to do this intelligently he should organize this by both product and by end-use. A search should then be made of all the patents issued in these specific end-use areas and for each product of interest. These should be categorized by company. In this way the marketing manager can determine: (1) what products are the greatest threat to his company's products, and (2) what end-use areas are of the greatest interest to his competitors.

VII. DEVELOPMENT OF NEW BUSINESSES

This is related to the preceding section. The marketing manager will naturally be interested in all the patents that impinge on the new business area under investigation. The new business should be segregated into its various end-use components, and a search made for all the patents relating to these end-uses and also arrayed by companies. The marketing manager naturally will need to know (1) who are the strongest competitors and (2) which uses are covered by the most patents.

This technique also lends itself to specific analysis of a specific competitor over a long time frame.

VIII. FOREIGN MARKETING

This is an area often overlooked by many marketing personnel. If a company decides to start marketing a product or group of products outside the United States, the company should ascertain if its patent coverage is adequate in those countries in which it intends to begin marketing operations. If not, then steps should be taken to ensure that its patent coverage is adequate. The marketing manager will also be interested in the amount of patent coverage its expected competitors have in those countries.

Much more can be said about the patent needs of the marketing manager. This presentation is intended to touch on only the most important aspects of these needs and to make marketing personnel aware of these needs and of the many assets available for their use within the patent department of their company, as well as outside patent reference services.

Studies on the Metallurgical Patent Literature. I. The Coverage of Patents by Abstracts Journals in Metallurgy

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A survey of the patents coverage policies of abstracts services in the field of metallurgy was carried out. In addition, the coverage of *Chemical Abstracts* was compared to that of Derwent's *World Patent Index*. The average time lag for entry into *Chemical Abstracts* was approximately twice that of *World Patents Index*. A further study on the patterns of equivalent filings demonstrated that by covering just British, American, and French or German patents, an abstract journal could retrieve over 95% of the world's patent output in metallurgy at small cost. On the other hand, abstracts journals which restrict their coverage to only one country's patents miss a substantial portion of the world's patent literature.

INTRODUCTION

Approximately 500 000 new patent documents are published throughout the world each year. Even if only one-third of these are first notices of an invention (the remaining two-thirds being equivalent to early applications), it can be seen that a vast amount of scientific and technical information must be contained in patent documents. In general, the information contained in patents is never published in the journal literature,[1] or, even when it is, the patent information appears well before the journal information.[2] It could be argued that the inventions not described elsewhere are unimportant, but research in Russia quoted by Vcerasny[3] indicates that 10–14% of patents in metallurgy and engineering prompt new developments.

With unlimited staff and financial resources, it would be possible for an information unit to monitor all relevant patents. However, in view of the restrictions most units have to work under, it is probable that most will look to the abstracts journals they subscribe to for details of relevant patents. Despite the fact that abstracts journals in metallurgy are widely used for such purposes, the efficiency of their coverage of the patent literature has never been assessed. This study attempts to provide such an assessment. The evaluation of secondary literature services presents a number of methodological problems, which are more difficult to solve when evaluating patent coverage. Two useful measures are the proportion of relevant material included and the time lag between the publication of this material and its inclusion in the journal. "Relevance" of a patent to the interests of an abstracts journal is extremely difficult to measure objectively. For example, *Lead Abstracts*, if it were to be completely comprehensive, should include all patents where lead is a constituent of a material, but subjective decisions must be made on questions such as whether the lead oxide content of glass is really relevant. Coverage can be tested by comparing patents included with a list of those considered to be relevant, but the result would reflect the difference in the subjective judgments of the compilers of the two lists, as well as any gap in coverage. This problem is compounded by the fact that equivalent patents may be published in a number of countries. A full list of all equivalents must, therefore, be compiled in order to allow for variations in country coverage.

METHODOLOGY AND RESULTS

Journal Patents Policy. A personal letter or telephone call to the editorial departments of the English language journals in Tables I and II resulted in 14 replies (marked × on Tables I and II). Journals known to cover patents to some extent were

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Table I. Abstract Journals in Metallurgy Which Cover Patents

×	*BNF Abstracts* (1)
	Bulletin Signaletique, 740 – Metaux (2)
×	*Cadmium Abstracts* (3)
	Centre Technique du Zinc, Bulletin Analytique (4)
×	*Chemical Abstracts* (5)
×	*Gold Bulletin* (6)
×	*International Copper Information Bulletin* (7)
×	*Lead Abstracts* (8)
	Metal Finishing Abstracts (9)
×	*Metal Powder Report* (10)
	Montanwissen, Schaftliche Literatur-Berichte, B (11)
	New Silver Technology (12)
×	*Platinum Metals Review* (13)
	Powder Metallurgy Science and Technology (14)
×	*Powder Metallurgy Technology* (15)
	Referativnyi Zhurnal (16)
×	*Selenium and Tellurium Abstracts* (17)
	World Aluminum Abstracts (18)
×	*Zinc Abstracts* (19)
	Worlds Patents Index/Central Patents Index (20)

Table II. Abstract Journals in Metallurgy Which Do Not Cover Patents

	Applied Science and Technology Index
×	*British Technology Index*
	Corrosion Abstracts
	Engineering Index
	Extracts of Documents on Copper Technology
×	*IMM Abstracts*
×	*Metals Abstracts*
	Molybdenum Documentation
	Physics Abstracts
	Resumenes de Articulos Cientificos y Technicos, Serie C

asked about the countries covered, time lag between patent publication and inclusion in the journal, selection procedures, and the manner in which equivalents are handled (where this was not made clear in the journal). Those which ignore patents were asked the reason for this.

The moderate response rate makes analysis of the replies difficult, and in the case of journals not covering patents, the form of the letter encouraged opinions rather than asking specific questions. However, a number of interesting replies were received. From those who do not cover patents, three contrasting replies came from *IMM Abstracts* (*IMM Abs*), *British Technology Index* (BTI), and *Metals Abstracts* (*M Abs*). The only reason *IMM Abstracts* does not cover patents is the lack of necessary resources; the need for coverage is realized.[4] Limited staff and financial resources mean that if *British Technology Index* were to cover patents, its primary objective of indexing major articles from British technical journals would suffer. They also query the need to extend the service.[5] In the case of *Metals Abstracts* patents are excluded on principle. "Scientific abstracting services should not include patents. If the contents of a patent is of any scientific value, it will be the subject of a paper in a journal".[6] We have commented on the validity of this argument in another paper.[7]

One interesting point to come out of the replies from journals that do cover patents is the apparent interreliance between the patents coverage of a number of journals. *Selenium and Tellurium Abstracts* (*Se and Te Abs*) is produced directly from the *Chemical Abstracts* (CA) database; the *International Copper Information Bulletin* (*Int Cu Inf Bull*) patent section is derived from items of interest published in *BNF Abstracts* (*BNF Abs*),[8] and *Gold Bulletin* (*Au Bull*) selects its patents from *BNF Abs* and Derwent's *World Patents Index* (WPI).[9] Even the two major sources of patent information—Derwents and CA—cooperated in the abstracting of Japanese patents.[10] Despite the competition within the field of secondary services, some work-sharing is, therefore, practicable.

Patents Coverage of the Services. Table III lists the approximate number of metallurgical patents abstracted by 19 of the 20 journals listed in Table I together with details of countries covered and approximate recall (i.e., proportion of all possible relevant patents actually covered) where known. These figures were not calculated by us, but were provided by the journals themselves or from ref 11.

Table III. Coverage of Metallurgical Patents by Abstracts Services

abstract journal no.	approx. no. of patents abstracted per year	no. of countries covered	recall, %	time lag (months)
1	700	1		
2	1 500	1	12	
3		11		
4	275	7		
5	69 000	26		5[12]
6	120	6		2-9
7	25	1		
8	160	11		4-8
9	2 000	8	50	1-5
10	600	3		12
11	450	10		
12	200	6		
13	150	4	40	2-18
14	300	3	25	6
15	150	1		
17	600	26		5
18	2 000	6		
19	250	11		4-8
20	100 000	24		1-2

Equivalents are handled in a variety of ways. *World Aluminum Abstracts* abstracts the first patent of a family to appear anywhere, and when an English equivalent first appears, the citation is given with a reference to the original abstract.[13] In contrast, *Metal Finishing Abstracts* abstracts all relevant patents published in the USA, UK, USSR, and West Germany, irrespective of whether the patent has already been noted in another of these countries or not. *Chemical Abstracts* (CA) has the most sophisticated equivalents system. Basic (new) patents are abstracted and indexed; equivalents enter the *Patent Concordance*. CA aims to cover patents from 26 countries, but in many of these countries, patents from national inventors only are covered.[12] The number of countries in Table III indicates the nationalities of patents that may be found in each abstract journal and does not necessarily mean that full coverage of all these countries' patents is achieved.

Patent Indexes in Abstracts Journals. Cumulated patent indexes make searching to see if a particular patent has been noted very easy. In fact only WPI, CA, *Lead Abstracts*, *Metal Finishing Abstracts*, *Montan*, *Zinc Abstracts*, *Referativnyi Zhurnal*, and *Powder Metallurgy Science and Technology* provide cumulated (mainly annual) patent number indexes. *World Aluminum Abstracts* has a separate patent subject index and *Bulletin Signaletique* has an annual patent applicant index.

Coverage of *Chemical Abstracts*. We remarked earlier that a number of abstracts journals in metallurgy rely for their patent information on CA or Derwent's WPI. The question of how well these services cover patents has therefore a wider significance than at first sight. WPI indexes all new patents appearing in 24 countries on any subject matter by means of the International Patent Classification (IPC) and is generally agreed to be the most comprehensive patent documentation service available to chemists.[14,15] Therefore, one way to test the coverage of CA is to take a sample of relevant patents from WPI and find out what proportion were noted by CA. This may not be a totally reliable measure, as WPI may itself suffer from deficiencies, but it does provide some indication of the coverage of CA.

Two sets of patents were selected from WPI. The first set of 202 patents was selected to give patents published in 1973

Table IV. Coverage by CA of Two Samples of Metallurgical Patents

	general metallurgy sample		zinc/copper/tin sample	
	no. in sample	% covered	no. in sample	% covered
Belgian Patents	12	0	0	
W. German Patents	27	81	15	93
Japanese Patents	64	77	33	85
USSR Patents	49	69	84	85
USA Patents	25	96	48	96
Others	25	64	20	55
Total	202	73	200	86

Table V. Delays between Patent Publication and Inclusion in CA

	no. in sample		mean delay (days)		longest delay (days)		shortest delay (days)	
country	1st	2nd	1st	2nd	1st	2nd	1st	2nd
USA	25	44	149	153	419	333	69	41
W. Germany	22	14	146	152	338	229	80	94
Japan	49	28	271	220	604	359	83	115
USSR	35	70	269	246	466	1338	34	132
Others	16	15	285	227	462	391	130	124
Total	147	171	227	208	604	1338	34	41

and 1974 which gave a broad coverage of metallurgy. The second sample covered four specific areas relating only to copper, tin, and zinc metallurgy (pretreatment and extraction; alloys, electrolytic and electrothermal production and refining; and electrocoating). In all, 200 patents published between July 1973 and November 1975 were chosen for this second sample. In the first group, every tenth patent noted by WPI in the broad field of metallurgy between February and July 1974 was chosen; in the second group every relevant patent noted by WPI after January 1975 was recorded until 200 items had been collected.

CA's *Patent Index* and *Patent Concordance* were checked for the years 1973–75 for the first sample and 1974–76 for the second. Overall, 73% of the patents in the first sample and 86% of the patents in the second sample were noted by CA. These figures are comparable to results obtained in other tests of the patents coverage of CA.[14,16,17] CA, being based in the USA, would be expected to cover US patents best; and this was indeed confirmed—96% of the US patents in both samples were noted.

Table IV lists the "success rate" for CA for the major countries represented in each sample. In would appear that in general CA abstracts virtually all US patents it meets of the slightest chemical interest, but is far more selective in the case of foreign patents and does not note the patents of more marginal interest. The poor coverage of Dutch and Belgian patents noted some years ago[14] does not appear to have improved. Combining the two samples, none out of 12 Belgian, and one out of seven Dutch patents were monitored. One important reason for this poor coverage was CA's policy of abstracting inventions of national inventors only for most of the period covered. Analysis of the second sample by subject matter also indicates a subject variability in CA's coverage, ranging from 94% for alloys to 73% on electrocoating.

Timeliness of *Chemical Abstracts*. Using those patents in our two samples which were abstracted by CA, we calculated how much time passed between publication of the patent and its inclusion in CA. Table V summarizes our results. These results indicate considerable variation in time lag and an overall time lag substantially worse than has been claimed by CA for median currency for all their patents (150 days) or for all US patents (110 days).[18] The fact that the second sample performed somewhat better than the first may be due to the different subject matters of the sample, or due to the fact that the second sample is more recent than the first and that CA is becoming more efficient. We also calculated the average time lag for WPI for the 147 patents noted by CA in the first sample. The results are shown in Table VI and confirm the reputation of WPI for speed.

Table VI. Comparison of WPI and CA for Timeliness in Sample I

		mean delay (days)	
country	no. in sample	CA	WPI
USA	25	149	43
W. Germany	22	146	42
Japan	49	271	59
USSR	35	269	275
Others	16	285	77
Total	147	227	107

Equivalent Patent Filing. Most abstracts journals limit the countries whose patents they survey and, among other reasons, this decision depends on the country in which the journal is based and its language, the ease of acquiring and translating foreign patents, and the financial resources available. These factors vary from journal to journal but one aspect relevant to them all which has so far received little attention is that of the various combinations of countries in which equivalent patents are taken out.

An equivalent may be defined as a patent with the same priority country, date, and number as an earlier one taken out in another country—the earliest patent with this priority reference being known as the basic. One priority application may result in a number of patents in a country.

It is normal to cover national patents as well as the first publication of that family to come to the journal's notice. *Bull Signal*, at one extreme, limits itself to French patents only and *BNF Abs* to UK patents.

We decided to test the implicit assumption made by *BNF Abs* that most important inventions in their field will get patented sooner or later in the UK. A sample of non-UK patents was, therefore, required in the subject area covered by the British Non-ferrous Metals Research Association. WPI only began in 1974 so it could not be used to select such a sample, but Derwent's *Country Patents Reports* were produced in 1972 and the chemical editions are classified into 12 sections, the final one being metallurgy. The countries for which Derwent patent abstracts journals were available and the size of the sample taken from each are shown on Table VII. One in 20 patents was selected from January, February, and March, 1972 issues, but in each case the IPC classification was looked at and the abstract read to ensure that the subject covered dealt with nonferrous metals. Where this was not so, the next patent was examined and, if suitable, used. This laborious process could have been avoided if we could have used *Central Patents Index*—Section M, but at the time that this research was carried out we did not have access to this service.

The sample selected totalled 213 patents, and for each of these the issue date and priority date were noted. When these were compared it was realized that a number were equivalent to others in the sample. The sample was reduced so that only one patent for each priority reference was included, the one with the later issue date being discarded from the original sample, which finally numbered 206 patents. Equivalents to the 206 sample patents were searched for using WPI priority concordance index and CA patents concordance and index. The WPI search should have brought to light all members of patent families where an equivalent has been published since 1974.

Those sample patents not found in WPI were then looked for in CA concordance index. When an equivalent is monitored by CA it is put in this index with a cross-reference to

Table VII. Equivalents of Metallurgical Patents

nationality of patent checked	sample size	% with 1 or more equiv
W. Germany	47	74
USA	37	38
France	31	81
USSR	26	4
Japan	43	34
Netherlands	9	44
Belgium	7	86
S. Africa	6	83
Total	206	51

the original abstracted patent. Under the original patent number are listed all known equivalents up to that date. The 20–30% of general metallurgy shown to be omitted by CA earlier is likely to be reflected in similar omissions in equivalents coverage.

Table VII lists the percentage of sample patents from each country which have equivalents in other countries. Overall about 50% of the sample (102 of 206) have no known equivalents, but the limitations of CA and WPI must be remembered and this therefore is a maximum figure.

Examination of Table VII further demonstrates that nonferrous metallurgy patents appearing in the USA, Japan, and USSR are unlikely to appear elsewhere.

It is possible that an important invention may be patented in one country only, but it seems logical that the more important an invention, the wider will be the area over which it is protected.

The sample 104 patents with foreign equivalents had in all 514 related equivalent patents (an average of about six per family), making a total of 618 spread over 16 countries. The family size ranged from 2 to 12 patents.

We also calculated the time lag for publication of equivalent patents in other countries, taking the publication date of the first patent to appear in any family as a baseline.

Our sample confirmed that patents appearing in Belgium, South Africa, France, Japan, Netherlands, and West Germany appear rapidly; patents appearing in the UK, USA, Canada, and Switzerland are relatively slow. The former group of countries are "early publication" countries which publish unexamined patent applications. The latter group publish patents only after examination is complete.

Only one of the 36 patents taken out in Belgium was not the first in its family. If there were no problems in acquiring Belgian patents, about one-third of the patents filed in more than one country could be monitored most rapidly by scanning Belgian patents. South African, French, and Japanese patents all appear on average 3 months after the first publication, but the standard deviation and range for Japanese are relatively high. The combination of a high proportion of the equivalents (about 80%) and rapid publication means that France is a worthwhile country to scan if someone wishes to keep up to date with the patent literature. A similar comment can be made about West Germany. About 2 years, on average, elapses before a British equivalent to a foreign patent is published, but on three occasions the British patent was the first to be published. The standard deviation from the mean is less than half the average time lag, and the maximum delay stands at about $3^1/_2$ years. A slightly shorter time lag (about 16 months) and higher standard deviation were found for US equivalents, but a higher proportion of patents have equivalents in the UK (73% as opposed to 64% in the USA).

The average time lag between the first publication and that in Canada and Switzerland is about 3 years, while for examined Japanese patents it is more than 3 years.

With recent changes in the patent laws of a number of countries, including the UK, it is likely that the time lag before patent publication in these countries will decrease. The present situation, where some publications appear up to 8 years before those in other countries, makes information gathering from patents more complicated than it need be and detracts from the value of patent information by decreasing its timeliness.

The primary aim of the equivalents search was to see how far abstracts journals, such as *BNF Abs*, were justified in limiting their patents coverage to the UK. *BNF Abs* and *Int Cu Inf Bull*, which selects its patents directly from *BNF Abs*, are the only journals we studied to look just at British patents. Of the original sample from outside the UK, about 50% are patented in one country only; 104 had foreign equivalents and 73% of these were patented in the UK. Therefore, 37% of the original sample have equivalents in the UK. A search through the last 10 years of *BNF Abs* shows that only 30 of the 76 samples appeared in the journal, i.e., 39% of the British equivalents, representing only 15% of the whole original sample. Each abstract was read carefully before its original inclusion in the sample to ensure that it came within the subject of nonferrous metallurgy and, although the relevance of some patents could probably be disputed, the coverage of the field by *BNF Abs* is undeniably poor.

Our sample shows that by extending coverage from British patents to US patents as well, 88% of the patents with foreign equivalents could be monitored—a quite considerable increase without any translation costs. In addition, a large proportion (about 60%) of the original US sample had no equivalents elsewhere and these would also, of course, be covered.

Bull Signal covers only French patents; 77% of the sample with equivalents had a publication in France, giving a theoretical coverage similar to that for *BNF Abs*, but the actual coverage could not be measured because there is no patent number index and patents are not distinguished in the issues from other forms of literature.

Montan, an East German publication, claims to cover ten countries in the required subject area. In fact a search through the patent index to the end of 1974, the last issue available, showed that only one of the three East German patents and 13 of the 92 West German patents had been included, i.e., about 13% of the sample with equivalents. Coverage for countries outside Germany is extremely sparse.

The other abstracts journals cover more specific topics. However, if the pattern of equivalent filing found for metallurgy in general is assumed to be similar for narrower topics, such as powder metallurgy, it can be shown that by extending coverage of US patents only (as *P/M Technol* does) to include Canada as well (as *P/M Sci* and *Technol* does) the proportion of patents with equivalents monitored rises from 64 to 85%. The Canadian patents with no foreign equivalents will of course also be included. A large share of patents with equivalents can be monitored by looking at either UK, US, and French, or UK, US, and West German patents. A search through UK patents alone should yield 73% of the 104 sample; UK + US will give 88% coverage; UK + US + France will yield 96% coverage, and for UK + US + West Germany this figure is 98%. Of course, the Russian and Japanese patents not filed in any of these countries will be omitted, but the information contained in them would be very expensive to obtain. Apart from these two countries the rest of the world's inventions can be well covered by monitoring only one of these combinations of three countries with a minimum of cost as only one foreign language is required. West Germany, France, and, in the near future, UK are relatively fast publishing countries, thereby minimizing the delay before information is available.

The logical answer to the multiple publication and protection of the same invention at different times in different countries would be a "world patent", published simultaneously in all the desired countries in the required languages. This, however, is a thing of the far distant future and for the moment the best

must be made of a complicated situation.

CONCLUSIONS

A number of conclusions can be drawn from this study. In general, abstracting journals in metallurgy cover patents in a cavalier fashion either because they ignore patents altogether or because they restrict their coverage to too few countries. *Chemical Abstracts* attempts to cover all the world's chemical patents and we have found that its coverage of the metallurgical patent literature is reasonable, but not as good as *World Patent Index* either in terms of coverage or timeliness. However, it does provide fuller abstracts than WPI. The more chemically oriented the subject, the better is the CA coverage, but its coverage of Belgian and Netherlands patents continues to be poor.

Finally, the policy of a number of abstracts journals to restrict their coverage to one country's patent seems unwise. Extension to coverage to only three countries would give excellent coverage of the world's patent literature without loss of timeliness and with a not too excessive translation burden.

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Studies on the Metallurgical Patent Literature. II. Case Study on GALVALUME

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A study was made of the patent and nonpatent literature coverage of a new steel coating process known as GALVALUME. It was found that *Chemical Abstracts* and *Metal Finishing Abstracts* noted all seven patent families which discuss GALVALUME. Very little nonpatent literature has appeared on GALVALUME; the earliest such material appeared 6 years after the first patents and gave very little detailed information. The first detailed description in a journal appeared 10 years after the first patent. These results confirm Liebesny's views that patents give fuller and faster information on technological developments than do journal articles.

INTRODUCTION

In an earlier paper[1] we examined the coverage of patents by a number of metallurgical abstracting servies. A number of these services do not cover patents at all and the editor of one (*Metals Abstracts*) commented in reply to our query[2] that "scientific abstracting services should not include patents. If the contents of a patent is of any scientific value, it will be the subject of a paper in a journal." This is a fairly widespread assumption, and we therefore decided to assess its validity with a case study on the major metallurgical development known as GALVALUME.

GALVALUME is the trade name for a hot-dip coating of an aluminum–zinc alloy which can be applied to steel. It was first patented by the Bethlehem Steel Corporation in 1966 and a number of foreign filings and subsidiary patent filings followed. GALVALUME was a completely new alloy coating for steel which combined the best properties of the traditional pure aluminum and zinc coatings. The nature of the invention meant that it came within the scope of abstracts journals in the fields of aluminum, zinc, metal finishing, and general metallurgy, and the coverage of GALVALUME patents by these journals can be used to give an indication of their patents coverage.

METHODOLOGY

Our first task was to prepare a list of GALVALUME patents. We were fortunate in having access through the Zinc/Lead Development Association Library to a list of these patents current up to 1976. Those on this list were examined and their priority dates, references, and issue dates were noted. Searches through WPI (*World Patents Index*) and CA (*Chemical Abstracts*) equivalent indexes added a number of new equivalent patents. The patents were then organized into families, according to their priority dates. A number of Luxemburg and Italian patents included on the initial list were not found in WPI or CA, nor were they held by the Science Reference Library in London. This is because Luxemburg and Italy are not covered by WPI, and Luxemburg and nonnational Italian patents are not covered by CA. The families which they belonged to therefore are not known. These patents are listed in Table I, with two Canadian and one Swedish patent which had priority dates not corresponding

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