

Trends disrupted—patent information in an era of change [☆]

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Abstract

Patent analysts predict trends in research and the business environment by studying the numbers and classifications of patents issued to companies around the world. Those attempts are often affected by the changes taking place in international treaties, governments, patent laws, patent classification systems, and corporate mergers and acquisitions. This paper describes some of the changes in the patent information environment that have disrupted the trends predicted by patent analyses in the past.

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1. Introduction

Patent analysis is very trendy these days. We look for trends because we believe that knowing what has happened in the recent past will help us predict what will happen in the future. Patenting trends are no exception. We look at the numbers of patents applied for or published in recent years by a company or in a technology to find trends in research and development. We look at patenting trends in a country to predict future economic development. Looking for patent trends is much more convenient that it used to be. Patent information is now widely available and relatively inexpensive, and there are increasing numbers of simple tools that can be used to analyze patents. In 2003 the Patent Information Users Group Annual Conference took Patent Analysis as its theme and had a record breaking number of exhibitors, most of them promoting software for patent analysis.

Patent data is subject to a great many forces that have little or no connection to trends in research and development or economics. Events that disrupt patenting trends, or disrupt the observation of those trends, can be international, for example, changes in international treaties and patent classification systems; national, for example, changes in patent laws and regulations; corporate, such as mergers and acquisitions or modifications in patenting policies; or simply changes in available data as databases change their coverage of countries or technologies. The last 10 years have been particularly disruptive to patenting trends. At the same time, patent analysis depends on data released by patent offices and provided by patent databases, each of which has its own standards for selecting and formatting data. Trends illustrated by analysis of the data often fail to account for the changes that disrupt technical and economic behavior. It is important to note that the era of cheap patent data and easy-to-use statistical software coincides with an era of unprecedented change in the patenting environment, as the combination often leads to facile analyses that can mislead as well as inform.

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2. Patenting trends in India

A dramatic illustration of disrupted patenting trends appears in a study published by Prabuddha Ganguli in World Patent Information in early 2004 [1], discussing the publication of patents in India over the period from 1979 to 2004. India was slow to introduce modern patent laws after it emerged from the shadows of the British Empire. In 1970 India amended its patent laws, and the new laws restricted the coverage available to patentees. Pharmaceutical, food and agricultural chemical products were declared unpatentable except through process claims. For most other inventions, the law introduced a term of 14 years from filing [2], but patents claiming food, drug and insecticide processes were given a term of only 7 years from filing or 5 years from sealing, whichever was shorter [3]. In view of the change in patent terms, it is not surprising that the number of patents in force, shown in Fig. 1, dropped severely: patents granted under the older law expired, the term of newer patents was shorter, and many companies were discouraged from filing Indian patent applications because claims for chemical compounds and medicines were excluded from coverage.

The effect of the 1970 law is evident in Fig. 2, which shows the number of patent applications filed in India over the years and the number of patents granted over the same period. There is always a lag of a number of years between filing of a patent application and grant, and the number of granted patents in any country will be lower than the number of applications filed, because applicants abandon some applications and patent examiners reject others. Indian patent applications settled in at a low level until about 1995, when the trend was suddenly disrupted by the passage of the General Agreement on Tariffs and Trade (GATT), which required that any country that wanted the advantages of membership in the World Trade Organization allow patenting of pharmaceutical compositions and patent terms of at least 20 years from their filing dates by January 2005.

India had a long way to go to meet the GATT requirements and patent applicants' expectations. India

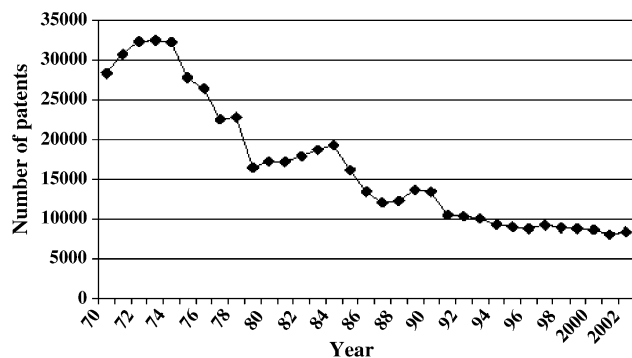


Fig. 1. Patents in force in India (1972–2002). (Reproduced with permission from Ref. [1]).

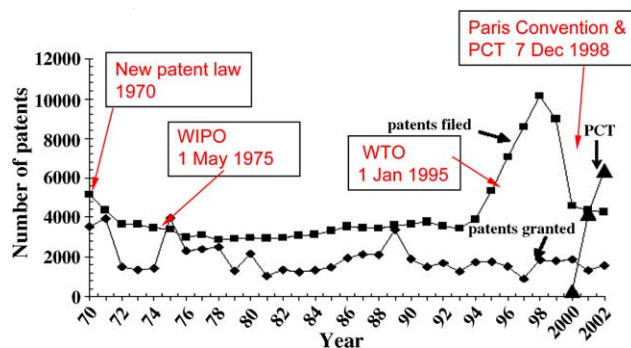


Fig. 2. Patents filed in India 1970–2002. (Adapted from Ref. [1]).

was not even a member of the World Intellectual Property Organization until May 1, 1975[4]. Joining WIPO did not change the provisions of the patent law, so the behavior of patent applicants did not change much at that time. The number of patent applications filed remained steady at 4000–5000 a year until the General Agreement on Tariffs and Trade took effect, establishing the World Trade Organization. India became a member of the WTO in January, 1995 [5], but it announced in 1996 that it would take advantage of the provision of the GATT treaty allowing less developed countries to postpone amending their patent laws until 2005. The number of patent applications filed in a year doubled after India joined the WTO, as applicants expected that more favorable patent laws to take effect in the immediate future, but the lower line on the graph shows that the number of patents granted did not increase because the law and patent office procedures had not yet changed. Patent applications covering pharmaceutical and agricultural products were accepted for future processing and kept in a “mailbox” until such time as the law would allow them to be examined. The new law was finally enacted on December 26, 2004, and information on the numbers of mailbox applications and the names of applicants began to be released in March, 2005 [6–8].

India finally acceded to the Paris Convention on December 7, 1998, and joined the Patent Cooperation Treaty on the same day. The number of Indian *national* patent applications immediately fell to its old level, while the number of PCT applications filed in India rose from zero to around 8000 by 2002. We can expect that increased numbers of Indian national patent applications will be filed under the 2005 laws and PCT applications filed after 1998 enter the national phase, but it is impossible to know what the future will look like until the publication of data reflecting the new laws.

3. Patenting trends in the United States

The situation in India is not unique to third world countries. Trends in patenting in the United States have

also been disrupted by changes in patent law during the last 10 years. US patent law was relatively stable for about 50 years. Patent applications were kept secret until they were granted—there were no pre-grant publications. The term of a patent was 17 years from grant no matter how long the patent application had been pending. Applicants were permitted to file divisional, continuation, and continuation-in-part applications as long as a parent application was pending. This sometimes resulted in “submarine patents” that surfaced many years after the original filing date and stayed in force for 17 years.

Fig. 3 shows the number of US patent applications filed from 1990 to 1999 and the number of patents issuing during those years [9]. The applications show a gradual increase during those years, while the number of patents granted stays nearly steady until it increases toward the end of the decade.

Close examination of the chart shows a larger increase in applications in 1995 followed by a decrease in 1996. The reason for this change is a change in the patent law—actually two different changes, both of them in response to GATT. On June 8, 1995, the term of a utility patent was changed from 17 years from grant to 20 years from the earliest US filing date. That change severely disrupted the patent filing strategy of many US companies. Those companies had been planning to extend the effective terms of their pending applications by filing divisions and continuations-in-part shortly before patents would be granted. If filed under the new law that took effect on June 8, 1995, many of those divisional patents would have expired much earlier than under the old law. The companies and law firms representing them responded by filing the continuing applications earlier than planned to maximize the terms of the eventual patents. The new law also introduced provisional applications, which could be used in the same way as a claim for foreign priority to extend the term of a patent to 21 years from the first international filing.

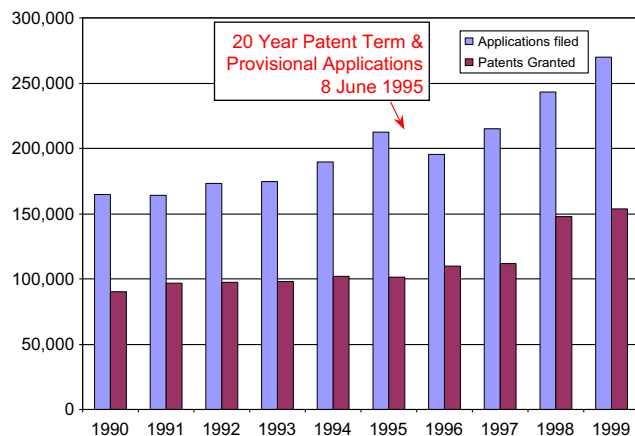


Fig. 3. US patent trends, 1990–1999.

This provided a motivation for United States-based applicants to delay the filing of new applications until after the law changed.

A closer look at the patents that issued from patent applications filed in 1995 [10] hints at the magnitude of this disruption to the previous trend. Fig. 4 shows that more than three times as many patents have issued from applications filed in June 1995 than in the following month. This chart does not really capture the magnitude of the difference—most of the applications filed in June 1995, were filed during the first week of the month. An unprecedented number of patent applications flooded into the USPTO between 1 June and 7 June, and seriously disrupted the processing of patent applications for many months afterward. The magnitude of this disruption is even more evident in Fig. 5, which shows the number of US patents that issued from applications filed two weeks before and after 7 June 1995. A sharp rise in the number of filings was seen in the week before 7 June and the number of filings fell precipitously on 7 June and remained at that low level for the following weeks. Virtually no patent applications were filed on Saturdays, Sundays, and the Memorial Day holiday, when the US Patent and Trademark Office

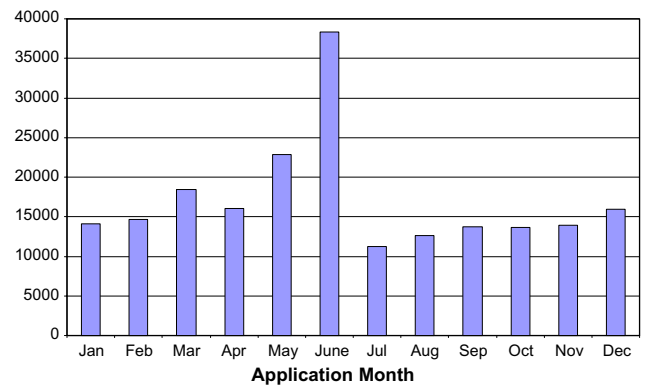


Fig. 4. US patents based on applications filed in 1995.

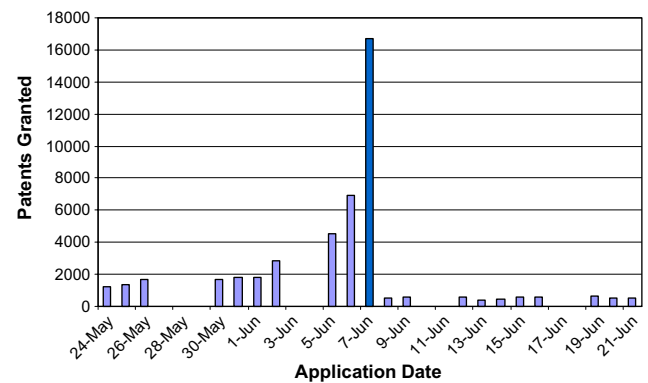


Fig. 5. Patents granted on US applications filed 7 June 1995 ± 2 weeks.

mailroom is closed. Of 48,375 patents from applications filed during that 29-day period, 16,703 were filed on 7 June, more than the average for applications filed in an entire month.

The 1995 changes in the patent term caused only a temporary disruption in US patent trends. As shown in Fig. 6, the number of applications filed returned to its upward trend and the number of patents issued leveled off again. On November 29, 2000, there was another major change in US patent law. The new law mandates publication of patent applications 18 months after their filing date. The new law seems not to have much effect on the number of patents granted, but it has had a profound effect on the number of patent publications [11].

The first pregrant publications began to appear in March of 2001, and, as shown in Fig. 7, the number has skyrocketed. Before the law was amended independent inventors and small companies were convinced that pregrant publication would make their inventions more vulnerable to better financed competitors, so a compro-

mise was including in the law exempting from pre-grant publication any application certified by the applicant not to be filed in any other country that publishes patent applications 18 months after filing. Although previous experience shows that most applicants for US patents do not file corresponding applications in other countries, only about 10% of applicants take advantage of the exemption and ask to have their applications kept in secrecy. Contrary to expectations, almost all US applications are being published, while granted patents continue to be issued at the usual rate. In 2003, over 406,000 US patent documents were published, only about 42% of them granted patents. As time goes on an increasing number of the granted patents are second publications of patent applications that were published earlier. This situation confounds many patent analyses and strains the resources of patent databases.¹

4. Corporate patenting trends—Cognis

Most people are more interested in companies and technologies than in national patent law. It would seem to be a relatively simple matter to judge the levels of research and development within a company by looking at its patenting trends. And sometimes the trends hold true. But sometimes they do not, as can be seen by looking at the patenting practices of one company, Cognis, over recent years. Fig. 8 uses the data from the PlusPat database on Questel-Orbit, which includes data from the INPADOC and DOCd.B databases with national patent data and combines granted US patents and their published applications in a single record, providing one database record for each patent application.

This chart shows the distribution of US patents assigned to Cognis over the time period from 1990 to 2003. Cognis is a large, prosperous company—why does it appear that the company has so few patents before 2001? Cognis is a very old company. Its website says it has 160 years of experience [13]. But it is also a very new company, spun off by Henkel in 2001. If we are going to track its patent portfolio, we need to find out whether any earlier patents were reassigned to Cognis. If the original patent owner has recorded the transfer of its patents at the US Patent and Trademark Office, we can do that by using the IFI Current Legal Status database (IFICLS) and searching for Cognis as the assignee in reassignment records and tabulating the original assignees in those patents. IFICLS includes records for patents reassigned by the original patentee after grant of the patent, and looking at the original assignee

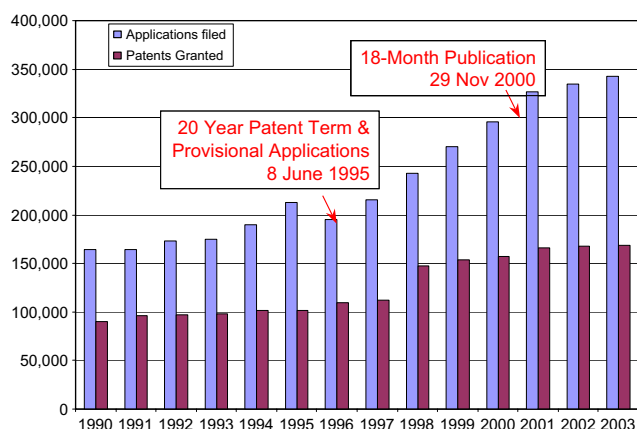


Fig. 6. US patent trends, applications filed and patent publications, 1990–2003.

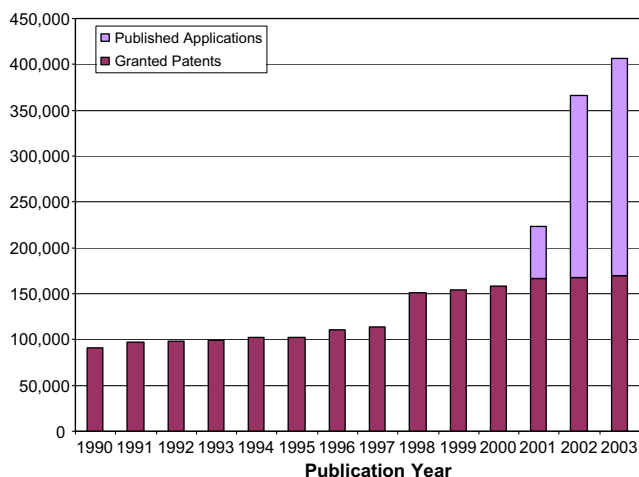


Fig. 7. US patents and published applications in 1990–2003.

¹ Note: The disruption to trends in patent filing and publication in Europe has generally been less severe than in the USA over the same timescale, but still make predictions from the observed trends difficult to quantify reliably [12].

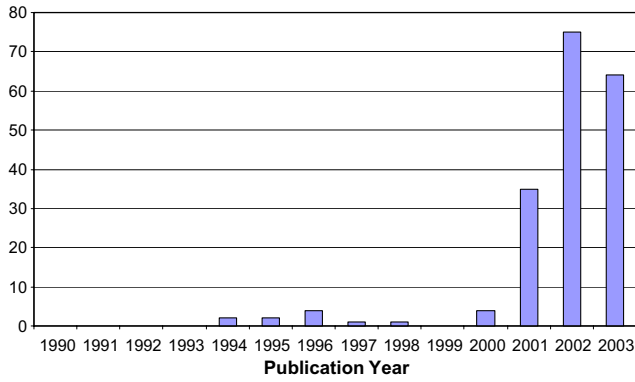


Fig. 8. Cognis US patents by publication year, 1990–2003 PlusPat records.

name tells us which companies have given or sold intellectual property to Cognis. This data was assembled by searching the reassignment data in IFICLS, and analyzing the original patentee data in PlusPat.

When we search for patents reassigned to Cognis in Fig. 9, we see that the company owns a substantial patent portfolio of US patents originally assigned to it or reassigned to it by the original assignee. The IFI Current Legal Status file has 718 patents reassigned to Cognis, with issue dates as early as 1983. The reassigned patents provide some interesting hints about the history of Cognis and its relationships with other companies, as shown in Fig. 10. Not surprisingly, most of the patents were reassigned to Cognis by Henkel, but some of the names belong to companies that owned the Cognis business before it became part of Henkel in 1989 [14], and others are probably partners in joint ventures or development agreements.

Every database has its own indexing conventions, even when the databases include the same documents. How much difference would it have made if the analysis of Cognis patents had been done using data from a different database? Fig. 11 shows the number of patents

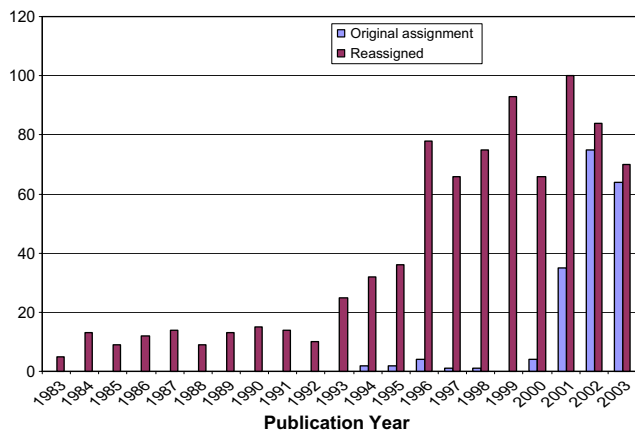


Fig. 9. US patents assigned and reassigned to Cognis.

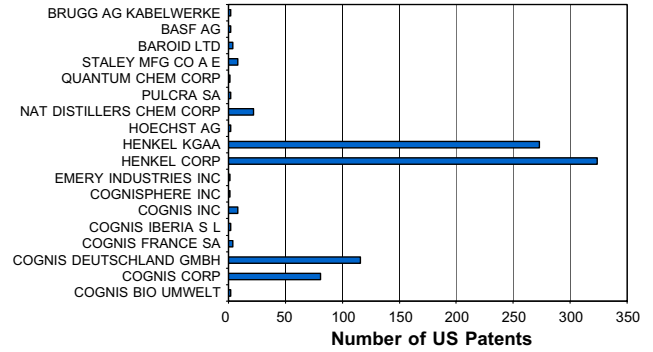


Fig. 10. Original assignees of US patents assigned or reassigned to Cognis as of October, 2004.

- PlusPat 218 US patent records
- IFI CLAIMS 324 US patent records
- Delphion 456 US patent records

Fig. 11. US patents assigned to Cognis comparison of three databases.

listing Cognis as the assignee in three different databases. Using PlusPat and limiting to US patents, using the Delphion US granted and published applications file segments, and using the IFI CLAIMS US Patent database on Questel-Orbit, a search was done for the word Cognis in the patentee name field. There were 218 US patent records for Cognis in PlusPat, 324 records in IFI CLAIMS, and 456 US granted patents and published applications in DELPHION—an extremely significant difference.

Fig. 12 shows the assignee names, and number of patents in each name that has more than two records in any of the three databases. There is quite a difference here, too. IFI shows about twice as many patents assigned to the Cognis Corporation, the US unit of the company

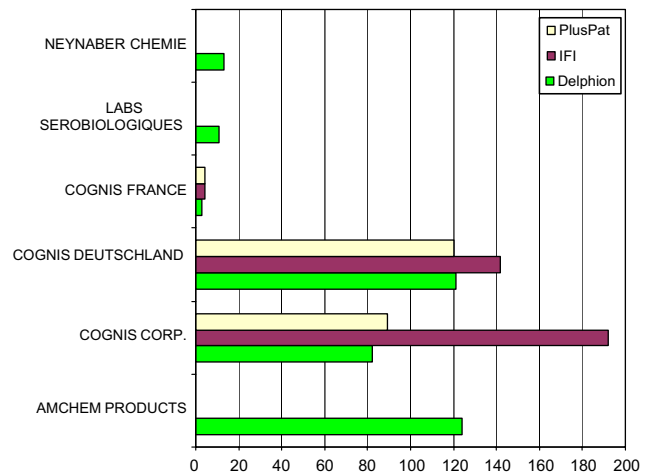


Fig. 12. Assignees of Cognis US patents comparison of three databases.

as PlusPat or Delphion. Delphion shows three patentee names that are not indexed by either PlusPat or CLAIMS. Most of these extra patents are assigned to Amchem Products.

What is going on here? There are differences in both database structure and indexing systems.

Pluspat uses INPADOC standardized patentee indexing. Unlike many patent databases, it combines all publication stages of a patent into a single document. Where both a published application and a granted patents have been issued, they appear in a single record.

IFI CLAIMS has its own standardized patentee indexing. The version of CLAIMS on Questel-Orbit has separate records for published applications and granted patents. United States patent applications are different from those of most countries in that ownership of patent rights automatically belongs to the inventor or inventors, and that the inventors are entitled to delay assigning rights to the eventual patent owner until shortly before a patent is granted. A great many US patent applications are published without the name of a corporate assignee. IFI is aware that users of its databases want to know the true ownership of patent applications, and it recognizes the fact that many patent applications are filed by a corporate patent department, the name and address of which are printed on the publication. In the CLAIMS files, the name of the corporate patent department is entered as the “probable assignee”. This can result in much higher counts of assigned patents than in other US patent databases.

Delphion has partnered with CHI Research to use CHI’s Corporate Tree indexing of patent assignee information for United States and European patents and applications. CHI goes beyond simply standardizing company names; it identifies corporate relationships and creates a Hierarchy under the parent company’s name. Delphion uses the Hierarchy as the default when searching for patentee names and does not show the CHI parent company information in the record of

the patent. While this can be helpful in identifying the ultimate ownership of patents belonging to complex corporate organizations, the scheme is applied without referring to actual assignment or reassignment records. Sometimes a search will retrieve patents assigned to a company that seems to be completely unrelated to the one the searcher is looking for. And sometimes those companies really *are* unrelated.

What is the relationship between Cognis and Amchem Products? Amchem Products received its latest US patent in 1989, and we know from our earlier search in IFICLS that Amchem’s patents were not reassigned to Cognis. According to a court decision published through the Internet [15], Amchem Products Inc. reorganized its business during the late 1970’s, and split into two companies. One of the successor companies became a subsidiary of Union Carbide and was merged into Rhone Poulenc in 1992. The other successor company eventually became a subsidiary of Henkel and was merged into the parent company in 1988. Cognis was also a part of Henkel until it was spun off in 2001. Henkel was a very large company with a complicated history of mergers, acquisitions, reorganizations and spinoffs during the years between its acquisition of Amchem Products and the creation of Cognis. CHI may have had good reasons for including Amchem in the Cognis hierarchy and omitting other predecessor companies like National Distillers and Chemicals, but the reasons are not obvious to the author.

5. Corporate patenting trends—Dow chemical

The Dow Chemical Company is another large company with a long history. What do we see when we look at Dow’s patent trends? Fig. 13 shows the number of Dow’s US patent records in the PlusPat database with priority application dates from 1983 to 2002. Surprisingly, the number of patents issued to Dow peaked at

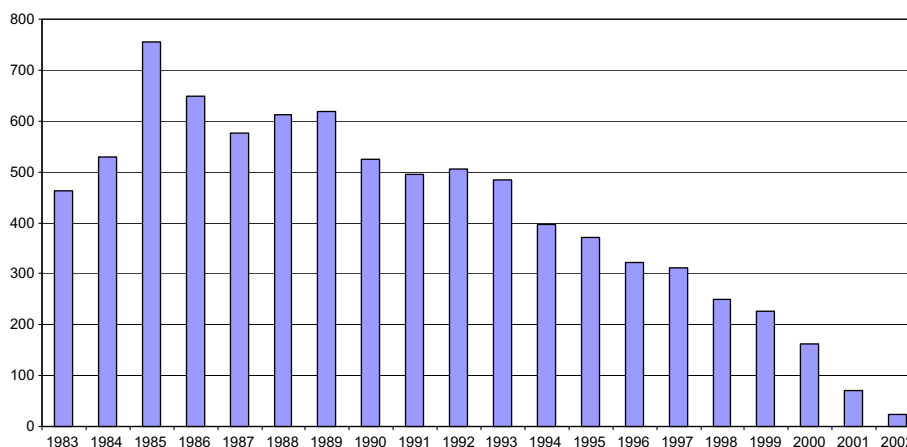


Fig. 13. Dow Chemical Co. US Patents by priority date 1983–2002 (PlusPat).

756 with 1985 priority dates and has fallen to a low of 23 for 2002. We know that Dow is headquartered in the United States, that US companies file nearly all of their priority patent applications in the United States, and that US patents filed since the end of 2000 are published 18 months after their filing date. We would have expected a decrease in patents issuing from applications filed during the last few years if this analysis had been done 5 years earlier, when only granted patents were issued, because the average pendency of a patent application is more than two years, but the arrival of 18-month publication should have wiped out that decrease for the last two years.

What could have happened? We can speculate on some things that would have caused the downward trend in filings and the extreme decline after the turn of the century.

- Dow could have stopped doing R&D. That is very unlikely.
- Dow could have changed its patent filing policies so as to be more selective about what patent applications it files. That is very likely. As patenting costs have risen, many companies have decided to file fewer patent applications. It is not something that can be confirmed without inside information, though.
- Dow could be filing US patent applications and delaying the filing of assignment papers until after the 18-month publication date. That would allow its US applications to publish without an assignee name, so that PlusPat would not recognize them as belonging to Dow. If a different database had been used, it would be possible to retrieve some or all of those applications from the information in the IFI CLAIMS “probable assignee” data or Derwent

patent families for cases that had been filed outside the United States.

- Dow could be using the Patent Cooperation Treaty to delay issuance of US patents. If a US application is used for priority in a PCT application and abandoned before being published, the PCT application will be published 18 months after priority, but the national application would not reenter the US phase of prosecution until 30 months after priority and would not be published until later than that.
- Or Dow could still be filing US applications, but assigning them to its subsidiaries.

What about Dow Chemical’s use of the Patent Cooperation Treaty? Have they been filing more applications that way than in the past? Well, yes, and no. Fig. 14 shows that they were filing more PCT applications a few years ago, but they had practically stopped filing by 2002. If they are still filing PCT applications, they are certainly not filing in the name of the Dow Chemical Company!

Some browsing in the European Patent Registry uncovered the fact that some patents originally filed by Dow Chemical also have a newer applicant name, Dow Global Technologies. It turns out that Dow created Dow Global Technologies as a new subsidiary that would hold title to its intellectual property. Looking at the combined US patent filings of Dow and Dow Global Technologies from 1990 to 2002 in Fig. 15, you can see a decline in US publication, but a much smaller decline than we saw when looking for Dow Chemical alone. There is an increase in 2001, suggesting that some, but probably not all, of their applications are being assigned before the 18-month publication date.

Looking at the combined Dow Chemical Company and Dow Global Technologies PCT publications in

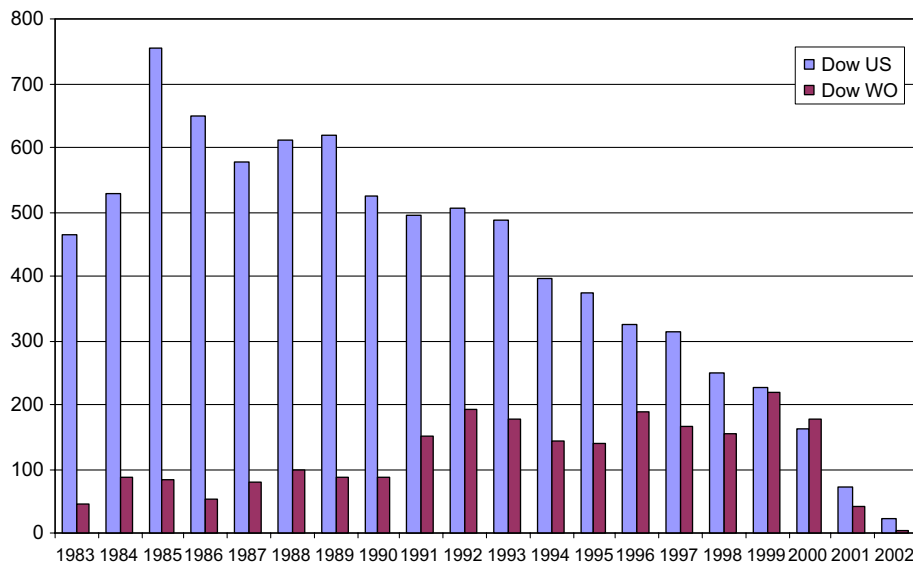


Fig. 14. Dow Chemical US & WO patents by priority date (PlusPat).

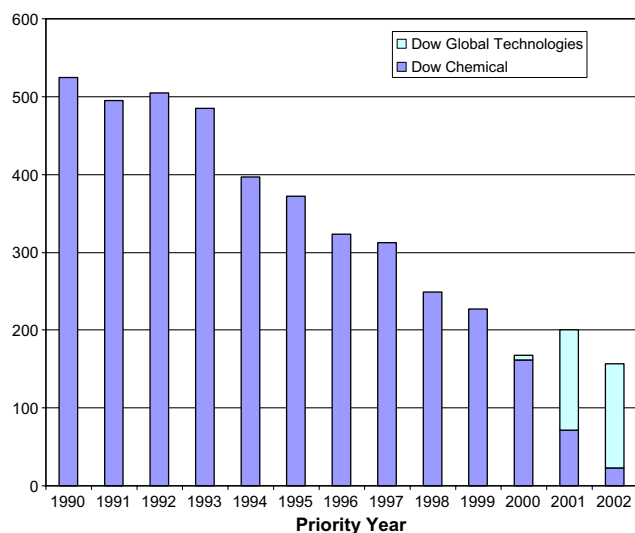


Fig. 15. Dow Chemical + Dow Global Technologies US patents by priority year.

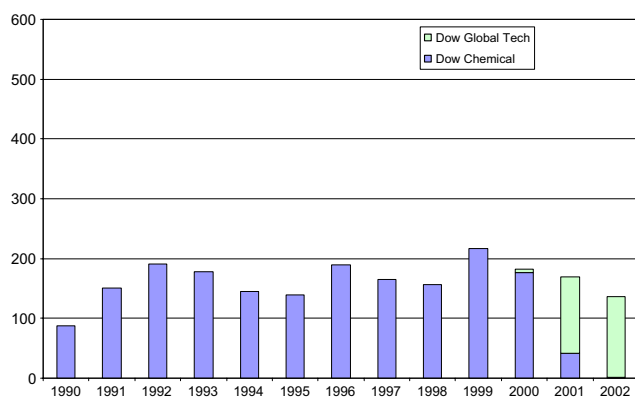


Fig. 16. Dow Chemical + Dow Global Technologies PCT applications by priority year.

Fig. 16, you can see a slight decrease in the last few years, but there is not enough information about the company's filing policies to make reliable predictions about the future. PCT applications have been filed selectively in the past. The rate of publication is definitely lower than in the past, but does not show the sharp decline we see in US patent publications.

6. Technology trends

Patent trends should be more useful for analysis of the progress in a particular technology. One can use patent classification codes and controlled indexing to look for broad fields of technology or search for specific information about a narrow field. The emergence of new technologies can change patenting trends in old technologies, a sign that research in mature technologies decreases as research in the new technology takes its

place. Technologies that disrupt trends in this way are, in fact known as disruptive technologies [16]. Unfortunately, the trends are easier to measure for established technologies than they are for developing technologies like nanotechnology.

There is an International Patent Classification for nanotechnology, B82B. What kind of trends can we see when we search the PlusPat database for that subclass? Looking at the number of patents issued around the world in IPC B82B in Fig. 17, we see that there were very few before 2000, when the 7th edition of the IPC came into effect. The earlier PlusPat records probably reflect its practice of merging data from published applications with their granted counterparts. In fact, there were very few patents classified B82B until 2002, when there was an enormous spike. There must have been research into nanotechnologies before 2000, or the IPC code would not have been created. Searching for nanotechnology requires a much more complicated search strategy than a simple search using the IPC to get any meaningful trends over time.

Can this limited IPC information show which companies are the leaders in nanotechnology? Fig. 18 shows the leading nanotechnology companies according to the overall PlusPat B82B distribution. If you had been following the news about nanotechnology, this will look very strange to you. The leading patentee is Yang Mengjun, not one of the companies that's been publicized as a nanotechnology leader.

The imbalance in patentee counts can be explained by the distribution of countries represented in the count of B82B patents, shown in Fig. 19. The vast majority of the patents were issued by China, with Japan considerably behind, and Germany, PCT, Korea, individual European countries, and the United States lagging far behind.

By contrast, a study of United States nanotechnology patenting published in 2004 by Bleeker et al. [17], shows that the vast majority of nanotechnology patents are filed by United States applicants, with Japan in a

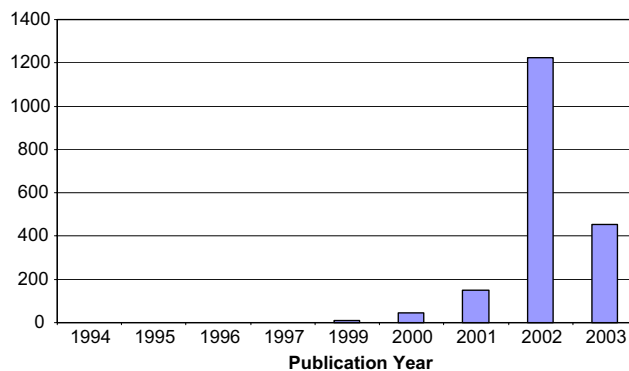


Fig. 17. Global nanotechnology patenting: IPC B82B, by publication year, 1994–2003.

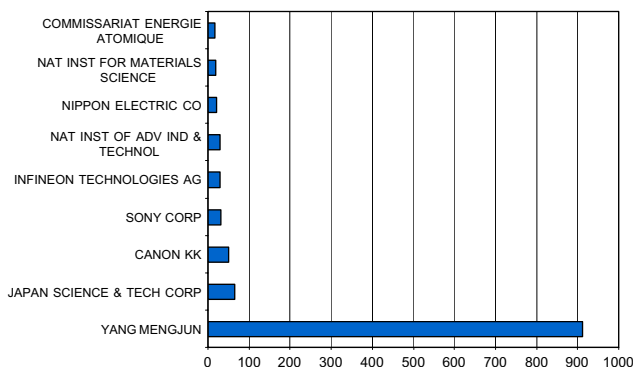


Fig. 18. Top 10 global nanotechnology patentees (IPC B82B, PlusPat).

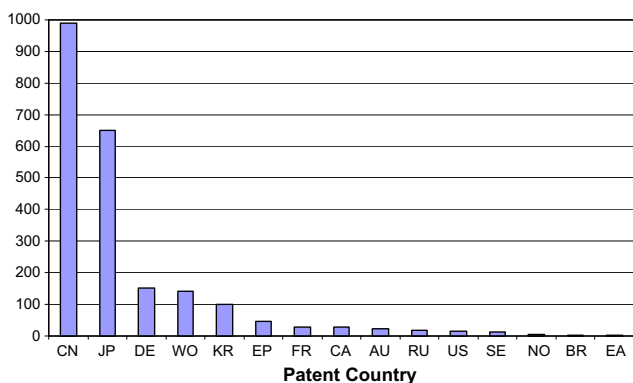


Fig. 19. Number of IPC B82B patents by patent country (PlusPat).

distant second place. Their data shows IBM as the leader in nanotechnology patenting, followed by Xerox, 3M, Micron, Eastman Kodak, and many other major corporations.

One would hope to be able to use other patent classification coding schemes to find nanotechnology patents, but the lag in creating a classification scheme exists elsewhere as well. The USPTO announced on October 18, 2004, its intention to create a new class for nanotechnology [18]. Thomson Scientific has refined the Manual Code system for the Derwent World Patents Index by adding some new codes in 2005, but has postponed creation of a comprehensive scheme for nanotechnology until a later date.

Nanotechnology is an extreme example of the difficulties inherent in studying trends in technologies. IPC codes and other standardized indexing are not created until a technology is fairly well developed. This lag can be overcome in retrospective search if patents are reclassified, as US and ECLA classifications now are, and the IPC is scheduled to be in 2006, but there will always be a delay in creating current indexing for new technologies. It has always been true that each country assigns IPC codes according to its own standards, and the data in Fig. 19 suggests that most countries have decided not to use the new nanotechnology classification

at all. It is clear from the B82B data that the Chinese patent office recognizes many inventions as relating to nanotechnology, and that most other countries do not. Most of the Chinese patent applications are not foreign filed, so we have little opportunity to compare the Chinese classifications with classifications applied by other patent offices. Since we read elsewhere that nanotechnology patents are being issued in large numbers in industrialized countries other than China, we must conclude that most patent offices see those inventions as belonging only to different technologies.

7. Concluding remarks

This is an era of unusual instability in the realm of intellectual property. This paper addresses only a few examples. Many countries have made major changes to their patent laws to conform to the requirements of the GATT agreement. Whole countries, such as the USSR and the CIS, have come and gone. Some countries, like Belgium, have stopped issuing national patents. The rules for filing PCT applications have changed radically, and are less complicated than in the past. Inventors and companies have changed their patenting behavior as national laws have changed and the cost of filing patent applications has increased. Companies are merging and demerging at an enormous rate. Established companies are realigning their businesses by buying new companies and spinning off divisions. Henkel and Dow Chemical are excellent examples of this behavior: in the last 5 years: each of those companies has been involved in around 15 mergers or acquisitions per year. Even more changes are due to internal changes in corporate direction. And beyond the changes in the business, there are changes in a company's intellectual property management policies. MicroSoft recently announced it would increase its annual patent filings by 50%! What will their patenting trends look like when they do? At the same time there are technological breakthroughs that generate patents in new fields and shut down patenting that uses older technologies. Those are often the trends we want to follow if our vocabularies and our indexing tools allow us to recognize them. It is easy to look at patent trends as keys to technological innovation, but we cannot let our goals blind us to all the other factors that can disrupt the trends our tools detect. When we see a changed trend, we need to look everywhere for the reasons.

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and 2004: a perspective from India.” *World Patent Information* 2004;26(1):61–62.

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