

# Current Comments

## *Nature*: 112 Years of Continuous Publication of High Impact Research and Science Journalism

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The explosion in science journalism that has taken place over the past two years is real. During that time, I've examined the scientific press in considerable detail. *Current Contents*<sup>®</sup> (*CC*<sup>®</sup>) has featured essays not only on many of the new science magazines,<sup>1-3</sup> but on some older ones as well.<sup>4-6</sup> More recently, I discussed *Science* magazine mainly in a journalistic context.<sup>7</sup> But one cannot separate its reputation as a scientific journal from its overall image. So it is with *Nature*, one of the world's leading and most prestigious science publications.

It is often difficult to explain subjective feelings. I know that as a young scientist, to publish a paper in *Science* seemed to me a kind of nirvana. It was the logical place to publish my first major paper on citation indexing.<sup>8</sup> Six years later it somehow seemed equally logical when I published my first paper on chemical linguistics<sup>9</sup> in *Nature*. Actually, it was what they call a "letter." But I knew deep in my bones they would accept it. From conversations with colleagues, I know that these intuitions are shared by others.

Of course the general perception of *Science* and *Nature* as prestigious primary journals is verified by citation analysis. Both attract a large number of papers that go on to become highly cited. For this reason, they achieve high impact in our various journal studies. There are many complex variables involved, since there are so many different types of articles and other items

published in these journals. However, according to the *Science Citation Index*<sup>®</sup>'s (*SCI*<sup>®</sup>) *Journal Citation Reports*<sup>®</sup> (*JCR*<sup>™</sup>) for 1980, *Nature*'s impact factor was 6.4, somewhat higher than *Science*'s 5.7. These two journals not only achieve eminence among multidisciplinary journals but are particularly significant in certain disciplines. *Nature*, for example, remains a core journal in molecular biology.

Almost 500 papers published in *Nature* have been cited more than 100 times since 1961. And *Nature* has accounted for eight *Citation Classics*. Figure 1 lists the 20 most-cited life sciences articles published in *Nature*. The 20 most-cited physical sciences papers published in *Nature* appear in Figure 2.

But like *Science*, there is more to *Nature* than original research. As *Nature*'s current editor, John Maddox, puts it, "Who says we are a primary journal primarily?"<sup>10</sup> A significant portion of each weekly issue of *Nature* is devoted to the "news" of science. And precisely because of its eminence as a primary journal, *Nature*'s views on various issues carry weight not only in the UK but throughout the international scientific community. By most objective criteria, such as page counts, it is first a scientific journal. But there is little doubt that the balance between the two roles is shifting.

The history of *Nature* has been described in a series of articles which appeared in the journal's centennial

**Figure 1:** The 20 life sciences papers published in *Nature* that were most-cited during the period 1961-1980.

Total Citations 1961-1980	Bibliographic Data
1,294	<b>Axén R, Porath J &amp; Ernback S.</b> Chemical coupling of peptides and proteins to polysaccharides by means of cyanogen halides. <i>Nature</i> 214:1302-4, 1967.
927	<b>Baltimore D.</b> Viral RNA-dependent DNA polymerase. <i>Nature</i> 226:1209-11, 1970.
1,286	<b>Born G V R.</b> Aggregation of blood platelets by adenosine diphosphate and its reversal. <i>Nature</i> 194:927-9, 1962.
960	<b>Giles K W &amp; Myers A.</b> An improved diphenylamine method for the estimation of deoxyribonucleic acid. <i>Nature</i> 206:93, 1965.
1,194	<b>Hughes J, Smith T W, Kosterlitz H W, Fothergill L A, Morgan B A &amp; Morris H R.</b> Identification of two related pentapeptides from the brain with potent opiate agonist activity. <i>Nature</i> 258:577-9, 1975.
2,966	<b>Hunter W M &amp; Greenwood F C.</b> Preparation of iodine-131 labelled human growth hormone of high specific activity. <i>Nature</i> 194:495-6, 1962.
8,989	<b>Laemmli U K.</b> Cleavage of structural proteins during the assembly of the head of bacteriophage T4. <i>Nature</i> 227:680-5, 1970.
820	<b>Lands A M, Arnold A, McAuliff J P, Luduena F P &amp; Brown T G.</b> Differentiation of receptor systems activated by sympathomimetic amines. <i>Nature</i> 214:597-8, 1967.
874	<b>Lyon M F.</b> Gene action in the X-chromosome of the mouse ( <i>Mus musculus</i> L.). <i>Nature</i> 190:372-3, 1961.
1,156	<b>McFarlane A S.</b> Efficient trace-labelling of proteins with iodine. <i>Nature</i> 182:53, 1958.
755	<b>Mitchell P.</b> Coupling of phosphorylation to electron and hydrogen transfer by a chemi-osmotic type of mechanism. <i>Nature</i> 191:144-8, 1961.
869	<b>Moncada S, Gryglewski R, Bunting S &amp; Vane J R.</b> An enzyme isolated from arteries transforms prostaglandin endoperoxides to an unstable substance that inhibits platelet aggregation. <i>Nature</i> 263:663-5, 1976.
1,097	<b>Perutz M F.</b> Stereochemistry of cooperative effects in haemoglobin. <i>Nature</i> 228:726-34, 1970.
706	<b>Porath J, Axén R &amp; Ernback S.</b> Chemical coupling of proteins to agarose. <i>Nature</i> 215:1491-2, 1967.
1,396	<b>Poulik M D.</b> Starch gel electrophoresis in a discontinuous system of buffers. <i>Nature</i> 180:1477-9, 1957.
1,807	<b>Reisfeld R A, Lewis U J &amp; Williams D E.</b> Disk electrophoresis of basic proteins and peptides on polyacrylamide gels. <i>Nature</i> 195:281-3, 1962.
974	<b>Temin H M &amp; Mizutani S.</b> RNA-dependent DNA polymerase in virions of Rous sarcoma virus. <i>Nature</i> 226:1211-3, 1970.
2,994	<b>Trevelyan W E, Procter D P &amp; Harrison J S.</b> Detection of sugars on paper chromatograms. <i>Nature</i> 166:444-5, 1950.
726	<b>Watson J D &amp; Crick F H C.</b> Molecular structure of nucleic acids. <i>Nature</i> 171:737-8, 1953.
799	<b>Wettstein F O, Staehelin T &amp; Noll H.</b> Ribosomal aggregate engaged in protein synthesis: characterization of the ergosome. <i>Nature</i> 197:430-5, 1963.

issue.<sup>11-16</sup> *Nature* was founded in 1869 by a young astronomer and government clerk named Norman Lockyer. Disillusioned with government service, Lockyer sought a career in scientific publishing. In 1863, he became the science editor of a new weekly called *Reader*. The magazine failed, however, in 1867. But the London scientific publishing community at that time was small and tight-knit. Lockyer had

come to know publisher Alexander Macmillan, who in 1859 had successfully launched a monthly, *Macmillan's Magazine*, which was devoted to science, literature, and the arts. When *Reader* failed, Lockyer prevailed upon Macmillan to start a new weekly journal devoted exclusively to the natural sciences. In 1869, Lockyer became the first editor of *Nature*. It is unclear who thought of the name *Nature*, but it was

**Figure 2:** The 20 physical sciences papers published in *Nature* that were most-cited during the period 1961-1980.

Total Citations 1961-1980	Bibliographic Data
195	<b>Carroll K K.</b> Quantitative estimation of peak areas in gas-liquid chromatography. <i>Nature</i> 191:377-8, 1961.
244	<b>Coats A W &amp; Redfern J P.</b> Kinetic parameters from thermogravimetric data. <i>Nature</i> 201:68-9, 1964.
285	<b>Fujishima A &amp; Honda K.</b> Electrochemical photolysis of water at a semiconductor electrode. <i>Nature</i> 238:37-8, 1972.
199	<b>Gold T.</b> Rotating neutron stars as the origin of the pulsating radio sources. <i>Nature</i> 218:731-2, 1968.
181	<b>Hawking S W.</b> Black hole explosions? <i>Nature</i> 248:30-1, 1974.
184	<b>Hewish A, Bell S J, Pilkington J D H, Scott P F &amp; Collins R A.</b> Observation of a rapidly pulsating radio source. <i>Nature</i> 217:709-13, 1968.
298	<b>Irving H &amp; Williams R J P.</b> Order of stability of metal complexes. <i>Nature</i> 162:746-7, 1948.
276	<b>Maitman T H.</b> Stimulated optical radiation in ruby. <i>Nature</i> 187:493-4, 1960.
185	<b>McKay H A C.</b> Kinetics of exchange reactions. <i>Nature</i> 142:997-8, 1938.
240	<b>McKenzie D P &amp; Parker R L.</b> The North Pacific: an example of tectonics on a sphere. <i>Nature</i> 216:1276-80, 1967.
331	<b>Molina M J &amp; Rowland F S.</b> Stratospheric sink for chlorofluoromethanes: chlorine atom-catalysed destruction of ozone. <i>Nature</i> 249:810-2, 1974.
294	<b>Morgan W J.</b> Convection plumes in the lower mantle. <i>Nature</i> 230:42-3, 1971.
303	<b>Nuckolls I, Wood L, Thiessen A &amp; Zimmerman G.</b> Laser compression of matter to super-high densities: thermonuclear (CTR) applications. <i>Nature</i> 239:139-42, 1972.
180	<b>Schilling J G.</b> Iceland mantle plume: geochemical study of Reykjanes Ridge. <i>Nature</i> 242:565-71, 1973.
206	<b>Smith A G &amp; Hallam A.</b> The fit of the southern continents. <i>Nature</i> 225:139-44, 1970.
269	<b>Turco A &amp; Peelle C.</b> Co-ordination of the thiocyanate group in inorganic compounds. <i>Nature</i> 191:66-7, 1961.
387	<b>Vine F J &amp; Matthews D H.</b> Magnetic anomalies over oceanic ridges. <i>Nature</i> 199:947-9, 1963.
592	<b>Wilson A J C.</b> Determination of absolute from relative X-ray intensity data. <i>Nature</i> 150:151-2, 1942.
332	<b>Wilson J T.</b> A new class of faults and their bearing on continental drift. <i>Nature</i> 207:343-7, 1965.
192	<b>Wilson J T.</b> Did the Atlantic close and then re-open? <i>Nature</i> 211:676-81, 1966.

undoubtedly a brilliant stroke: a number of journals with imitative names soon sprang up throughout Europe.

The first issue of *Nature* appeared on November 4, 1869. From the first, the new journal received contributions from prominent authors. Among them was John Tyndall, the physicist who, among other things, demonstrated why the sky is blue. There was also Thomas H. Huxley, the educational reformer and defender of Darwin's theory of natural selection. With such distinguished contributors, and with the backing of a successful commercial

publisher, which few journals had at the time, Lockyer was able to get his new journal established. *Nature* had financial problems in its early years, but Lockyer was able to avoid the false starts and suspensions of publication that *Science* was to experience in America a few years later.<sup>17</sup>

Maddox was appointed to his position as editor of *Nature* in 1979 for the second time. Previously, he had been editor from 1966 to 1973. Of his first tenure at *Nature*, *New Scientist* has written: "It is difficult to make an exhaustive list of his achievements...as

editor, so radically did the magazine improve."<sup>18</sup> Maddox is a chemist by training, although he gained extensive journalistic experience as science writer for the *Manchester Guardian* during the early 1960s. Perhaps one of his most controversial moves was to split *Nature* into three editions: one for the life sciences, one for the physical sciences, and one for general science. This experiment lasted from 1971 to 1975. The bibliographic confusion created by this split lingers on.

The other editors of *Nature* were Sir Richard Gregory (1919-1939), L.J.F. Brimble (1939-1965), and David Davies (1973-1979). A.J.V. Gale coedited *Nature* with Brimble from 1939 to 1958.

Comparisons of *Nature* and *Science* are reasonable. While *Nature* originally appealed to a British (and commonwealth) audience, *Science* was, and is, distinctly American in slant. Today, *Nature* may cover the news of science in the US more thoroughly in some ways than *Science*.

*Science* is the official publication of a nonprofit organization, the American Association for the Advancement of Science. *Nature* remains commercially published. *Science* has a somewhat benign editorial advisory board. *Nature* does not make this pretense. These differences notwithstanding, both journals are edited by people who exercise a great deal of editorial autonomy. Maddox makes the policy decisions for *Nature*. *Science's* editorial advisory board imposes few limitations upon editor Philip Abelson.

There is, however, considerable difference in style. Maddox is the more flamboyant. Having known him for many years, I consider him more American than Abelson, who is probably more British in his reserve. For this reason, I've never understood why Maddox persists in maintaining his policy of unsigned editorials. Apart from news stories, I don't know many reputable scientific publications that publish so

much anonymous material. One must distinguish between editorials and the many other kinds of anonymous items. Most of these anonymous articles appear in the *News* section of the journal. You can count on at least one unsigned item per issue, often more. In the April 23, 1981, issue, there are five unsigned news items.<sup>19-23</sup> If you ask Maddox who writes these pieces, he'll tell you it's a secret.<sup>10</sup>

Such a policy lends weight or authority. Much the same is done in newspapers like the *New York Times*, but even there one now sees an occasional departure from this practice by Phil Boffey, the science editorialist who became so well known when he wrote for *Science*. Some years ago, I wrote an essay denouncing anonymous publication.<sup>24</sup> I haven't changed my mind since then.

In the 1980 *SCI*, 285 anonymous articles published in *Nature* were cited a total of 323 times. Many of these citations came from letters to the editor generated by the unsigned items. But many also came from other journals.

Of course, anonymous publication in *Nature* is a tradition that goes back to Lockyer himself. For example, in his study of the British scientific establishment during the years 1880 to 1919,<sup>25</sup> author Frank M. Turner cited 22 items from *Nature*, all of them anonymous. Perhaps the staff of *Nature*, like those of many newspapers, take collective pride in knowing that their work is of sufficient impact to become cited. But in responsible scientific communication, authors should not hide behind a cloak of anonymity.

Another difference between *Nature* and *Science* is one of style. Neither publication avoids debate or controversy. But Maddox is not afraid to let sarcasm and acrimony creep into the pages of *Nature*. Thus, one book reviewer, after systematically criticizing a book in psychology, begins his concluding paragraph with the sentence: "One can only hope that this grubby little opus will sink

without trace."<sup>26</sup> In response to an anonymous article on a possibly dangerous herbicide,<sup>27</sup> one letter writer accuses *Nature* of making a "snide reference" to him.<sup>28</sup> Another anonymous article<sup>29</sup> makes disparaging comments about an original research paper<sup>30</sup> that appears in the very same issue of *Nature*. This last item caught the attention of *New Scientist*, which reported the incident and called it "a strange breach of etiquette."<sup>31</sup>

*Nature* is divided into several departments, two of which are devoted to original papers. The *Articles* section typically contains four research papers from different disciplines. Except for the field of molecular biology, there appears to be no conscious disciplinary bias at *Nature*. The overwhelming majority of papers come from Europe and North America. The UK, of course, is well represented.

The *Letters* section of *Nature* should not be confused with similarly named sections of other journals. The title is an anachronism going back to the last century. Many of these "letters" are in fact primordial, if not full-blown, papers. For example, the "letter" on thrombosis appearing in the May 14, 1981, issue by H.L. Nossel, Columbia University, contained 48 references.<sup>32</sup> And this is not unusual for a letter in *Nature*.

*Nature* frequently includes a review article. Reviews are clearly labeled as such on the contents page. Generally, reviews are invited, rather than submitted. A few recent reviews cover such diverse topics as the ecosystem of the Western English Channel,<sup>33</sup> the release of dopamine by the dendrites of certain neurons,<sup>34</sup> and the properties of amorphous semiconductors.<sup>35</sup>

The "journalism" of *Nature* is found in the *News* and in the *News and Views* departments. The first item in the *News* section is always an unsigned piece which often has the tone of an editorial, although it is never so labeled. I always assume it is written by Maddox. He re-

cently called upon the Reagan administration to develop a nuclear proliferation policy.<sup>36</sup> In another piece, he assesses the administration of Philip Handler, the retiring president of the US National Academy of Sciences.<sup>37</sup> These examples illustrate another difference between *Science* and *Nature*—*Nature* is much more international in its coverage. Recognizing the reality of America's leading role in science, it covers developments in the US as well as Europe. *Science* is more provincial, and concentrates on developments in North America, although this emphasis is beginning to change.

As mentioned previously, there may be more than one unsigned "article" in any edition of the *News* section. The rest of the items are largely written by a staff of 13 science writers. Occasionally, items are written by people not connected with the journal. Recent *News* articles reported on the impending removal of recombinant DNA research guidelines by the National Institutes of Health;<sup>38</sup> plans for a joint effort by British and German scientists to study the auroras;<sup>39</sup> the current state of French oceanographic research;<sup>40</sup> the development of government regulations in the UK regarding toxic chemicals;<sup>41</sup> the joint efforts by Caribbean nations, under United Nations auspices, to control pollution in the Caribbean Sea;<sup>42</sup> and work by Soviet scientists on a solar power station scheduled to go into operation in 1985.<sup>43</sup>

The *News and Views* section provides a forum for scientists to communicate ideas or report research developments without the constraints of formal publication. Articles appearing in the *News and Views* section are usually about a thousand words long. They are written largely by British scientists, although some are written by *Nature* staffers. Many *News and Views* articles contain literature references. Some topics that have recently been discussed in *News and Views* are the application of genetic

engineering to the development of a vaccine against foot and mouth disease, a disease of cattle;<sup>44</sup> the measurement of atmospheric gases;<sup>45</sup> the influence of habitat on the spread of rabies;<sup>46</sup> the discovery of some long-lost notes belonging to Darwin;<sup>47</sup> a summary of developments in research on interferon;<sup>48</sup> and the wobble in the rotation of the Earth.<sup>49</sup> In some respects, these articles correspond to the mini-reviews which will appear in ISI's forthcoming *Atlas of Science: Biochemistry and Molecular Biology, 1978/80*.

Actual letters to the editor appear in the *Correspondence* section, which is one or two pages long. Most of the letters attack or endorse articles appearing in the *News* and *News and Views* sections of *Nature*. The writing in *Correspondence* is often heated and makes for absorbing reading.

Recently, *Nature* changed the format of its contents page. While the print style is conveniently more readable, it is devastating to our printing budget. It may come as a shock to some readers to realize it costs us about \$30,000 per year to cover *Nature* in CC. Think of that next time you wonder about the size of print we employ in the indexes and on certain pages.

In approximately every other issue of *Nature*, there is a section called *Matters Arising*. Items appearing in this section are short, scholarly rebuttals to original papers appearing in *Nature*. The authors of the original papers are given a chance to respond to their critics in the very same issue. In effect, this innovative feature of *Nature* presents the reader with a scholarly mini-debate. Topics treated in recent *Matters Arising* include: the effects of the Earth's rotation rate on climate,<sup>50</sup> why black-backed jackals remain with their parents to help rear subsequent litters,<sup>51</sup> and what part of a pulsar is responsible for its radiation emissions.<sup>52</sup>

Each issue of *Nature* contains six to eight book reviews. Each year, *Nature*

presents a Spring Books Supplement, which features a greatly expanded book review section. This year's supplement, appearing in the April 23 issue, featured reviews of 27 books. The supplement was introduced by a philosophical discussion, anonymously written, of course, on the art of book reviewing. The discussion explained, among other things, why some of the criticisms found in *Nature's* book reviews are so strongly worded. Some books present ideas which "are such a challenge to accepted doctrine and at the same time so self-consciously challenging that it is helpful to readers to know the strength of opinion on the other side. Polemic is therefore part (but ideally a small part) of book review columns."<sup>53</sup>

*Nature* is published weekly except for the last week in December. The cover price for each issue is £ 1.25, or \$3.00, although virtually all sales are by subscription. In the US, an individual subscription costs \$86.50 yearly. The institutional rate is \$173.00. In the UK the rate is £ 75.00. *Nature* has additional rates for other European countries. *Nature* has a circulation of about 25,000. Customers outside of the UK account for fully 85 percent of the circulation.

The typical issue of *Nature* contains about 140 pages. Normally, there are about 25 to 30 full-page ads. Virtually all of the ads are professionally oriented. They promote such products as laboratory chemicals, technical equipment, and other journals. There is no consumer advertising.

*Nature* publishes an American edition that differs from its UK edition only in advertising. The publisher of this American edition is Robert Ubell, former editor of *The Sciences* who helped transform that science magazine in the mid-1970s.<sup>4</sup> A full-page black and white ad appearing in both *Nature* editions costs \$1,245, or £ 430 in the UK. A full-page four-color ad costs \$1,895, or £ 830 in the UK.

*Nature* prints about 665 pages of classified advertising per year. Classified ads largely consist of job openings for professionals, announcements of upcoming symposia and conferences, fellowships, and assistantships. Classified ads in *Nature* cost \$50.00 per column inch. One full page of classified ads generates about \$2,000.

One could cite Merton's so-called Matthew Effect in explaining *Nature's* present eminence. After all, success tends to ensure continued success. But there are countless other successful publications that eventually declined, so it is somewhat amazing that *Nature* has survived for 112 years. An unsigned editorial attributes that success in part to enlightened management by the Macmillan Company over the years.<sup>54</sup> The policy consisted mainly in leaving the editors free to operate the journal without interference. This has worked with varying degrees of success. Maddox rescued *Nature* from its downward course after many years of benign neglect. In the period between Maddox's two stints as editor, Davies did an ex-

cellent job in preserving *Nature* as one of the world's most important scientific journals.

I recently spoke to Maddox and asked him what his plans for *Nature* are in the immediate future. He told me to expect expanded news coverage of the US, Latin America, and the Eastern Bloc countries. He plans to focus more attention on the politics of science, and to expand the journal's coverage of high-energy physics. But perhaps most importantly, he will concentrate on making the writing in *Nature's* primary papers more intelligible to the average reader.<sup>55</sup> This is no mean task, and will require a new kind of collaboration between scientist-authors and the editors. If Maddox can pull this off, he will have made a major contribution to improving science communication.

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