that is why almost all vegetation, floristic, and faunistic studies have a geographical term in their titles. The most interested readership for such studies will usually be other field biologists in that general region. This is in fact the very reason for the existence and usefulness of regional journals like *Castanea, Southwestern Naturalist, Prairie Naturalist, Great Basin Naturalist, Madroño, Northwest Science, and most state academy journals.*

If a vegetation ecologist were reporting on the existence of a new plant community process, or a major geographical extension of a vegetation type, then this might well be of great enough interest to readers on a national scale to be published in *Ecology* or *Bulletin of the Torrey Botanical Club*. If it is the first modern detailed study of the vegetation of a large portion of a physiographic province or of a major disjunct outlier of a widespread vegetation type, perhaps *Bulletin of the Torrey Botanical Club* or *American Midland Naturalist* would be the journals of choice. If the study is of the differences between two different portions of the same physiographic province in the southeastern U.S., then one might send it to *Castanea*. If the research involves the comparison of relative abundances of certain tree species above and below the scarp of a Coastal Plain terrace, then the appropriate choice might be a state Academy of Science journal, such as *Journal of the Elisha Mitchell Scientific Society* (North Carolina). While it makes sense to

publish in the most prestigious journal one can, the choice of the journal should be determined in large part by where the interested readership is to be found.

For workers in research areas such as molecular biology or plant or animal physiology, there is no geographic constraint on applicability of the results. For them, publication in a state academy journal might be regarded as "invisible," in the sense that it will almost certainly be overlooked by other workers in their specialty. Because of the regional nature of so many vegetational, floristic, and faunistic studies, the appropriate state academy journals are routinely consulted by most field biologists, and thus these journals are not as "invisible" as they are in other subdisciplines. Because of an interest in the ecology of limestone outcrop plants, I routinely consult the *Journal of the Tennessee Academy of Science*, where pertinent articles occur from time to time (Table 2). Apparently other field ecologists also consult such state journals, for three titles my students and I published in the *Virginia Journal of Science* have since been cited in books, and none of the three citing authors were from Virginia.

SCI doesn't regard some of the regional journals in which I publish as very prestigious, because they have low impact factors. A Dean who counts SCI citations will perhaps underestimate the significance of my work, for he will never know my work was cited in these journals, since they are not covered by SCI. My departmental colleagues may not esteem sufficiently the work I publish in these journals, because they are merely regional. Yet, when one considers which journals (a) regularly have articles pertinent to my research, (b) are most likely to be cited in my articles, (c) are most likely to cite my articles, and (d) seem to have a readership likely to be interested in my research, then these regional journals rank right up along with ones of broader geographic coverage like *Ecology* and *Bulletin of the Torrey Botanical Club*. Given the geographical distribution of the plant communities I find particularly interesting, regional journals are likely to remain useful to me as both a reader and a contributor, despite any lack of prestige, impact, or esteem from some of my colleages outside of field biology. I guess I'm just a regional kind of guy.

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