altruism, patriotism and science: scientific journals in the early republic

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In contrast to the slow and steady growth of science in the early American republic, the relatively rapid and continual foundation of new scientific and technical journals presents a puzzling anomaly. Although science in America lacked the tradition, interest and institutional support enjoyed by science on the continent, new American journals of science and technology appeared at approximately the same rate as their continental contemporaries. Perhaps even more curiously, that rate slightly exceeds that of the present day, a period commonly regarded as witnessing an explosive growth of science. The relatively rapid pace of foundation and publication of new vehicles for scientific communication, a sign of a vital and growing research community, paradoxically occurred at a time when such a community was virtually nonexistent.

Early American scientific journals seem to have been published despite the absence of any considerable audience for their contents. At that time, there were few scientists in America; those few were relatively isolated from each other by geographical dispersion, limited transportation and inadequate communication. Even more significantly, they were isolated from Europe, the scientific capital of the world. Moreover, scientists of the early republic were not professionals; at this time in the development of science it was the rare individual who earned his living as a scientist, far rarer in America than in Europe.[1] Physicians, as representatives of the profession most similar to the yet embryonic one of science, played an important part in developing science in the early days of the republic. Except for a very few general scientific journals, the majority of early scientific and technical periodicals were medical journals. They functioned not only as medical publications, but also outlets for publication of research in sciences distinct from, but ancillary to,

medicine; they only began to abandon that function with the appearance of specialized journals in the 1820's and 1830's.

In view of the limited professional character, dispersed and isolated state, and small number of American scientists the rate at which new scientific journals appeared seems highly disproportionate. What, then, might be the explanation for this apparent inconsistency in the development of early American science? Investigation of a number of plausible reasons only compounds the puzzle and indicates that its solution is far from trivial. For example, perhaps it was the case that despite the limitations of their potential audience, scientific and technical periodicals were well received, and had good chances of flourishing. Consequently, the high annual rate at which new journals appeared (one new title for every six in existence), would be the result of this favorable environment for journals. Unfortunately for this hypothesis, the rather high birth rate of 16 per cent per year was accompanied by a high mortality rate of about 9 per cent per year. As a result, the prospects of periodicals were profoundly pessimistic: a new journal had about a 50-50 chance of lasting five years; more than half of all scientific and technical periodicals did not live to celebrate their fifth birthday.[2] Although such a high mortality rate might have been expected, because of both the embryonic state of the American scientific community and the lack of a widespread popular interest in science,[3] these factors fail satisfactorily to account for it. As in the case with the birth rate, the mortality rate is matched in the scientifically more advanced European countries; it seems that peculiarly national characteristics alone are insufficient to explain the apparent anomaly of rapid journal foundation.

Was it then perhaps possible that the high birth rate resulted from editors' ignorance of the harsh realities implied by the high mortality of scientific journals? Even a casual inspection of the journals reveals that their editors were all too clearly aware of the strong likelihood that their publications would not long survive. For example, in reporting on the foundation of the *Medical Repository,* S. L. Mitchill wrote:

> The institution of this work was originally undertaken as an experiment on the condition of society and the progress of science in the United States. We were fully aware of the labour, difficulty, and discouragement which await such attempts, of the fate of former periodical publications in this country, and of the uncertainty of success in this untried field of enterprise. For that public spirit which has constantly assisted our exertions we then could only form our wishes; of the reality of its existence we entertained the utmost doubt.[4]

Twenty years later, the situation still had not changed. Benjamin Silliman made similar comments in his introductory remarks to the first volume of the *American Journal of Science.* "Most of the periodical works of our country have been short-lived. *This,* also, *may* perish in its

infancy; . . ."[5] Editors' cognizance of likely failure led them to characterize new journal offerings as being experimental in nature. Such characterizations were current even as late as 1827, judging from the retrospective remark that Daniel Drake made in 1838, concerning the foundation of *The Western Medical and Physical Journal*: "When this work was commenced 10 years ago, the editor regarded it as an experiment."[6] Despite editorial recognition of the high probability of failure, new journals continued to appear at a constant rate throughout these decades.

Perhaps, then, economic factors may help to explain the rapid publication of new scientific and technical periodicals. For example, such high birth rates might have resulted from regarding the publication of a journal as a good prospect for a short term, quick profit operation. That is, initial subscriptions might have been designed to yield a profit over expenses for the short time of the journal's existence. However, comparative statistics of subscription prices for journals in several fields, such as literature and religion, show that scientific and technical periodicals are priced comparably with other periodicals. The average subscription costs for journals in all fields are remarkably similar.[7] Nor does the subscription cost of a journal guarantee either failure or success, for the average costs are approximately the same for both successful and unsuccessful ventures. One of the most expensive journals of the period, priced at six dollars per year, was the prominent, well-known and successful *American Journal of Science.* Furthermore, despite its high subscription rate, it is clear from its editor's published remarks that the early years of this journal involved financial hardships. It seems reasonable to conclude, therefore, that journals were not founded on the basis of attempts to realize a quick and profitable return on investments.

Moreover, editors give no sign that despite the risks of failure they regarded journal publication as economically attractive in the long run. The following remarks seem representative of contemporary editorial views about the economics of scientific and technical periodicals:

> We wish it to be distinctly understood, that we neither have nor will receive any pecuniary compensation as editor of this journal. The only motives which led us to engage in the enterprize, are announced in our Prospectus, and which will be found of a character liberal and wholly disinterested.[8]

A direct statement comparing the costs of publication with the income from subscriptions appears in the *Mathematical Diary,* where its editor, J. Ryan, notes that: "It may be well to observe, that in return for the fifteen hundred dollars which Mr. R. has expended in the publication of the Diary, he has not received above five hundred in subscriptions."[9] Incidentally, a year's subscription cost only one dollar.

Mr. Ryan's statement only adds to the puzzle of high birth rates, for it presents an additional economic factor that would make new journal

ventures even more unlikely. His experience may not have been exceptional; it may generally have been the case that the costs of publication exceeded income from subscriptions in the first years of establishing a journal. In fact, a thorough investigation of published remarks concerning journal finances and subscribers yields only evidence that tends to support this view. From an economic viewpoint, such a situation makes journal publication even less attractive. An editor willing to suffer such initial hardships, knowing that the ultimate chances of success were one in three, would scarcely have been motivated by economic reasons to found a new journal.

Thus, the problem is further compounded, for there was neither long nor short term economic incentive to found a periodical; scientific and technical journals did not have good investment potential. Neither financial reward, fiscal irresponsibility, potential success nor audience demand can serve to explain the high rate of foundation of scientific and technical journals.

What, then, might motivate a potential editor to add to the journal population? Given that he could hope for little in the way of economic return, and given that he knew the odds were overwhelmingly against success, why would he risk such an undertaking?

Although there is yet no final answer to these questions, both information and insight pertinent to their solution are provided by a study of editorial statements concerning the purposes of the new journals. Such an investigation produces a dominant constellation of editorial motives for founding scientific periodicals. To the extent to which this set of motives provides answers to the questions which have been raised, it also affords an interesting insight into the actual and hoped-for state of science in the early American republic, and into the role which journal editors hoped scientific and technical periodicals might play in the relationship between science and society.

In its first issue, nearly every journal contains a statement of purpose —in a prospectus, advertisement, editorial notice or preface—concerning the aims and objects of the new periodical. In these statements, and in editorial remarks in later issues, lie at least public clues to the reasons that provoked editors to swell the numbers of scientific journals. Taken in context, the remarks additionally provide a record of the contemporary outlook regarding the relations between science and society in America and the state of science in that period. Since they are subject to the twin constraints of both the international and the public character of science, such statements present a reasonably reliable picture of editorial motivations. That is, at a time when Americans were still dependent upon European science, yet strongly felt any adverse criticism of their nation's status, editorial remarks must have demanded careful composition, both for their countrymen's eyes and for the critical scrutiny which American productions were given abroad.[10]

A primary aim of every journal, so obvious it scarcely deserves documentation, was to act as a means of communicating scientific information or "intelligence." This intelligence was not always necessarily new information, but might include abstracts and reviews of articles or books that had appeared in other journals, particularly foreign works which did not receive widespread circulation in America. The practice of including material already published elsewhere was not solely an American habit; in the first half of the nineteenth century, approximately 40 per cent of all original articles published in scientific and technical journals received additional publication in other journals.[11]

Then as well as now there were other recognized and acceptable means for the communication of scientific results—books, monographs and newspapers. Since the rate of production of scientific journals is not justified by an appreciable scientific audience or by a great popular interest in science, it is reasonable to ask why, once committed to the communication of information, one would choose the periodical form of publication. For a few journals, the periodical format was chosen to enable the editor to report his own research in an expedient and rapid fashion; a notable representative of this practice was Constantine Rafinesque, a colorful figure in natural history. However, the majority of journals were not primarily organs for the display and communication of their editor's research. For the great bulk of the journals, the choice of a periodical format involved at least the same reasons as those present at the birth of the first scientific journals in the seventeenth century.[12] In discussing medical collections, whose advantages also applied to the periodical he was founding, S. L. Mitchill cited the following benefits of a journal form of publication:

> Publications of this kind, likewise, from their very nature, possess many advantages over systematic works. They employ a greater number of observers, over a wider field, admit of minuter details, ampler discussions, and more various opinions and recondite investigations. By their instrumentality, facts are preserved or rescued from oblivion, which without them had been wholly lost: for there are few men who find leisure and inclination, from the pressure of daily business, to become authors, and still fewer whose observations are so numerous and important as to demand a labored treatise; while there are many who have time and facts to furnishe out, almost every year of their lives, a short but valuable essay . . . the example of almost every civilized country of Europe may be cited; in which publications of this kind are successfully multiplied, and sought after with peculiar avidity[13]

It is in the latter part of his discourse that Mitchill introduced the most recent reason, emulation of the example already set by Europe, the world leader in science. By this time, widespread feeling existed that the example was highly successful and in large measure responsible for the

great and rapid scientific progress that had been made. Periodical publication was becoming the normal and major mode of communication of scientific research. In a later volume of the *Medical Repository,* Mitchill referred to this feeling:

> It will be unnecessary to direct the reader's attention to the benefits which have resulted to Medicine, as well as to all other sciences, from the adoption of periodical publications. They are now so far multiplied, in every part of the learned world, as to form a considerable portion of the means by which knowledge is diffused through all grades of society, and brought within the reach of every inquirer. . . . The advantages of periodical publications on Medicine and Surgery, and all the auxiliary branches of Science, were never so conspicuous and universally acknowledged as at the present moment.[14]

A brief but far more extreme statement about the power of this form of publication appeared in the *Philadelphia Journal of Medical and Physical Sciences,* "Next to the invention of the art of printing, periodical publications probably exercise the most beneficial influence in awakening literary curiosity and diffusing knowledge."[15] Similar testimony occurred in a longer and more detailed evaluation of the prominence and utility of scientific journals in Silliman's introductory remarks to the *American Journal of Science.*[16] So strong was the faith in the power of the scientific periodical, that it was removed from the prefatory remarks to the *Emporium of the Arts and Sciences,* for a separate and prominent presentation as the first article in the first volume, "On the Utility of Scientific Periodicals."

Given a commitment to engage in the communication of scientific information, the leading candidate for a vehicle was the periodical. However, the choice of publication format was, in a sense, secondary to the choice of the material to be communicated. That is, why would it be thought either necessary or desirable to disseminate scientific knowledge? The rationale is inextricably a part of the American heritage; it appeared in nearly every journal from pre-Revolutionary days to the 1840's. The theme first comes to light in the preface to the first volume of the *Transactions of the American Philosophical Society*:

> Knowledge is of little use, when confined to mere speculation: but when speculative truths are reduced to practice, when theories, founded upon experiments, are applied to the common purposes of life; and when, by these, agriculture is improved, trade enlarged, the arts of living made more easy and comfortable, and of course, the increase and happiness of mankind promoted; knowledge then becomes really useful.[17]

Both this theme, and the reasons for choosing a periodical form of pub-

lication are discussed in the first specialized scientific journal in the United States, one devoted exclusively to mineralogy:

> Of the utility of a publication of this kind, much might be said: it may however be sufficient to observe, that nothing has contributed more to increase and diffuse Mineralogical information than the periodical works on the continent of Europe, particularly those in Germany and France. At the present period, when such laudable exertions are making to improve and extend the manufactures of our own country, a knowledge of the mineral productions, on which so many of the useful arts depend, and with which nature has so liberally supplied us becomes particularly desirable.[18]

The motif of the utility of knowledge was not restricted to the American Philosophical Society nor to the mineralogists; it appears in the first journals devoted to natural history: "The object of the Lyceum, in publishing its Annals, is to record new and valuable facts in Natural History; and to advance the public good by the diffusion of useful knowledge. The importance of this science, is, at present, every where acknowledged; . . ."[19] So great was the emphasis on the utility of knowledge that it could be carried to extremes: "The members of the Academy of Natural Sciences of Philadelphia, desirous of acquiring knowledge themselves and extending it among their fellow citizens, . . . propose to exclude entirely all papers of mere theory. . . ."[20] One of the most polished statements concerning knowledge's usefulness came from the pen of Silliman:

> Science and art mutually assist each other; the arts furnish facts and materials to science, and science illuminates the path of the arts. . . . In a word, the whole circle of physical science is directly applicable to human wants, and constantly holds out a light to the practical arts; it thus polishes and benefits society, and every where demonstrates both supreme intelligence, and harmony and beneficence of design in the CREATOR.[21]

But perhaps the grandest claims of power and utility for a branch of knowledge came from the least empirical of the sciences, if it can be so classified, mathematics. G. Baron, editor of the *Mathematical Correspondent,* liberally cited the extensive benefits of mathematics:

> The mathematical sciences are the foundation of almost every art that is necessary to promote the comforts and convenience of civilized man: their extensive use in human affairs stands attested by the wise and learned of every age. . . . For by mathematical exercise, as the celebrated Dr. Barrow observes, the mind is inured to a constant diligence in study, delivered from a credulous simplicity, strongly fortified against the vanity of skepticism, restrained from rash presumption, inclined to a due assent, subject to the gov-

> ernment of right reason, and inspired with resolution to combat the unjust tyranny of false prejudices.[22]

It was thus both desirable and necessary to disseminate scientific knowledge, for science was regarded as the foundation and ally of the useful arts. Furthermore, it was axiomatic that the useful arts were what distinguished the rich and powerful civilizations of the West from all others. Those very arts, together with the knowledge upon which they were founded, would ensure the eventual prominence of the United States. The strong motivation to promote and disseminate scientific and technical knowledge lay in the spirit of the Baconian aphorism that "Knowledge is Power," a spirit prevalent in the science of the early American republic. Publication of a scientific or technical journal was a means to foster the rapid growth and development of the useful arts, the foundation of modern civilization. The dissemination of scientific information, above any other type of knowledge, was a necessary condition for the rapid realization of the vast American potential for growth and power.[23]

The belief that America would some day be a major power in the world, perhaps the most powerful of nations, was no minor conviction of the editors.[24] They had consummate confidence that the destiny of America was to be the supreme world leader, the successful experiment that would illustrate the superior nature of democracy, underpinned by the utilitarian foundation of science and technology. So strong a conviction inevitably provoked the critical reaction of foreigners assessing the American press. To them its expression seemed ridiculously naive. Yet, American editors were all too well aware of the inferior and as yet dependent state of science in their country, often coupling their acknowledgement of this status with the assurance bred of conviction that shortly the situation would be different.

The advantages of the new nation for attaining future greatness were described shortly after the Revolution by the American Academy of Arts and Sciences:

> . . . —the citizens have great opportunities and advantages for making useful experiments and improvements, whereby the interest and happiness of the rising empire may be essentially advanced. At the same time, enjoying, under a mild but steady government, that freedom, which excites and rewards industry, and gives relish to life—That freedom which is propitious to the diffusion of knowledge, which expands the mind, and engages it to noble and generous pursuits,—they have a stimulus to enterprise, which the inhabitants of few other countries can feel. . . .[25]

One can almost detect the promise of future imperial splendor in the remarks of S. L. Mitchill, nearly a quarter century later: "Our leading objects since the first establishment of this work uniformly have been . . . to institute a national work, which may assist similar designs elsewhere

in exciting the energies, developing the productions, and hastening the maturity of a young and rising empire."[26] In 1818 Silliman repeated the theme in commenting on the resources and potential of science in the United States:

> In a general diffusion of useful information throughout various classes of society, in activity of intellect, and fertility of resources and invention, producing a highly intelligent population, we have no reason to shrink from a comparison with any country. But the devoted cultivators of science in the United States, are comparatively few; they are, however, rapidly increasing in number. . . . We may hope for the happiest results, with regard to the advancement of both science and the reputation of our country.[27]

Thus, at least for those men who undertook the publication of scientific periodicals, science was to play a prominent role in assuring the future ascendancy of the United States. In order for science to play that role, the scientific periodical was deemed a necessity.

Yet the scientific and technical journal could do more to insure eventual American superiority than simply communicate and disseminate useful knowledge. Cognizant of the scattered and isolated state of the few scientists in America, the journal editors realized that such a condition was detrimental to their country. The periodical might help to remedy that condition, for it would serve to unify and increase the scientific labor force. Thus, an additional justification for the publication of scientific and technical journals was found in the patriotic motivation of service to the nation. Periodicals were not only intended to diffuse knowledge, but also to encourage and stimulate those who might otherwise not engage in scientific activity. In their initial volumes, both the American Philosophical Society and the American Academy of Arts and Sciences refer to this function of stimulation and encouragement as one of the advantages and benefits of their institutions. This sentiment continued to be held; nearly fifty years later the editor of the *Mathematical Miscellany,* C. Gill, combined this motive with that of utility:

> . . . for it will be peculiarly gratifying to the Editor, if he can supply the means in any degree of fostering the emulation of American youth in a study which is peculiarly adapted to the enquiring mind, and which is daily becoming of more practical importance to the country.[28]

At about the same time, the Boston Society of Natural History noted that one of the motives for the foundation of its *Journal* was to enable it to create "a taste for Natural History," and thereby help satisfy one of the purposes of the Society.[29]

In a few instances, journals offered rewards to help stimulate and encourage their readers. Two of the mathematics journals promised subscriptions or prize medals for solving problems posed in their issues.

Daniel Drake's medical journal offered authors "pecuniary compensation," subject to the limitation that it could only be "as liberal as the circulation of the journal will authorize."[30] Such practices had their parallel in the premiums or awards given by early agricultural societies and societies for the promotion of manufactures and useful arts.

Still, there was one remaining and perhaps vital function for the journal. It was not enough to diffuse knowledge and encourage the development of young scientists. The journal, as a place for the display of native talent and accomplishment for comparison with other countries, was also a source of civic and national pride. It provided a place in which concrete evidence could be found that the new nation was not really so culturally and scientifically inferior as its transoceanic neighbors implied. In spite of the difficulties attending the pursuit of science in a newly settled and expanding nation, Americans were making slow and steady progress. The patriotic pride which these accomplishments evoked was more than mere testimony to the Baconianism of the editors. These achievements served notice to both America and Europe that progress towards the future prominence and prosperity of the United States had already begun. Scientific and technical journals provided a corrective to the critical assessments of foreigners, for they contained "proof" that such criticisms were far too extreme. That the journals did serve a patriotic role is illustrated in many cases; the following incident may help show to just what lengths it might be carried.

At the time, Americans felt keenly their inferior status in science and the arts, including medicine. Apparently as a means of stimulating readers to demonstrate the contrary, Dr. Noah Chapman, editor of the *Philadelphia Journal of Medical and Physical Sciences,* had printed on its title page Sydney Smith's now famous statement denigrating American culture and American medicine: "In the four quarters of the globe, who reads an American book? or goes to an American play? or looks at at an American picture or statue? What does the world yet owe to American Physicians or Surgeons."[31] The review containing this statement had considerably excited the choler of American medical temper, for it was reported that American physicians had taken "mortal offence" at the remark.

Yet not all medical men reacted uniformly to the review; differences in opinion led to an editorial exchange which serves to illustrate the strength of the patriotic defense of American accomplishment, and to demonstrate the presence of sectional rivalry. An offending opinion was published in the first volume of a Boston journal edited by three Boston physicians. In a short notice in the "General Intelligence" section of the journal, the editors commented on Smith's remark:

> The expression was a harsh one, savouring too much of nationality and might certainly have been spared; but having been used, it cannot be denied to have some real

> foundation. We cannot, at this moment, call to mind any one leading principle in pathology or physiology, any one acknowledged improvement in surgery, or any one remedy of general efficacy, proposed by an American practitioner.[32]

However realistic this assessment may have been, it was not overlooked at home or abroad. Thus it served both to prolong European impressions and to generate domestic criticism of the Bostonians. In a very patriotic and defensive article entitled "American Medicine" in the *Philadelphia Journal,* it was first claimed that American medicine had already accomplished a great deal:

> . . . within a comparatively short time, the American profession has contributed as large a stock of valuable information for the improvement of medical science, as any equal number of men in the world, and although we cannot *yet* enter the field on any thing like equal terms with our adversaries, we feel secure in stating that no long time will elapse before the force now disciplining will be sufficient effectually to displace them.[33]

And then, in close juxtaposition, in a footnote to a passage concerning the "impertinence and presumption" of the Europeans, came the Philadelphians' somewhat oblique criticism of the Bostonians' breach of patriotic support of the American medical profession:

> In a late number of the *London Medical and Physical Journal,* whose motto is a commendatory sentence from our countryman RUSH, we find an obscure American publication selected as a fair specimen of our Medical literature, and an assertion that the editor cannot recollect any thing of any consequence that has been done by American physicians and surgeons!![34]

Clearly the American medical profession was sensitive, and it was considered necessary by its leaders and spokesmen to improve what was regarded as a second-rate image. For that purpose, the medical journal was an important instrument and any but the most optimistic assessments of the current stature and future promise of American medicine were virtually unpatriotic. At times, this feeling led to unrealistic extremes:

> The rapid and brilliant improvements which have latterly marked the progress of Medical and Physical Science, have directed to its prosecution a degree of attention and zeal hitherto unprecedented in the history of the human mind . . . results are promised, more flattering to the powers of the human intellect, and more auspicious to the interests of mankind, than have yet encouraged the diligence of learning or rewarded the enterprise of genius. It is honourable to our national character, and gratifying to patriotic pride, to reflect, that to these great objects, American talent and zeal have largely contributed.[35]

Even S. L. Mitchill could be influenced by his patriotism to go so far as to claim that by 1815, "There is now no necessity to visit transatlantic climes for professional study. The United States furnish the information that is the most important to its own citizens. As well might foreign students come to America for education, as our fellow students go abroad for the same purpose."[36]

Although these patriotic expressions were primarily national, journals also served as more regional sources of pride. Occasionally references to continuing sectional rivalries appeared. One journal's prospectus stated that "in conducting this Journal no traces of local partialities, or sectional prejudices, shall be discerned."[37] By implication, at least, other journals had been guilty of such "improper" functions. Far more explicit were the traces of regional rivalry, as well as pride, in Drake's *Western Medical and Physical Journal.* They appear, in a rather restrained fashion, in the first volume:

> We trust that our senior brethren of the East will not regard a journal in the Backwoods, as altogether unworthy of the productions of their more experienced pens. The number and intelligence of their western readers would be greater than many of them may suppose. . . .[38]

After eight years had passed, Drake's restraint had given way to more biting comment:

> To the East he (Drake) does not venture to look either for patronage or professional contribution. The Journal has never, yet, had a dozen subscribers east of the mountains, nor have half that number of his eastern brethren contributed to its pages! . . . The Editor notes these facts, as items in the history of western medical literature; and may add, that the periodical press of the Eastern States, has seldom taken the slightest notice of his Back-woods' enterprize; although, with all its imperfections, it has received sufficient Back-woods' patronage, to live for a longer period, than a majority of the medical journals that have shot forth in the East.[39]

To be sure, Drake's remarks are less subtle than those which can be found in other journals. Nonetheless, they serve dramatically to illustrate the role of the journal as a source of regional pride.

The regional pride evinced by Drake completes the constellation of editorial motives for founding journals of science and technology. The aims of their editors run the gamut from touting sectional superiority to serving the grandiose role of assuring the future imperial prominence of the United States. Yet one of the themes is central to all the motives: the certain conviction that science and technology will be the foundation for the power and success of future societies. This motif's involvement can be clearly seen in a brief summary of the motivations that led to the founding of a disproportionate number of scientific and technological

journals in the early republic. The following themes have been identified: (1) a desire to communicate and disseminate (useful) knowledge; (2) a strong Baconian faith in science's power to mold society; (3) a proselytizing fervor coupled with an almost religious commitment to the spread of science; (4) patriotic zeal and pride connected with the desire to erase a sense of inferiority with respect to Europe; and, (5) regional pride and rivalry.

These incentives to publication are more than consistent; they are also continuous. They endured throughout the first half century of the republic's existence and beyond. In one respect the published editorial remarks represent propaganda, an attempt to convince others of the truth and value of their philosophy. That propaganda succeeded as the nineteenth century progressed, for gradually the occurrence of prefatory remarks and justifications for the place of a new journal declined. By the last two decades of the century, such preliminary remarks were no longer necessary and were virtually absent from new journals. Such justifications as did appear were in non-specialized journals, journals without a professional emphasis on original research, journals intended for teachers, students or interested laymen. Yet even in these, the notion of the importance of science and technology to the nation continued to be displayed, not because it was intrinsically intellectually exciting and demanding, but because of its practical worth as a fundamental economic and intellectual resource. By the end of the nineteenth century, the early editor's faith was becoming reality; it was no longer necessary to communicate it in professional journals.

Still, it may seem unusual and perhaps curious that the constellation of editorial motives is peculiarly lacking in any hint of baser or material considerations. Certainly the desire for professional recognition or status such as might accrue to the editor of a successful journal must have played some part in inducing men to found scientific periodicals. However, the state of science in America was so embryonic that such rewards could hardly have been overwhelming and determinative considerations for the editors. In addition, the widespread lack of popular interest in science in this period helps to reinforce the conclusion that material interests could not have been realistic. Considering all the evidence pointing to the lack of material reward, it seems reasonable to conclude that the absence of such motivation is not due to deliberate editorial omission.[40]

Thus, in the light of current evidence, it appears that the founders of scientific and technical periodicals in the early American republic represent a special group of dedicated, foresighted and altruistic patriots. Given the situation of that time, the publication of scientific journals had the characteristics of selfless professional and public service, not those of profitable private enterprize. Imbued with a strong sense of national destiny and convinced of the superior power of a strong science

and technology, the editors of scientific journals in early nineteenth-century America formed a unique class of energetic patriots, who altruistically assumed what they considered to be the necessary task of helping to lay the scientific and technological foundations for the eventual greatness of America.

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footnotes

1. Science had not yet achieved the status of a profession; it still remained predominantly the avocation or hobby of interested amateurs. Usually, the cultivators of science were professionals in other fields: clergy, physicians, teachers, lawyers, or businessmen, who were devoted to the pursuit of science in their leisure time.

2. Donald deB. Beaver, "A Statistical Study of Scientific and Technical Journals," NSF report (mimeo), Nov., 1964. The vital statistics of the nineteenth-century journals investigated in this study dovetail with, and are a continuation of, those which can be extracted for earlier periods from D. A. Kronick, *A History of Scientific and Technical Periodicals* (New York, 1962).

It is worth noting that the chances of survival were somewhat better for journals which had institutional support. Journals sponsored by scientific societies had slightly greater life expectancies than journals sponsored by private individuals. Two prominent examples are the *Transactions of the American Philosophical Society* (1771-), and the *Memoirs of the American Academy of Arts and Sciences* (1785-). *The American Journal of Science,* founded in 1818 as a private venture, represents the prime exception to the rule for it is still being published. However, at one stage in its early career, it might well have failed but for the timely support it received from the members of the Connecticut Academy of Arts and Sciences.

3. John C. Greene, "Science and the Public in the Age of Jefferson," *Isis,* XLIX (1958), 13.

4. *Medical Repository,* VI (1803), Preface, iv-v.

5. *American Journal of Science,* I (1818), Introductory Remarks, 5.

6. *Western Medical and Physical Journal,* X (1838), Preface.

7. Cf. "Periodical Journals Published in 1834," *American Almanac,* VI (1835), 275 ff. Of 140 journal titles representing the fields of medicine, law, literature, religion, etc., 81 have prices appended. The average yearly subscription cost for all journals is $2.72, with a median price of $2.50. An independent selection of 17 scientific and technical journals bears an average yearly price of $2.72. Consequently, there can be no doubt that the scientific press was quite competitively priced with respect to other fields.

8. *Philadelphia Journal of the Medical and Physical Sciences,* III (1821-22), 4.

9. *Mathematical Diary,* II (1832), 302.

10. It is worth noting that in the subsequent discussion, based upon characteristic themes extracted from editorial statements, not all journals universally display each and every theme. Although not every editor refers to the same set of purposes, the agreement on the few mentioned in this paper is overwhelming; additional purposes are not contradictory to these, but are either seldom mentioned or particular to the given journal or editor. The source journals comprised altogether a total of 26 different journals founded between 1771 and 1836.

11. This proportion of reprinting of original articles was obtained from a 2 per cent count of the articles indexed in the *Royal Society Catalogue of Scientific Papers,* I-VI (1800-1863).

12. Cf. Martha Ornstein, *The Role of Scientific Societies in the Seventeenth Century* (Chicago, 1938), and D. Kronick, *op. cit.*

13. *Medical Repository,* Vol. I, Number 1 (1797), Circular Address, viii.

14. *Medical Repository,* VI (1803), Preface, iii-iv.

15. *Philadelphia Journal of the Medical and Physical Sciences,* I (1820), Prospectus.

16. *American Journal of Science,* I (1818), Introductory Remarks, 1-2.

17. *Transactions of the American Philosophical Society,* I (1771), Preface, xvii.

18. *American Mineralogical Journal,* I (1810), Introductory Remark.

19. *Annals of the Lyceum of Natural History of New York,* Vol. I, Number 1 (1823), Advertisement.

20. *Journal of the Academy of Natural Sciences,* Vol. I, Number 1 (May, 1817), Introduction, 1-2.

21. *American Journal of Science,* I (1818), Introductory Remarks, 8.

22. *Mathematical Correspondent,* I (1804), Preface, iii.

23. Curiously enough, there was little evidence to warrant this belief, for at that time and for some time thereafter, there was but a tenuous relation between science and technology. However, so strong was the Baconian philosophy that it had become an article of faith, or, to put it properly, an Idol of the Theatre.

24. Cf. J. C. Greene, "American Science Comes of Age, 1780-1820," *The Journal of American History,* LV (June, 1968), 34-35.

25. *Memoirs of the American Academy of Arts and Sciences,* I (1785), Preface, xi.

26. *Medical Repository,* VI (1806), Preface, ix.

27. *American Journal of Science,* I (1818), Introductory Remarks, 2.

28. *Mathematical Miscellany,* I (1836), Advertisement, iii.

29. *Journal of the Boston Society of Natural History,* Vol. I, Number 1 (April, 1834), Introduction, 5.

30. *Mathematical Correspondent; Mathematical Diary; Journal of the Western Medical and Physical Sciences,* IV (1831), Prospectus.

31. Sydney Smith, *Edinburgh Review,* Vol. 33, Number 65 (Jan., 1820), Art. III.

32. *Boston Journal of Philosophy and the Arts,* I (1824), 598.

33. *Philadelphia Journal of the Medical and Physical Sciences,* IX (1825), 406.

34. *Ibid.,* 405-406. For a fuller exposition of the running feud between America and England, see James Eckman, "Anglo-American Hostility in American Medical Literature of the Nineteenth Century," *Bulletin of the History of Medicine,* IX (1941), 31-71.

35. *New York Medical and Physical Journal,* I (1822), Prospectus, 1.

36. *Medical Repository,* XVII (1815), Preface, 3.

37. *Philadelphia Journal of the Medical and Physical Sciences,* I (1820), Prospectus, xii.

38. *Western Medical and Physical Journal,* I (1828), "To Subscribers, Readers, and Correspondents," 2.

39. *The Journal of the Western Medical and Physical Sciences,* VII (1834), 152.

40. Since these arguments are based only on published evidence it is possible that some modifications might be demanded by research in the unpublished papers and manuscripts of the editors.