Biomedical News Items and Feature Articles in *New Scientist* Magazine and the Research Papers that They Cite

Grant Lewison

grantlewison@aol.co.uk
University College London, Department of Information Studies, London WC1E 6BT (UK)

Abstract

New Scientist is a British weekly magazine that is half-way between a newspaper and a scientific journal. It has many news items, and also longer feature articles, both of which cite biomedical research papers, and thus serve to make them better known to the public and to the scientific community, mainly in the UK but about half overseas. An analysis of these research papers shows (in relation to their presence in the biomedical research literature) a modest bias towards the UK, but comparatively a strong bias to the USA and Scandinavia. There is a reasonable spread of subject areas, although neuroscience is favoured, and coverage of many journals – not just the leading weeklies – but with an emphasis on basic research. Some of the stories in *New Scientist* include comments by other researchers, who can put the new results in context. Their opinions appear to be more discriminating than those of commentators on research in the mass media, who usually enthuse over the results while counselling patience before a cure for the disease is widely available. The funding acknowledgements on the cited papers have also been analysed; the US papers show a great reliance on the National Institutes of Health.

Introduction

Scientific research, especially that relating to health, is of increasing interest to the mass media, and there are a growing number of publications that analyse this reportage (Hertog *et al*., 1994; Moyer *et al*., 1995; Adelman and Verbrugge, 2000; Brittle and Zint, 2003; Rezza *et al*., 2004;. Nichols and Chase, 2005). This is not surprising in view of the importance of science to policy-making in all areas, although some politicians still prefer dogma-based evidence-making to an objective appreciation of scientific evidence (Shulman, 2007). Biomedical research stories in newspapers and the broadcast media inform senior administrators, medical personnel, other researchers (Phillips *et al*., 1991) and the general public. Sometimes the stories are written so as to spread alarm, *e.g*., over the supposed dangers of vaccination (Anderson, 1999; Raufu, 2002), for political purposes or simply to boost circulation (Durant and Lindsey, 2000). Some previous publications have examined the selection of research articles cited in media stories (Lewison, 2002; Lewison, 2008). They have shown a marked own-country preference in the selection, but international comparisons are sparse.

In this study, which has begun only recently (August 2008) and which is intended to continue indefinitely, the weekly magazine *New Scientist* has been processed in order to identify and characterise the biomedical research stories and the papers that they cite. We wanted to find out whether *New Scientist* resembled a British newspaper in its coverage of different subjects and journals, was more akin to a scholarly journal in its referencing behaviour, or was somewhere in between. The magazine first appeared in 1956, and is now available on news-stands, by postal subscription and electronically. Its readership was estimated in 2007 at 843,000 of which just under half were in the UK, but its circulation was much less – 174,000, of which 57% were in the UK and Ireland, 19% in Canada and the USA, and 15% in Australia and New Zealand. Figure 1 shows the national breakdown of those readers who have recently (August – December 2008) written letters to the magazine. These nationalities correlate very closely with the circulation figures quoted above ($r^2 > 0.99$.) There appears to be a strong penetration of the market in Australia and New Zealand, particularly in relation to their populations (20 and 4 million, respectively).

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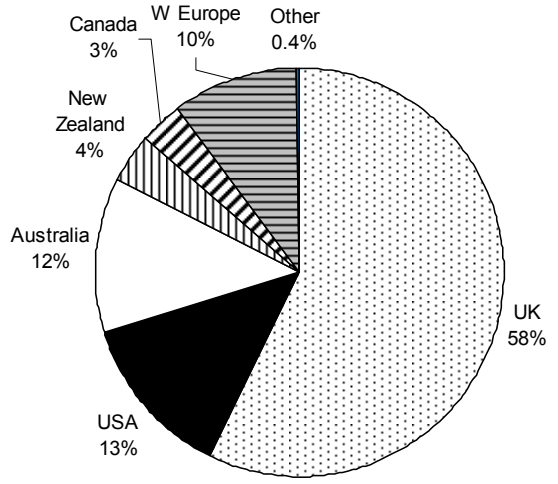
The magazine is multi-disciplinary, although my impression is that biomedical research, clinical medicine, high-energy physics and cosmology are favoured at the expense of chemistry and engineering. This is borne out by an analysis of the major fields of the jobs for which display advertisements appeared during the same five months, Figure 2.



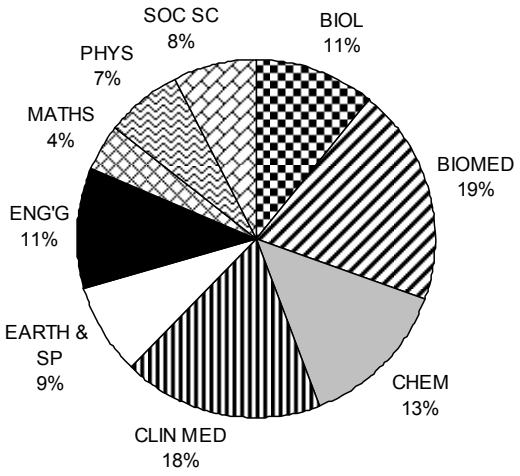


Figure 1. (left) National locations of writers of letters to *New Scientist* magazine, August – December 2008 (n = 252).

Figure 2. (right) Distribution of *New Scientist* job advertisements by major field (sample), August – December 2008 (n = 515) (estimated).

New Scientist, although written for lay people, can be considered as a newspaper for scientists, and appears relatively free from the sensationalism that sometimes pervades the stories about research or disease in the mass media. [Since 89% of the readers (from a readership survey of many UK periodicals) are described as being in the professional, managerial or other non-manual classes, this is not really surprising.] The *New Scientist* stories about research are of two kinds: short news items, mainly without a named author, and multi-page feature articles with one normally a journalist (some staff members, some freelance). The news items usually cite a single recent journal article, whose exact reference is given punctiliously (often as a DOI code); the feature articles often cite several papers, possibly published some years previously, and some of these are only referenced obliquely. The news items appear to be picked up by other news media quite often, particularly on Thursdays (because *New Scientist* issues a Press Notice on Tuesdays, embargoed for two days), but the stories are then re-written at greater length, sometimes with a change of tone, although a few are simply copied (in defiance of copyright law). In this way, *New Scientist* acts as an early source of research news, which is one of its selling points.

Methodology

New Scientist on the Web of Science. Although it is much more of a magazine than a scientific journal, *New Scientist* has been processed for the Web of Science (WoS) since 1977. However coverage was only partial until 1983 when there were 2317 items processed. In 2007-08, there were 3700 items (as at 14 December 2008), of which 40% were letters (mostly comments on earlier items), 29% news items (but the very short ones are not covered), 15% articles (perhaps they should really be classified as reviews), and 14% editorials. [In earlier years, editorials dominated, with 41% of total items.] Although *New Scientist* always includes a few book reviews, they are hardly covered in the WoS. The numerous references,

normally more than 20 per issue, are also not given. It is difficult to deduce the content of items from their titles, because they tend to be elliptic and may sacrifice transparency for punchiness. This applies both to news items and to feature articles. As a result, it is necessary actually to inspect the magazine and read through the items, or most of them, in order to identify those that deal with biomedical research.

Collection of biomedical references. This paper describes the results of the first five months of analysis, from August to December 2008. This is, of course, only a small sample of the magazine's reportage, but there were enough references (282, of which two were duplicates) to allow a reasonable initial determination of their characteristics. Each week I read through the paper copy of the magazine and marked all references to biomedical research – interpreted to include both basic biomedicine and clinical work – for subsequent data entry to a spreadsheet. This contained the information in respect of each reference shown in Table 1.

Table 1. Information recorded on the spreadsheet in respect of each cited biomedical reference in *New Scientist*.

Ref (number)	Reporter	Journal	Addresses
Source = NST	Synopsis	Reference/DOI	Funding sources
Year	Subject code(s)	Authors	No of funders
Day, month	Number of cites	Title	Commentator(s)
Page	Scientist(s)	Document type	Organization(s)
Story title	Institution(s)	Full source	Notes

To aid in subsequently finding the paper, the names of the scientist(s) involved in the research and their institution were noted. The five items: "authors", "title", "document type", "full source" and "addresses", were taken from the actual cited paper, and the "funding sources" were taken from the acknowledgement section of the paper and written in the form of standard codes denoting their identity, their sector and country (Dawson *et al.*, 1998). The "reference" was that given in the story, mostly as a DOI citation, but sometimes it was not present so the "notes" box was then completed as an aid to the identification of the cited paper.

The collection of the details of the references was by no means a trivial task. For some of the papers, where the story gave the name of the researcher(s), their institution, the journal and the year (mostly 2008), it was possible to use the WoS to identify the paper, and then to collect their bibliographic details, download them to file, and put them into the required format by use of a special Excel macro written by Philip Roe. [This was necessary so that other macros could be applied in order to conduct the main analyses.] However, many references consisted of just the DOI code, and so this was used to search for the paper on the Web, and its details transcribed into the spreadsheet in the standard format. Other *New Scientist* references simply gave the journal name, volume and page. For these, the journal was searched (electronically, using the UCL library resources) in order to find the paper. When it had been identified, either the details were transcribed to the spreadsheet directly (for example, the title could be simply Copied and Pasted), or sufficient details were noted that the paper details could be subsequently collected from the WoS. For a few references, mainly from the feature articles, some detective work was needed to identify the cited paper, particularly if it had been published many years previously. Altogether, 272 of the 282 cited papers were identified and their bibliographic details entered to the spreadsheet.

Analysis of biomedical references. The first analysis was of the geographical origin of the cited papers at the level of country; this was calculated both on an integer and a fractional

count basis (based on all the addresses recorded). This was performed by means of a special macro (again written by Philip Roe). The integer count distribution was then compared with that of the leading countries in biomedical research, as recorded in the WoS for 2007 (publication year, counting just articles and reviews). Biomedical research was defined by means of a complex filter based on cognitive terms in the papers' addresses (de Bruin and Moed, 1993; Lewison and Paraje, 2004).

A second analysis was of the research level (RL) of the cited papers on a scale from 1.0 = clinical observation to 4.0 = basic research, based both on the journals in which they were published (RLj; see Table 2 for examples) and on the title words in the papers (RLp; Lewison and Paraje, 2004). The distribution of RLj could be compared with the corresponding ones for the UK, the USA and the world; data were taken from the SCI on CD-ROM for 2005. The mean RLj and RLp values were calculated separately for UK and US cited papers.

Table 2. Some biomedical journals cited in the New Scientist stories with their research levels for 2005 (1 = clinical observation, 4 = basic research).

Journal	RLj	Journal	RLj
Cell	3.85	*Fertility and Sterility*	2.00
Nature	3.75	*J. National Cancer Institute*	1.64
Cancer Research	3.40	*Lancet*	1.20
Evolution and Human Behavior	2.35	*JAMA-J. Amer. Medical Ass'n*	1.09

It was, of course, impractical to see if the cited papers were themselves frequently cited by other papers because too little time had elapsed since their publication, but a surrogate measure of impact was determined in the form of the citation impact factors of the journals in which they were published, based on five-year forward citation counts (*i.e.*, the mean number of citations received in 2002-06 to papers published in 2002). These could then be compared with the corresponding values for UK and US biomedical papers published in 2005 to see if the papers cited by *New Scientist* were in journals that were relatively highly cited. A distinction was made between the two countries' outputs because it was known that US papers tend to be more highly cited (King, 2004) and therefore are likely to be published in higher impact journals than UK ones.

Analysis of cited papers' funding sources. The individual cited papers were looked up with the aid of the UCL on-line library facilities so that the funding acknowledgements could be determined. These were mainly in the formal acknowledgement section, but some sources were implicit from the address(es), such as national research agencies and industrial companies. The organisations that had contributed funding were recorded by means of trigraph (three character) codes, together with digraph codes denoting their sector (government, private-non-profit, commercial) and their country. Organisations not in the thesaurus of funding bodies were recorded by means of "generic" trigraph codes that simply designated their sector and country. Some papers had no funding acknowledgements: these would in practice have been supported by general university funds or those of a hospital. It was possible to find funding data for 254 of the 272 cited papers (93%) whose details had been recorded.

Analysis of commentators. Many of the stories included comments on the significance of the results by external commentators. This is a notable feature of biomedical research stories in the mass media, where (for cancer research stories on the BBC website) over 90% of them solicit an external comment – often two or more. The names and affiliations of the

commentators in the *New Scientist* stories were recorded, and a geographical analysis of the latter was carried out using the macro used for the analysis of the cited papers.

Results

The New Scientist stories. There were a total of 162 stories, an average of 7 per issue. Some 92 of them (57%) were short news items without a named author, almost all with a single reference; the others were by 41 different writers, led by Linda Geddes (12 stories) and Andy Coghlan (8), and cited up to 10 papers.

Table 3 shows the distribution of the leading subject areas; the total is more than 100% as some stories covered two or more subjects. Among disease areas, it is notable that cancer is easily in first place and receives far more attention than cardiovascular disease and stroke, even though the latter account for more deaths and DALYs (Disability Adjusted Life Years) in the UK and the USA, though there are more cancer DALYs in Australia and New Zealand, see Table 4. This may have been because of the greater intrinsic scientific interest of cancer research. But it is clear that neuroscience, mainly stories of basic research on the way the human brain works, is the dominant theme.

Table 3. Leading subjects treated in *New Scientist* stories that cite biomedical research, August-December 2008; integer counts.

Subject	N	Subject	N	Subject	N
Neuroscience	36	Infectious diseases	7	Fertility	5
Genetics	22	Virology & vaccines	7	Gerontology	5
Oncology	19	Obesity	6	Obstetrics & gynaecology	5
Pharmacology	18	Psychology	6	Cardiology	4
Mental health	10	Stem cell research	6	Ophthalmology	4
AIDS	7	Alcoholism	5	Toxicology	4

Table 4. Relative death and disability-years from cancer and heart disease in the UK, USA, Australia and New Zealand; WHO estimates for 2002.

	UK		US		AU		NZ	
(thousand)	Deaths	DALY	Deaths	DALY	Deaths	DALY	Deaths	DALY
Cancers	151	1168	559	5077	36.5	306	7.4	67
Heart & stroke	229	1297	923	6156	47.2	268	11.0	66

Analysis of cited papers. The 272 identified cited papers were published in 125 different journals, so the *New Scientist* journalists clearly read widely. The leading journals are listed in Table 5. Perhaps surprisingly, the *BMJ* (formerly the *British Medical Journal*) was not in the list at all. The journals include both clinical and basic research journals, see Table 2.

Table 5. Leading journals in which biomedical papers cited by *New Scientist* research stories (August - December 2008) were published.

Journal	N	Journal	N
Nature	24	*New England J. Medicine*	8
Proc Nat Acad Sci USA	16	*JAMA-J. Amer. Medical Ass'n*	5
Lancet	14	*Journal of Neuroscience*	5
Science	14	*Nature Neuroscience*	5

The cumulative RLj distribution of the cited papers is shown in Figure 3, with, for comparison, the corresponding values for all UK, US and world biomedical papers for 2005. UK papers are more clinical than the world ones, and US papers are more basic. But the papers cited by *New Scientist*, although there are some clinical ones, tend to be quite basic, with a median RLj value of 3.4, compared with a world median of 2.4 and a UK median of 2.1. This is a consequence of the large number of stories about brain functioning and human behaviour, classed as neuroscience.

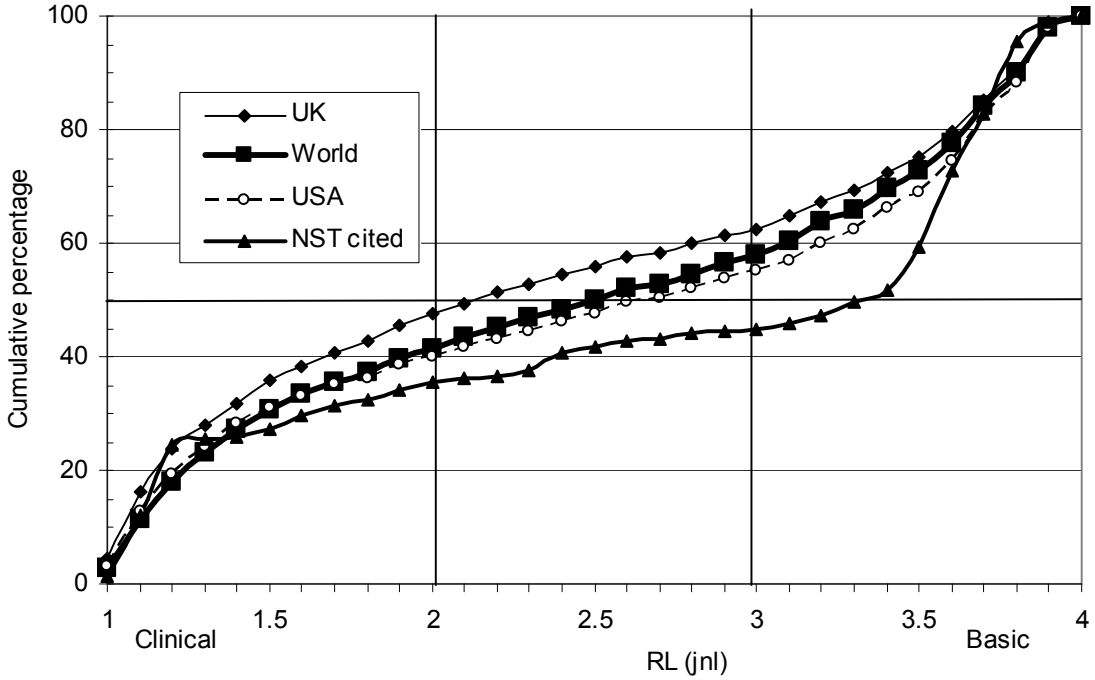


Figure 3. Cumulative RLj distributions for biomedical papers cited in New Scientist stories, and for all UK, US and world biomedical papers (2005). 1 = clinical observation, 4 = basic research.

Geography of cited papers. Details of the addresses of 281 cited papers were obtained – even if the paper was not identified, the story often gave the researchers' institution. They were analysed first by country. Table 6 shows the leading countries represented in these cited papers, on both an integer and a fractional count basis. It also gives the percentage presence of these countries in biomedical research in 2007 in the WoS (the latest complete year for which data were available) on an integer count basis, and the ratio of the two percentages.

Although the number of references is still quite small, some trends are already apparent. In the first place, research papers from both the UK and the USA are over-cited, relative to their presence in biomedical research, by about two to one. This is not surprising for the UK as *New Scientist* is a British publication, but in fact the over-citation of UK research is somewhat less than that occurring in the newspapers (Lewison, 2002), and on the BBC Website

(Lewison, Tootell, Roe *et al*., 2008), where it appears to be about 3:1. The same ratio was found for the references on UK scientific publications in biomedical research and clinical medicine (Glänzel and Schubert, 2005). On the basis of these analyses, one might have expected about 74 UK papers to have been cited instead of the actual 59: the difference is statistically significant at p ~ 4%.

On the other hand, previous analyses of the references in newspapers and the BBC suggested that US research would be cited about in line with its percentage presence in world biomedical research, currently 32%. In fact, *New Scientist* clearly favours US research by almost 2:1. This might to some extent reflect the desires of its readers – the USA had the biggest foreign contribution to readers' letters, see Figure 1 – but the relative neglect of Australia and New Zealand (the latter not shown in Table 6, but there was only one cited paper from that country) despite the large number of local letter writers, suggests that catering to readers' national interests was not a factor.

Table 6. Countries of authorship of papers cited by *New Scientist* research stories (August - December 2008) and these countries' percentage presence in world biomedical research for 2007. INT = integer count basis; FRAC = fractional count basis. Ratios > 1.41 shown bold.

Country	ISO	INT	INT, %	BIOM, %	Ratio	FRAC	FRAC, %
World	Wld	468				281	
USA	US	179	63.70	32.56	**1.96**	144.3	51.35
UK	UK	59	21.00	8.76	**2.40**	34.7	12.35
Germany	DE	24	8.54	7.79	1.10	13.5	4.80
Canada	CA	16	5.69	4.58	1.24	9.3	3.31
Italy	IT	14	4.98	4.60	1.08	8.0	2.85
China	CN	14	4.98	5.17	0.96	5.0	1.79
France	FR	12	4.27	4.91	0.87	8.6	3.06
Sweden	SE	12	4.27	2.11	**2.02**	6.4	2.29
Netherlands	NL	11	3.91	3.07	1.28	4.6	1.63
Switzerland	CH	10	3.56	2.04	**1.74**	5.1	1.82
Denmark	DK	9	3.20	1.21	**2.66**	4.5	1.59
Spain	ES	9	3.20	3.10	1.03	3.7	1.33
Australia	AU	7	2.49	3.16	0.79	4.2	1.49
Ireland	IE	7	2.49	0.55	**4.50**	3.4	1.22
Belgium	BE	7	2.49	1.56	**1.60**	2.3	0.80
Norway	NO	6	2.14	0.78	**2.74**	0.8	0.30
Japan	JP	6	2.14	7.56	*0.28*	3.6	1.28
Israel	IL	5	1.78	1.09	**1.63**	2.6	0.91
Finland	FI	5	1.78	0.94	**1.90**	2.0	0.71

The relative lack of attention to Japanese research in the UK media was found previously, but perhaps surprisingly Chinese research is now not neglected. On the other hand, Scandinavia appears to be well favoured, and the four largest countries are all well represented among the cited papers. [Only the result for Finland is not statistically significant; for the three other countries, p < 1%.] And Ireland has the highest ratio of over-citation, with more than four times as many papers as would be expected.

For the 59 cited papers with a UK address, an additional analysis was made of the postcode areas represented. [This is the first one or two letters in the postcode, and denotes the city, or part of London, thus B = Birmingham, CB = Cambridge, WC = London West Central.] Three areas dominated: Oxford with 12 papers, and Cambridge and London WC (the location of University College London) with 9 each. On a fractional count basis, the "golden triangle" of London, Oxford and Cambridge accounted for 44% of the UK cited papers.

Differences between UK and US cited papers. These are the only two countries with enough cited papers to make a comparative analysis meaningful. The mean RLj of the cited US papers was 2.79, and that of the cited UK papers was 2.49, meaning that the UK papers were in more clinical journals than the US ones. On an individual paper basis, the US papers had a mean RLp of 2.20 and the UK ones, RLp=1.80, showing that the US papers were more basic than the UK ones. However they were all more clinical than the average for the journals in which they appeared.

The mean potential citation impact of the journals in which the cited US papers were published was 54.2 cites in five years (a very high value) on an integer count basis, and that of the UK papers was even higher, at 56.3 cites. But integer count values do not take account of the fact that internationally co-authored papers tend to be published in high impact journals [although this is because they usually have more funding sources and authors – international collaboration *per se*, except with the USA, tends to have a *negativ*e effect on journal impact factors (Lewison, 2003)], and so give a false sense of achievement, particularly for smaller countries with much international co-authorship. On a fractional count basis, the situation is reversed, with cited US papers having a mean PCI of 52.3 cites in five years, whereas the cited UK papers had a mean PCI of only 43.8 cites. The effect of different counting methods is greater for the UK, with an average presence among the addresses (where it was represented) of just 54% compared with 80% for the US presence among its papers. This effect of fractional counting has been noted previously (Aksnes and Sandström, 2006).

News stories and feature articles in New Scientist. It was mentioned earlier that there were two kinds of items that cited to biomedical research – news items, usually anonymous, with just one citation to very recent work (often published on-line before it appeared in print), and feature articles, usually with a named author, and typically several citations, some of which were from earlier years. Of the 272 cited papers for which a date was available, 83 were in the first category, and all but three were from the current year. The large majority (189) were in the second category, and although just over half (105) of the citations were to papers published in 2008 or 2009, 61 were to papers from 2004-07 and 23 to papers published in 2003 and earlier. There was a tendency for the recent papers (2008-09; n = 185) to have a higher representation from the UK (fractional count presence 13.6% compared with 9.8% in the earlier papers), whereas for the USA the situation was reversed (fractional count presence 47.8% in 2008-09 compared with 57.4% for earlier papers). To some extent this reflects the higher US percentage presence in biomedical research in earlier years (Shelton, 2008).

Funding acknowledgements on the cited papers. Of the 254 papers whose funding was determined, 163 were from the USA and 56 from the UK. There were just 35 papers without an explicit (or implicit) funding acknowledgement; the other 219 papers averaged just over 3.0 funders each – rather a high figure. Figure 4 shows the percentages of the US and UK papers with one or more funding acknowledgements from five sectors – own country government, own country private-non-profit, industry, international, other – and none. Even with these small samples, there is clearly a big difference in the two countries' funding patterns. In the USA, funding is dominated by the federal government, mainly the National Institutes of Health (NIH) and its daughter institutes (which are often acknowledged separately), but also the Department of Defense (DOD) and the Centers for Disease Control

and Prevention (CDC). The private-non-profit sector makes a substantial contribution, particularly from numerous individually-endowed foundations, which often jointly contribute to support a project. In the UK, by contrast, the private-non-profit sector leads, with the Wellcome Trust the principal funder. Industry is involved in 23% of US papers but 32% of UK ones: these are relatively high percentages – the normal percentage of industrial support in the UK being about 15% (Webster, 2005) – suggesting that *New Scientist* takes an active interest in research sponsored by industry, mainly small biotechnology firms rather than large pharmaceutical companies, with the exception of GlaxoSmithKline. International support, nearly all from the European Commission, occurs for one in eight of the UK papers but far fewer of the US ones. The UK papers also receive much support from other foreign sources, mostly of course given to its international partners.

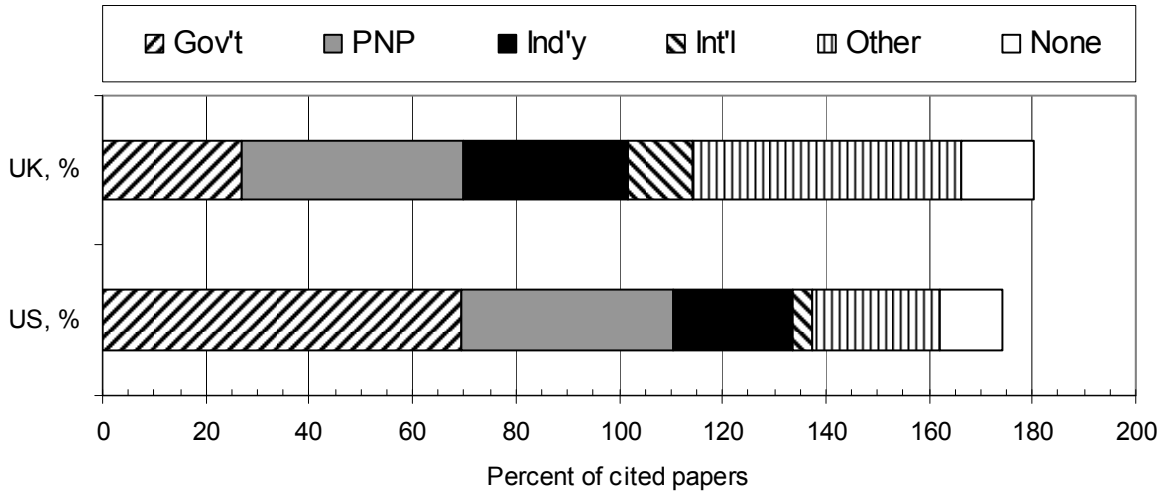


Figure 4. Percentages of papers cited by *New Scientist* from the UK and the US with funding acknowledged from national government (Gov't), national private-non-profit organisations (PNP), industry (Ind'y), international organisations (Int'l), other and none.

Commenting organisations and people. Most of the news items with just one biomedical reference did not seek a commentator on the results; these were invited mainly from the feature articles with a named author. Of the anonymous one-reference stories, only 15 of 83 had a commentator (18%), whereas 62 of the 199 other cited papers did so (31%). Of 89 commenting organisations in total, 43 were academic, and only 10 were from charities and foundations (of which Cancer Research UK provided half), 9 from companies, and 8 each from hospitals and government agencies. Geographically, slightly over half the commentators were from the USA (44 out of 84 papers where there was a commentator), and one third from the UK. This result is in marked contrast to that from the mass media (Lewison *et al*., 2008), where UK charities were the main source of comment on the significance of the new results.

Discussion

This project is continuing, and the present results will become more definitive as time passes and the corpus of biomedical research stories, and their cited references, expand. However, some tentative conclusions can be drawn already. One is that the international readership of a magazine can be approximately judged from the geographical distribution of readers' letters. This hypothesis may also apply to learned journals that encourage discussion of current topics in research; if it does, it may throw some interesting light on the tendency of some countries' papers to receive more citations than those of others in particular journals.

A second conclusion, applicable to the *New Scientist* rather than to the UK mass media, is that there appears to be a US bias in its reporting of research, and Scandinavia also appears to be favoured. This reflects the presence of two *New Scientist* US editorial offices – in Cambridge MA and San Francisco CA – but although there is a small Australian *New Scientist* office, there are relatively few research stories from that part of the world.

Third, whereas the mass media in the UK give much attention to clinical work (often because their readers or audience want to know about possible cures for a disease), *New Scientist* tends to concentrate on basic research, particularly on the workings of the brain. The relative neglect of diseases other than cancer may, however, reflect the small size of the set of cited papers, and would need to be checked with a bigger sample. As was mentioned above, it is remarkable that the set of cited papers did not contain a single one from the *BMJ,* although this journal features prominently in stories on the BBC (Lewison *et al.*, 2008) and in newspapers (Lewison, 2002). Possible reasons are that many of the *BMJ* articles are either very UK-oriented, or are concerned with healthcare policy (*e.g.*, on the workings of the National Health Service), and so would be of less interest to the international readership of *New Scientist*.

Fourth, *New Scientist* is itself cited as the leading source of biomedical research stories in UK newspapers (Lewison, 2002). This suggests that it plays an important role as a publiciser of research, and draws attention through its Press Notices and its stories to new and important work that is then subject to reportage in newspapers, and other media. With its very large circulation, it is likely also to be important to scientists as a source of research news, particularly in the UK, but also in Australia and New Zealand.

In future, it will be interesting to investigate whether papers reported in this magazine enjoy more citations, and more rapid citations, in scientific research articles as a result. In October 2008, an Indian edition of *New Scientist* was produced (fortnightly rather than weekly); this may make Indian scientists more aware of work in other countries, and its effects on them could in principle be detected. There is evidence that the lay press plays a role in the dissemination of research to other scientists (Phillips *et al.*, 1991), and citation by the BBC has been shown to have a small but measurable effect (Lewison *et al*., 2008), so one might expect a positive result for the papers cited by *New Scientist*. Initially, we plan to investigate whether BBC stories about mental health research, including neuroscience, are later or earlier than the corresponding ones in *New Scientist*, in order to determine whether they are plausibly copied from this magazine.

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