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AD HOC OPEN-ENDED WORKING GROUP ON
ACCESS AND BENEFIT-SHARING
Fifth meeting
Montreal, 8-12 October 2007
Item 3 and 4 of the provisional agenda*

BIODIVERSITY AND THE PATENT SYSTEM: TOWARDS INTERNATIONAL INDICATORS

Note by the Executive Secretary

1. In decision VIII/4 E, the Conference of requested the Working Group, at its fifth meeting, to further address the issue of the need and possible options for indicators for access to genetic resources and the fair and equitable sharing of benefits arising from the utilization of genetic resources. It also invited Parties, Governments, relevant international organizations, indigenous and local communities and all relevant stakeholders to submit their views and information on the subject and requested the Executive Secretary to make such views and information available to the Working Group at its fifth meeting.

2. Accordingly, the Executive Secretary is pleased to make available herewith, for the information of participants in the fifth meeting of the Ad Hoc Working Group on Access and Benefit-sharing, a submission on the above subject provided by the ESRC Centre for Economic and Social Aspects of Genomics (CESAGen), Lancaster University, United Kingdom.

3. The document is reproduced in the form and language in which it was provided to the Secretariat.

* UNEP/CBD/WG-ABS/5/1.

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Biodiversity and the Patent System:

Towards International Indicators

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About CESAGen:

The ESRC Centre for Economic and Social Aspects of Genomics is a Research Centre of the Economic and Social Research Council, United Kingdom and is a collaboration between Lancaster and Cardiff Universities. CESAGen forms part of the national ESRC Genomics Network. CESAGen's work is directed towards analysis of the social, economic, ethical and environmental implications of genomics across the spectrum of red and green genomics.

About this Series:

This working paper series has been established as a contribution to evidence based analysis of the potential role of intellectual property instruments within an international regime on access to genetic resources and benefit-sharing under the Convention on Biological Diversity. The series aims to provide independent information and analysis of intellectual property issues to assist policy-makers and other participants within debates on the international regime.

Acknowledgements:

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Introduction:

This paper has been developed as a contribution to debates on indicators for access to genetic resources and benefit-sharing under the Convention on Biological Diversity (decision VIII/4). The paper is also relevant to related debates within the Intergovernmental Committee on Intellectual Property and Genetic Resources, Traditional Knowledge and Folklore under the World Intellectual Property Organization (WIPO).

The paper focuses on the relationship between biodiversity and traditional knowledge and the international patent system. This relationship is one of the most heavily contested issues involved in debates on access and benefit-sharing and the development of an international regime under the Convention on Biological Diversity.

This paper does not address debates on the substantive ethical, human rights, social, economic, environmental, health and legal dimensions of patent activity for biodiversity and traditional knowledge. Instead the paper focuses on introducing the available indicators for biodiversity and traditional knowledge within the international patent system. By adopting this approach it becomes possible to make the presence of biodiversity and traditional knowledge within the patent system visible to participants in debates on access and benefit-sharing (OECD 2004). Furthermore, this approach opens up a variety of possible options for further consideration.

The paper provides a series of over 840 classification codes for use as quantitative indicators for patent activity for biodiversity and traditional knowledge drawn from the International Patent Classification (IPC). The IPC is a system of over 70,000 classification codes that are in use by patent offices worldwide to describe the contents of patent documents. Using the IPC it is possible to develop international indicators for a broad spectrum of biodiversity and traditional knowledge, including the demarcation of sectors, technologies and identification of the actors involved.

The indicators provided in this paper can be used for five main purposes:

1. To identify patent activity in relation to biodiversity and traditional knowledge;
2. To map trends in specific sectors, areas of technology and identify the actors involved;
3. To facilitate monitoring and compliance measures in relation to proposals for enhanced disclosure of origin and certificates under intellectual property instruments;
4. To facilitate mutual visibility and recognition between the patent system and *sui generis* measures that may be developed as part of an international regime on access and benefit-sharing;
5. To facilitate targeted and Adjustable Incentive Measures (AIMs) for particular sectors of activity.

This paper represents a work in progress in the development of indicators for biodiversity and traditional knowledge and is intended to stimulate further work.

The paper is divided into three sections. Section I introduces the patent classification system and the types of analysis that can be performed using an understanding of the classification system. Section II focuses on the demarcation of biodiversity and traditional knowledge within the patent system and provides a list of main classification codes for use in developing indicators. Section III provides

a summary of trends for main indicators for a variety of sectors and sub-sectors of patent activity involving biodiversity and traditional knowledge. The Annex provides a list of patent classifiers from the International Patent Classification as a contribution to future work on access and benefit-sharing and indicators.

Recommendations:

1. Further guidance from specialists within WIPO and other relevant organizations is desirable on indicators for biodiversity and traditional knowledge within the International Patent Classification;
2. The development of quantitative indicators for access and benefit-sharing with respect to the patent system will logically focus on counts using classification codes, country codes and the publication and priority year. The development of indicators should encourage wide participation in order to promote confidence in the indicators. Harmonisation and validation of indicators could be achieved through the use of baseline data from the EPO/OECD World Patent Statistics Database (PATSTAT). Further advice and cooperation in the development of indicators could usefully be sought from the OECD, the OECD Patent Statistics Taskforce, and other relevant organisations;
3. Enhanced disclosure measures under patent instruments and an international regime will ideally include enhanced disclosure of genus and species names, country of origin and the names of indigenous peoples/societies.[1] The further development of classification codes would greatly facilitate monitoring and tracking of enhanced disclosure and compliance;
4. Proposals for certificates of origin/source/legal provenance could be operationalised through the introduction of standardised codes within the front page of patent documents and patent databases. Three potential options are suggested in this area: Country of Origin/Certificate of Origin (COO); Certificate of Source (COS); Certificate of Indigenous Peoples and Local Communities (CIPLC or CILC);
5. The same approach could be considered for *sui generis* measures, such as commons or open source licensing models, in order to promote international cooperation and mutual visibility between systems;
6. Adjustable Incentive Measures (AIMs) for biodiversity and traditional knowledge could be targeted towards specific areas through the use of the International Patent Classification. Such incentive measures might include variable fee structures, tax incentives, and incentives for research and development;
7. Further development of the classification system for biodiversity and traditional knowledge is desirable for the purpose of monitoring arrangements under an international regime and flexibility in responding to emerging developments in the biosciences.

[1] European Community and its Member States (2004) Disclosure of origin or source of genetic resources and associated traditional knowledge patent applications. Proposal of the European Community and its Member States to WIPO. Location: <http://www.wipo.int/tk/en/genetic/proposals/european_community.pdf>. It is important to note that a range of proposals have been put forward on disclosure of origin or source within patent applications (i.e. Switzerland, Brazil and groups of other countries). For a summary of these proposals see the note by the Executive Secretary 'Overview of Recent Developments at the International Level Relating to Access and Benefit-Sharing'. UNEP/CBD/WG-ABS/5/4/Add.1.

Section I: Patent Classification and International Indicators

1.1 Approaching the International Patent System:

According to statistics from the World Intellectual Property Organisation (WIPO) between 1990 and 2000 an estimated 7.6 million patents were granted worldwide across all areas of invention.[2] In 2005, the most recent year for which statistics are available, approximately 1.6 million patent applications were submitted worldwide, approximately 600,000 grants were awarded and an estimated 5.6 million patents were in force.[3] On the global level the patent system is estimated to consist of over 50 million documents dating back to the 19th Century.

This basic information draws attention to the problem of the scale of the international patent system. For debates on access to genetic resources and benefit-sharing this raises the question of how biodiversity and traditional knowledge can be identified within the system at the level of indicators.

In seeking to answer this question it is important to distinguish between debates on the legal rights granted under patent instruments and the patent system as a system for documenting, organizing and tracking patent documents. It is the patent system as a system for organizing and tracking documents that is the central issue at the level of indicators.

Patent documents have historically been held in physical form and organised within the archives of intellectual property offices. That situation has changed dramatically as the system has expanded and responded to the possibilities afforded by information technology. In particular, recent years have witnessed increasing trends towards the electronic filing and storage of patent documents in patent databases.

The largest international patent database is the European Patent Office DOCDB database. DOCDB can be understood as a data repository that provides the platform for a range of other services developed by the European Patent Office. These services include: the global esp@cenet patent database; national and regional databases (such as LATIPAT for Latin America), and; the new World Patent Statistics Database (PATSTAT) (Rollinson and Heijna 2006). DOCDB also provides the foundation for commercial database services (i.e. Micropatent and the Derwent World Patent Index operated by the Thomson Corporation). Growing interest in patent information is reflected in the establishment of the Open Patent Services (OPS) by the European Patent Office and the creation of freely accessible databases such as CAMBIA's Patent Lens initiative for life science patent data.[4] The release of the Beta version of Google Patent for US patent grants is the most recent development in this area.[5]

One problem confronting the patent system as an international system is the use of multiple languages and the storage and retrieval of documents from multiple jurisdictions. This is achieved

[2] WIPO Patent Statistics 1990-2000. Location: <http://www.wipo.int/ipstats/en/statistics/patents/index.html>.

[3] WIPO (2007) *WIPO Patent Report: Statistics on Worldwide Patent Activity*. Geneva: World Intellectual Property Organization. Citations at 9, 10 and 43. Location: <http://www.wipo.int/freepublications/en/patents/931/wipo_pub_931.pdf>

[4] Location: <http://www.patentlens.net/patentlens/simple.cgi>.

[5] Location: <http://www.google.com/patents>.

through the use of a series of standardised coding and numbering systems. For the purpose of developing international indicators the most important starting point is patent classification.

1.2 Patent Classification Systems:

In order to organise patent documents classification codes are awarded to all patent applications. These codes commonly consist of combinations of letters and numbers and provide a shorthand description of the technical subject matter within applications. Documents receiving the same code then form a grouping for that subject area.

A number of patent classification systems are in use on the national and regional level.[6] However, the main classification system is the International Patent Classification (IPC). The IPC is in use by a reported 95 countries worldwide and five international patent organisations, notably: the African Intellectual Property Organization (OAPI); the African Regional Intellectual Property Organization (ARIPO); the Eurasian Patent Office (EAPO); the European Patent Office (EPO), and; the World Intellectual Property Organization (WIPO) for the Patent Cooperation Treaty (WIPO 2006).

The IPC was created under the 1971 *Strasbourg Agreement Concerning the International Patent Classification* (IPC) (amended 1979) that established the IPC Union.[7] There are presently 57 Contracting Parties to the IPC Union.[8] The World Intellectual Property Organization (WIPO) serves as the administrative body for the IPC.

The objectives of the IPC are described in *The Guide to the IPC* in terms of its primary and secondary purposes (WIPO 2005). The primary purpose of the IPC is described as follows:

> "…the establishment of an effective search tool for the retrieval of patent documents by intellectual property offices and other users, in order to establish the novelty and evaluate the inventive step or non-obviousness (including the assessment of technical advance and useful results or utility) of technical disclosures in patent applications" (WIPO 2005: 7).

In short, the primary purpose of the IPC is to facilitate the identification of patent based prior art. This is particularly significant under the Patent Cooperation Treaty in relation to determining the state of the art at the time of application through searching "everything which has been made available to the public anywhere in the world by means of written disclosure" in order to determine whether or not a claimed invention is new and involved an inventive step.[9]

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[6] For example the United States Patent Classification (USPC) employs a numeric coding system (i.e. 977 for nanotechnology) consists of 987 classes and over 150,000 subclasses to describe patent applications at various levels of detail. Other countries, such as Japan and the United Kingdom, also operate national classification systems. On the regional level the European Classification (ECLA) employs approximately 129,200 classifiers consisting of letters and number combinations (i.e. C12N5/06B2P). The ECLA is used by the European Patent Office and national patent offices serving as authorities under the European Patent Convention. National classifications and regional classifications such as the ECLA are regularly updated to reflect emerging developments (i.e. nanotechnology and classifier Y01N).

[7] Strasbourg Agreement Concerning the International Patent Classification. Location: <http://www.wipo.int/treaties/en/classification/strasbourg/trtdocs_wo026.html>

[8] WIPO, Contracting Parties, Strasbourg Agreement: Location: <http://www.wipo.int/treaties/en/ShowResults.jsp?lang=en&treaty_id=11>.

[9] PCT Rule 33.1(a) as provided in WIPO 2006.

In addition, the classification is also intended to perform a number of secondary purposes, notably, as:

1. An instrument for the orderly arrangement of patent documents in order to facilitate access to the technological and legal information contained therein;
2. A basis for selective dissemination of information to all users of patent information;
3. A basis for investigating the state of the art in given fields of technology;
4. A basis for the preparation of industrial property statistics which in turn permit the assessment of technological development in various areas (WIPO 2005: 7).

For the purposes of the development of indicators, the IPC can best be understood as a protocol providing a common language through which intellectual property offices can cooperate in the identification and grouping of prior art.

The latest version of the IPC is the Eighth edition (IPC8) which entered into force on the 1st of January 2006 (Makarov 2006).[10] IPC8 consists of two levels, a "core" level and an "advanced" level. The core level consists of approximately 20,000 classifiers on the class, sub-class, group and sub-group level that are stable over successive editions of the IPC. It is anticipated that the core level will primarily be used by small and medium-sized patent offices to organise their collections.[11] The core level will be updated every three years (WIPO 2005).

The "advanced" level consists of the full 70,000 classifiers (including the core level) and will be used by large patent offices to classify and order their collections to a greater level of detail. In contrast with the core level the advanced level will continuously expand to reflect emerging developments. The classifiers in this paper are mainly drawn from the core level on the basis that this is in use by patent offices irrespective of their size.

IPC8 represents a major reform to the classification system in terms of enhanced flexibility and the accelerated process for updating the classification. This may provide opportunities to introduce new classifiers to serve as indicators under an international regime. It may be noted that as a technical classification system the IPC, or developments based upon or aligned with it, could be used outside the patent system. This is particularly relevant for debates on certificates, commons and open-source licensing models and other *sui generis* systems involving some form of documentation.

[10] IPC8 is also variously referred to as the Reformed IPC or IPCR.

[11] This and the following information is drawn from the "Basic Information on IPC Reform" within the printed edition of IPC8.

1.3 Understanding the International Patent Classification:

The IPC structures patents into eight sections of which five sections are of greatest relevance for biodiversity, traditional knowledge and indicators:

Section A:	Human Necessities (i.e. agriculture, biocides, cosmetics, food supplements, botanical medicines and pharmaceuticals);
Section B:	Performing Operations; Transporting (i.e. nanotechnology);
Section C:	Chemistry; Metallurgy (i.e. biochemistry, biotechnology);
Section G:	Physics (i.e. proteomics, bioinformatics)
Section H:	Electricity (emergent for genomics, proteomics, nanotechnology)

Within each section patents are classified in a hierarchy consisting of Sub-Sections, Classes, Sub-classes, Groups, and Sub-Groups. In certain cases the main classifiers are accompanied by descriptive indexing classifiers (i.e. C12R for microorganisms and cell lines). The hierarchical structure of the IPC can be briefly illustrated for the main classifier for ethnobotanical medicines from plants (A61K36) in Table One.

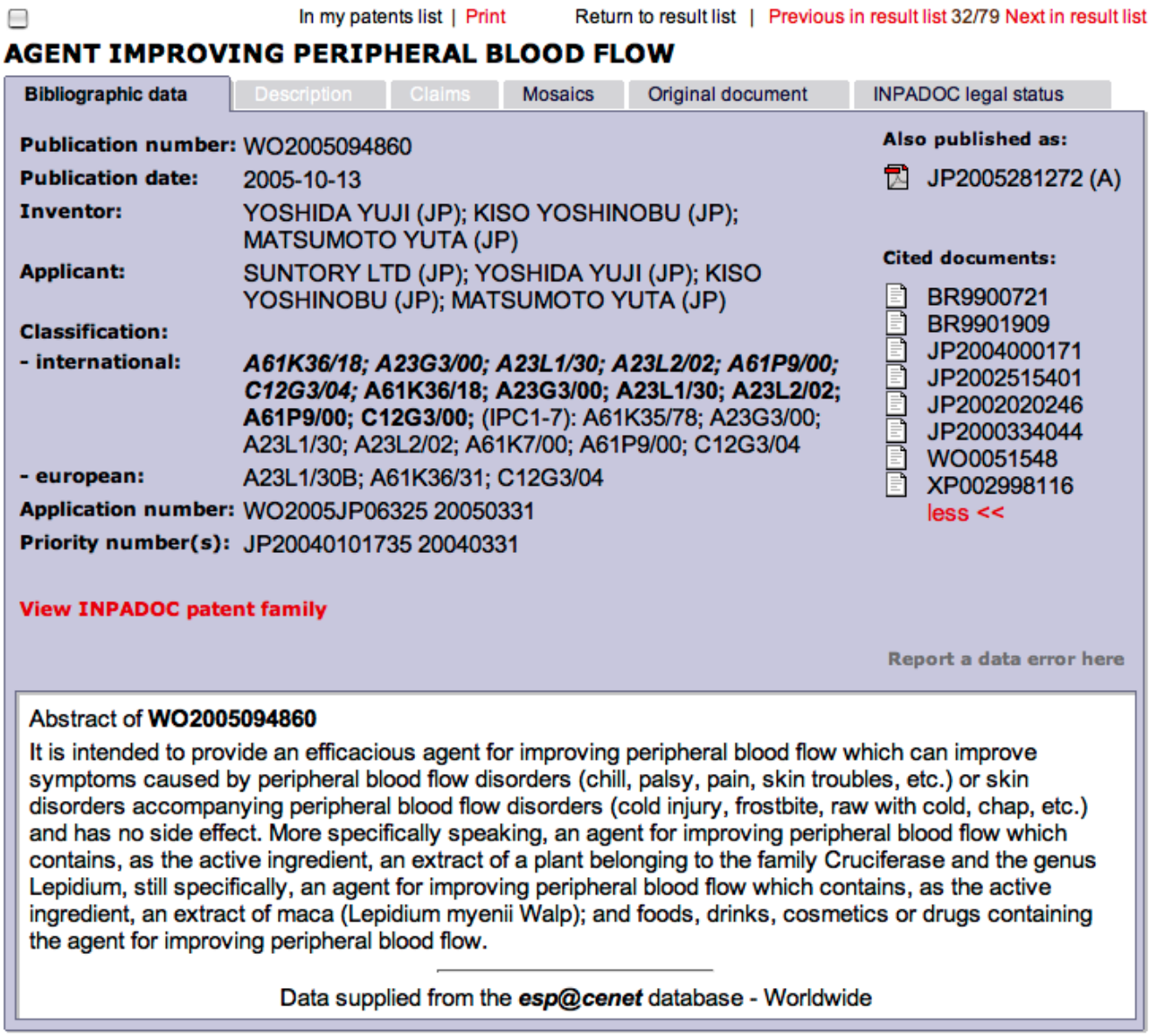
Table One: Hierarchical Structure of the IPC

Section	**A** - Human Necessities
Sub-Section	Health; Amusement
Class	**A61** Medical or Veterinary Science; Hygiene
Sub-Class	**A61K** Preparations for Medical, Dental, or Toilet Purposes
Group	**A61K36** Medicinal preparations of undetermined constitution containing material from algae, lichens, fungi or plants, or derivatives thereof, e.g. traditional herbal medicines
Sub-Group	**A61K36/18** Magnoliophyta (angiosperms) [flowering plants]

Patent classification codes are awarded by patent examiners. Examiners will commonly seek to describe a claimed invention to the highest level of detail that is possible using the hierarchy established within the IPC. This will normally involve awarding more than one classifier to adequately describe the claimed invention (i.e. 1 to 5 or more). Under IPC8 patent examiners are increasingly expected to use patent classifiers to more completely describe the content of patent documents. This includes the growing use of descriptive classifiers (i.e. for disorders and diseases).

The use of patent classification codes and their relationship with other coding systems within the international patent system can best be illustrated through a working example. This example will also provide the basis for illustrating trends in patent activity using classifiers as indicators.

Figure 1: Patent Cooperation Treaty Application WO2005094860



In my patents list | Print Return to result list | Previous in result list 32/79 Next in result list

AGENT IMPROVING PERIPHERAL BLOOD FLOW

Bibliographic data | Description | Claims | Mosaics | Original document | INPADOC legal status

Publication number: WO2005094860
Publication date: 2005-10-13
Inventor: YOSHIDA YUJI (JP); KISO YOSHINOBU (JP); MATSUMOTO YUTA (JP)
Applicant: SUNTORY LTD (JP); YOSHIDA YUJI (JP); KISO YOSHINOBU (JP); MATSUMOTO YUTA (JP)
Classification:
- international: ***A61K36/18; A23G3/00; A23L1/30; A23L2/02; A61P9/00; C12G3/04;*** **A61K36/18; A23G3/00; A23L1/30; A23L2/02; A61P9/00; C12G3/00;** (IPC1-7): A61K35/78; A23G3/00; A23L1/30; A23L2/02; A61K7/00; A61P9/00; C12G3/04
- european: A23L1/30B; A61K36/31; C12G3/04
Application number: WO2005JP06325 20050331
Priority number(s): JP20040101735 20040331

View INPADOC patent family

Also published as:
JP2005281272 (A)

Cited documents:
BR9900721
BR9901909
JP2004000171
JP2002515401
JP2002020246
JP2000334044
WO0051548
XP002998116
less <<

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Abstract of **WO2005094860**

It is intended to provide an efficacious agent for improving peripheral blood flow which can improve symptoms caused by peripheral blood flow disorders (chill, palsy, pain, skin troubles, etc.) or skin disorders accompanying peripheral blood flow disorders (cold injury, frostbite, raw with cold, chap, etc.) and has no side effect. More specifically speaking, an agent for improving peripheral blood flow which contains, as the active ingredient, an extract of a plant belonging to the family Cruciferase and the genus Lepidium, still specifically, an agent for improving peripheral blood flow which contains, as the active ingredient, an extract of maca (Lepidium myenii Walp); and foods, drinks, cosmetics or drugs containing the agent for improving peripheral blood flow.

Data supplied from the ***esp@cenet*** database - Worldwide

Figure 1 is a Patent Cooperation Treaty application concerning components of the family Cruciferae (mod. Brassicaceae), the genus Lepidium, and the Andean plant *Lepidium meyenii* (Peru 2003, Oldham 2006). Figure 1 demonstrates that the front page of a patent document contains a wide range of information. For the moment we will focus on the information under Classification.

This application has been awarded six classifiers under IPC8 (the remainder are repeated).[12] A series of seven codes from the seventh edition of the IPC (IPC7) are also provided to facilitate the retrieval and tracking of documents during the transition to IPC8. Table Two sets out the technical descriptions behind these codes.

Table Two: Patent Classifiers for WO2005094860

IPC8	
A61K36/18	Medicinal preparations of undetermined constitution from - Magnoliophyta (angiosperms) [flowering plants]
A23G3/00	Cocoa, cocoa products e.g. chocolate; substitutes thereof
A23L1/30	Foods or foodstuffs, their preparation or treatment - containing additives
A23L2/02	Non-alcoholic beverages, dry compositions or concentrates thereof; their preparation containing fruit or vegetables
A61P9/00	Drugs for Disorders of the Cardiovascular system
C12G3/04	Preparation of other alcoholic beverages - by mixing i.e. liqueurs
IPC7	
A61K35/78	Medicinal preparations containing material or reaction products thereof with undetermined constitution, from – plants
A23G3/00	Cocoa, cocoa products e.g. chocolate; substitutes thereof
A23L1/30	Foods or foodstuffs, their preparation or treatment - containing additives
A23L2/02	Non-alcoholic beverages, dry compositions or concentrates thereof; their preparation containing fruit or vegetables
A61K7/00	Cosmetics or similar toilet preparations
A61P9/00	Drugs for Disorders of the Cardiovascular system
C12G3/04	Preparation of other alcoholic beverages - by mixing i.e. liqueurs

Table Two demonstrates the basic principle that through an understanding of patent classification codes it is possible to begin the process of identifying patent activity that involves claims over biodiversity and traditional knowledge. In this case the most important classifier is A61K36 (formerly A61K35/78) which relates to claims over the components of *Lepidium meyenii* and its wider genus and family for a variety of purposes.

As we will now see a basic knowledge of classification codes combined with the information provided on the front page of patent documents can be used to generate statistical indicators and analysis at various levels of sophistication.

[12] This in part reflects a bridging exercise between versions of the classification but also reflects the use of automated reclassification within major patent offices for IPC8 (i.e. at the European Patent Office). This is achieved through the use of a Master Classification Database. The major patent offices (i.e. EPO) retrospectively reclassify members of patent families within their collections that originate from offices that do not reclassify documents. See WIPO (2006) *General Information on the Eighth Edition of the International Patent Classification (IPC)*. Geneva: World Intellectual Property Organization. For detailed discussion of the reclassification, see Foglia, P (2007) 'Patentability search strategies and the reformed IPC: A patent office perspective', *World Patent Information* 29; 33-53.

1.4 Patent Indicators and Analysis:

The patent classification codes set out in Table Two are also quantitative indicators. The reason for this is that patent documents that receive the same classification code form part of a grouping that can be counted.

This paper is primarily concerned with introducing the use of patent classification codes as quantitative indicators. It should be noted that the report of the Expert Meeting on Indicators of Biological Diversity provides important guidance on the development of indicators for the conservation and sustainable use of biodiversity.[13] The expert meeting did not address the development of indicators for access and benefit-sharing. However, as the report makes clear, indicators are desirable on a variety of levels (i.e. satellite, core, aggregate and headline) to meet a variety of user needs. With respect to indicators for access and benefit-sharing a suite of quantitative and qualitative indicators is likely to be desirable. The development of indicators for access and benefit-sharing will ideally be harmonised with wider work on indicators under the Convention relating to the 2010 Biodiversity Target and the Millennium Development Goals.

For the purposes of illustration in the use of classification codes as quantitative indicators, this example will combine classifiers A61K36 and A61K35/78 for ethnobotanical medicines from plants (hereafter, ethnobotanical medicines).[14] The reason for this is that A61K36 replaced A61K35/78 in IPC8. Longitudinal trends can best be defined by combining these classifiers.

The data that follows is drawn from the commercial Micropatent "Aureka" database service for patent applications and grants from the United States, the European Patent Office, Germany and applications from Japan, the UK, France, and under the Patent Cooperation Treaty. A fuller international picture reflecting a broad range of Parties to the Convention on Biological Diversity will be possible using PATSTAT.

1.4.1 Instrument and Country Trends:

Patent documents contain a series of two letter country and instrument codes (i.e. WO for the Patent Cooperation Treaty).[15] These codes are linked to standardized numbering formats that include the year followed by a ten character unique identification number i.e. [WO]-[2005]-[0]-[94860].[16] When country codes are combined with classifiers they can be used to map long term trends.

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[13] UNEP/CBD/SBSTTA/9/INF/7. See in particular Figure 2 page 17 within the Guidelines for developing national-level monitoring programmes and indicators for biodiversity.

[14] The search formula to generate such datasets is (A61K35/78 or A61K36) and (19900101 to 20063112). Note that the required syntax may vary between databases.

[15] Two letter country codes are made available in WIPO Standard ST. 3 Two-Letter Codes for the Representation of States, Other Entities and Organizations. Location: <http://www.wipo.int/scit/en/standards/standards.htm>

[16] Standardised numbering formats are developed in accordance with WIPO standard ST. 16 and the work of the International Patent Documentation Centre (INPADOC) at the EPO. Location: <http://www.european-patent-office.org/inpadoc/index.htm>. See also, Location: <http://www.wipo.int/scit/en/standards/pdf/03-16-01.pdf>. However, it should be noted that standardisation of numbers is somewhat patchy for historic data and different databases may use different formats. This can make tracking numbers across databases difficult.

Figure 2: Ethnobotanical Medicines by Publication Year[17]

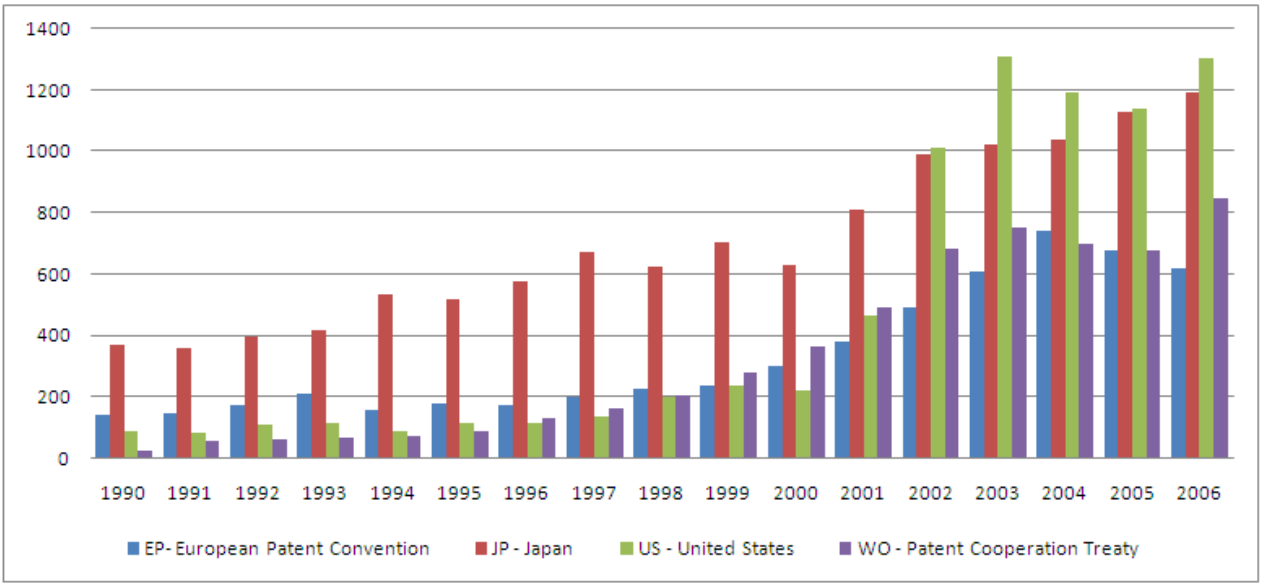
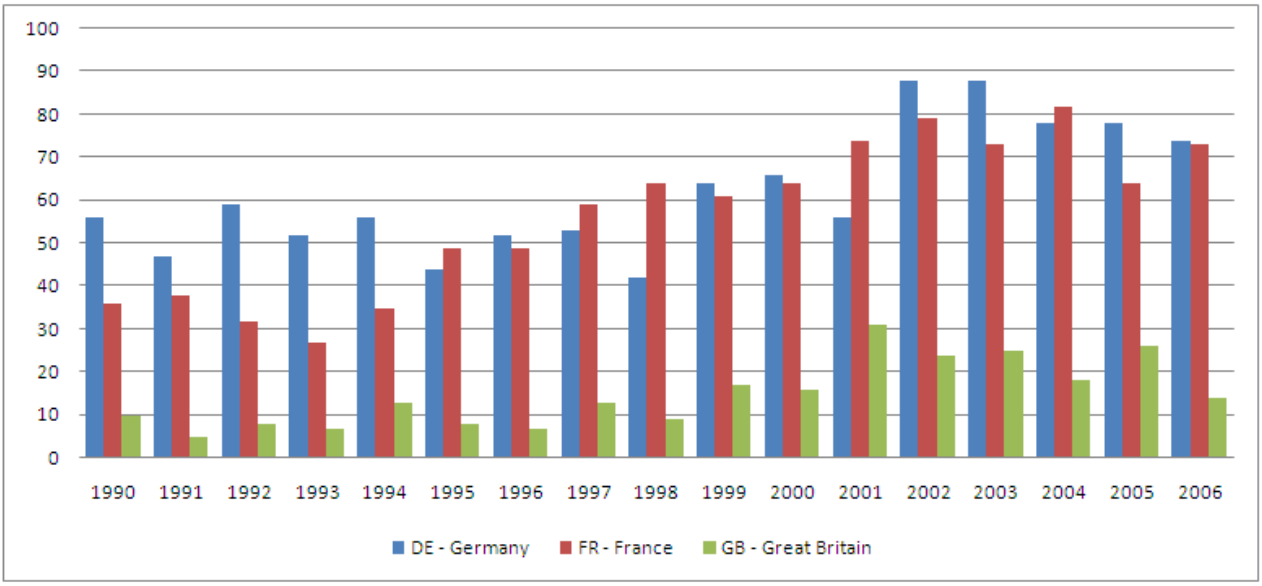


Figure 3: Ethnobotanical Medicines by Publication Year



[17] Prior to 2001 patents in the United States were only published at the time of grant. From 2001 onwards patent applications have been published 18 months from the date of filing. This helps to explain the apparent surge in US activity for recent years.

Figure 2 and Figure 3 set out patent publication trends for ethnobotanical medicines under classifiers A61K35/78 and A61K36 in the main jurisdictions based on a dataset of 33,610 documents published over the period 1990-2006.[18] This data reveals that using a combination of classification codes and other information on the front page of patent documents it is possible to elucidate statistical trends. However, in considering patent indicators it is important to recognise three main issues:

a) The timeliness of patent data and patent counts by priority, application and publication year;
b) Patent counts by applications and grants;
c) Patent kind codes and patent families.

a) Timeliness and counts by priority, application and publication year:

Figure 1 reveals that patent documents are awarded three types of number: a) a priority number; b) an application number, and; c) a publication number. We can also see in Figure 1 that these numbers consist of a combination of a country code, the year and a unique numeric identifier. In the case of the priority and the application numbers the main numeric codes are also followed by the date (i.e. JP20040101735 20040331).

The priority number is the number that is awarded to a patent application the first time that it is filed anywhere in the world (OECD 2001). The priority number system has its origins with the Paris Convention (1883, amended 1979).[19] Article 4 of the Paris Convention establishes that an applicant submitting an application within their home jurisdiction will enjoy a period of up to 12 months in which to file an application in another Contracting State. During that period the applicant will also enjoy precedence (priority) over other applicants within a Contracting State who submit an application for the same claimed invention. For this reason the priority date establishes the order of precedence between competing applicants.[20] At the time of writing there are 171 Parties to the Paris Convention.

For the purpose of the development of indicators the priority year is important because it is the year closest to the claimed inventive activity. In the work of the OECD it is used as a proxy indicator for innovative activity for this reason (i.e. OECD 2006a). However, it should be noted that patent counts by the priority year are presently difficult to elucidate using freely available tools such as esp@cenet or Patent Lens.

The second number that can be used for patent counts is the application number. In cases where an original application is filed with a patent office for the first time the application number will be the same as the priority number. Thus, the priority number and application number for the original patent filing in Figure 1 is JP20040101735. However, where an original filing is submitted under a regional or international instrument the application number will change (i.e. JP20040101735

[18] The data was developed by using the search formula (A61K36 or A61K35/78). This formula captures all patent documents within the relevant jurisdictions containing either one or both of the classifiers. The dataset was developed on the 8th of June 2007.

[19] Paris Convention for the Protection of Industrial Property (1883, amended 1979). Location: <http://www.wipo.int/treaties/en/ip/paris/trtdocs_wo020.html>.

[20] This situation may vary in "first to invent" systems (i.e. the United States) where evidence of being the first to invent may be required (i.e. lab records) to substantiate claims to precedence.

becomes WO2005JP06325). With the exception of the first (priority) filing, the application year will be later than the priority year as in Figure 1.

In contrast, the publication number is awarded when a patent is published in a particular jurisdiction. This will be at least 18 months from the priority date (OECD 2001). However, as a consequence of the dramatic increase of patent activity from the mid-1990s onwards publication may be delayed for long periods. [21]

The differences between patent counts by the priority year, the application year and publication year in the June 2007 dataset are provided in Figure 4.

Figure 4: Patent Counts by Priority, Application and Publication Year

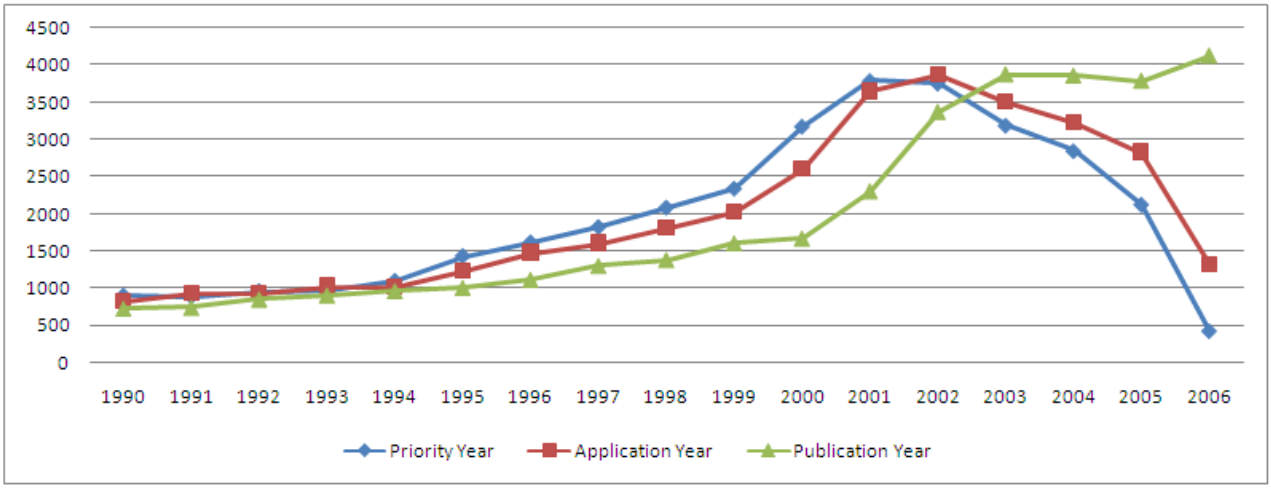


Figure 4 demonstrates that the priority year is the earliest within the data followed by the application year and the publication year. In particular, we observe that counts by the priority year and the application year display a steep decline from 2002 onwards when compared with the publication year. This will normally correspond with a lack of priority and application data within patent databases. This information will generally become available when a patent is published for the first time.[22] As such there is a significant lag time in the availability of priority and application data. In contrast, publication data is always later than priority and application data.

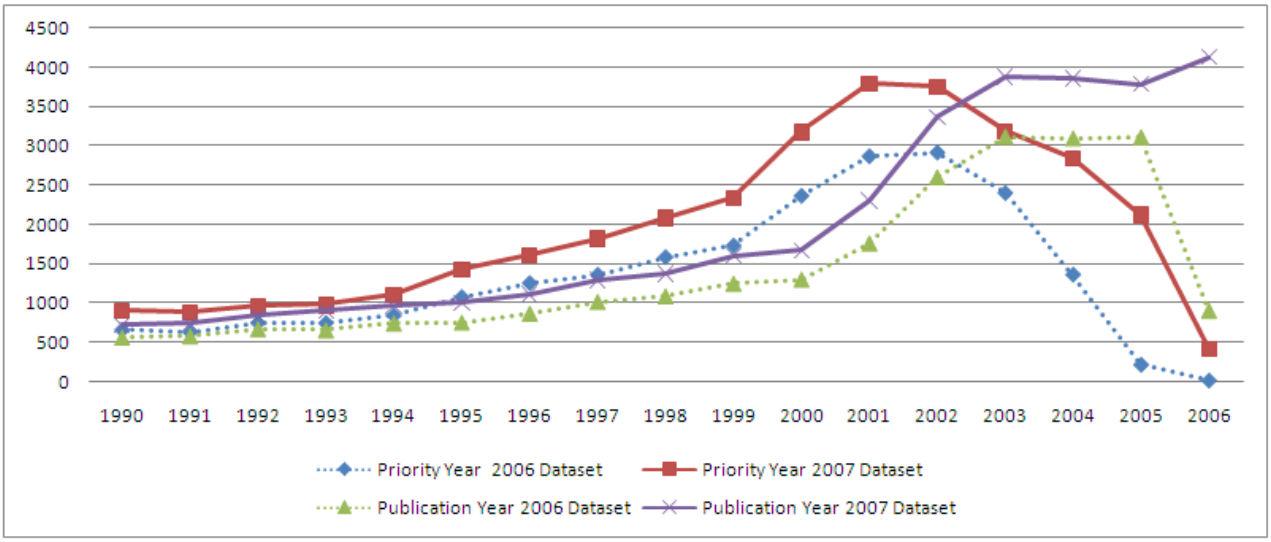
The wider issue of the timeliness and availability of patent data is revealed in Figure 5. Figure 5 compares trends for patent activity for ethnobotanical medicines by both the priority and publication year from a dataset collated in December 2006 with a dataset collated in June 2007.

[21] As reported by J. Dudas, Under Secretary of Commerce for Intellectual Property and Director of the USPTO the latest estimate for the global backlog is 10 million applications (cited in EPO 2007 at 36). The corresponding figure from the USPTO in 2003 was 7 million (see Oldham 2004a). The empirical basis for such estimates is not readily available. However there is widespread agreement that the main patent offices are experiencing significant backlogs. For discussion of the lag times for PCT applications see OECD 2006a.

[22] In some cases priority and application data may become available in databases such as esp@cenet without the abstract, specification and claims.

Figure 5 demonstrates that there is a significant lag time in the availability of patent data. Thus, the December 2006 dataset contained a total of 24,081 patent documents for the period 1990-2006 while the June 2007 dataset contained 33,610 for the corresponding period (a difference of 9,529 documents). Of these documents, a total of 6,763 were published in the period 2001-2006 of which 3,225 were from 2006. As such patent data and patent databases are dynamic in nature.[23] This is particularly marked in the case of major emerging areas of demand such as ethnobotanical medicines.[24] Indeed, ethnobotanical medicines from plants emerged as one of the strongest areas of demand in the underlying review of global trends (see Section III). An individual dataset will thus provide a snapshot of the available documents at a particular point in time.[25]

Figure 5: Dataset comparisons by Priority and Publication Year



For the purposes of the development of indicators using patent classification codes it is thus important to understand the limitations of both the timeliness and availability of patent data.[26]

In the author's view the further development of indicators should focus on the use of the priority and the publication year and exclude the application year.[27] The reason for this is that priority data

[23] For this reason close attention is required to the contents of a given database and update schedules. Additional considerations affecting data are the impacts of the retrospective reclassification of patent documents to reflect IPC8 and a change in the format of DOCDB during 2006 and early 2007. The effect of these changes, including reclassification of patent documents from Japan and Germany, is to improve data capture. This reveals that underlying factors concerning databases, including the coverage of particular databases and "black box" effects, are key issues. The creation of PATSTAT represents a major breakthrough in providing a stable "no black box" baseline for patent statistics and data validation.

[24] To test this issue the underlying review of Global Status and Trends in Intellectual Property Claims generated multiple datasets in 2004, 2005 and 2006 using esp@cenet. Dataset comparison graphs for the main indicators presented in this paper are provided in open access form in Oldham and Cutter 2006b. Future work will use PATSTAT.

[25] In connection with debates on certificates of origin/source/legal provenance and their relationship with the patent system this discussion makes clear that a lag time will be experienced between any patents that may potentially be filed under a certificate system and visibility at the level of indicators.

[26] For fuller discussion see OECD 2006a.

[27] The application year does not appear to add useful information and may cause confusion through ambiguous references to "filing year" when compared with the use of the priority year.

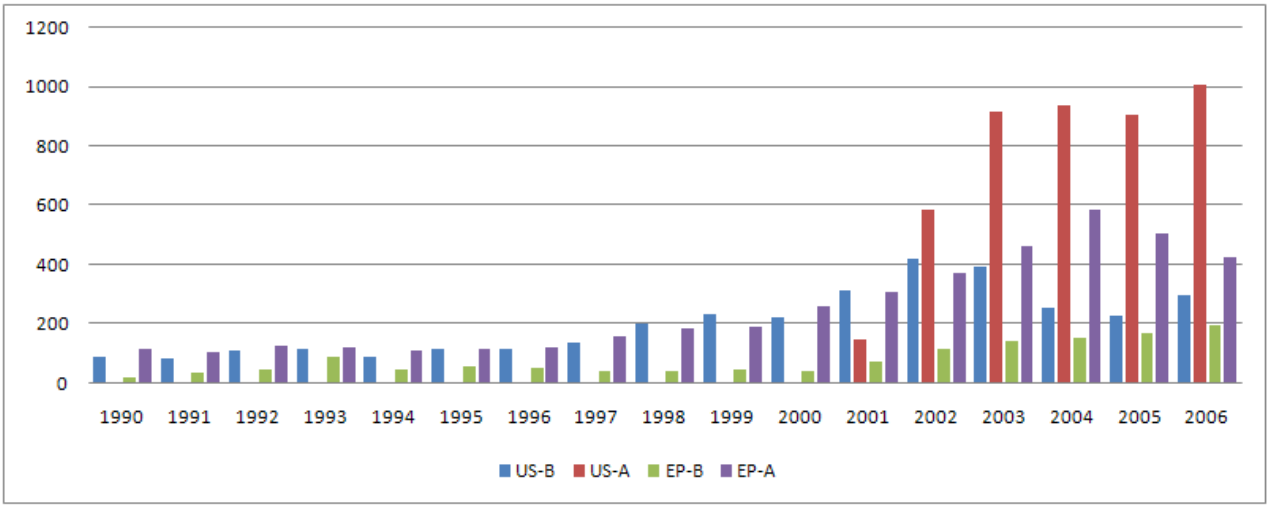
provides the key to understanding who is doing what, and where (see below). The priority year also provides an indicator of underlying trends in particular areas of science and technology within the patent system and is useful for economic analysis. The development of indicators on access and benefit-sharing (inside or outside the patent system) should be mindful of the desirability of harmonising methodologies to avoid duplication of effort and to serve a variety of purposes and user needs (see Section III).

Patent counts by publication year should be favoured for two main reasons. First, while organisations such as the OECD prefer the use of the priority year, in practice it is only possible to examine the contents of patent documents when they are published. The contents of patent documents are particularly important in terms of wider quantitative and qualitative analysis of patent activity for biodiversity and traditional knowledge (Oldham 2006). Second, taking into account that there are 190 Parties to the Convention on Biological Diversity, and a wide range of other participants in debates on access to genetic resources and benefit-sharing, the publication year enjoys the significant advantage of being readily accessible to anyone with an internet connection through databases such as esp@cenet (see Section III). Patent counts by publication year are the easiest to reproduce in a verifiable way and will be sufficient for most purposes. Patent counts from different sources can as necessary be cross-tested using baseline data from PATSTAT.

b) Patent counts by applications and grants:

Figure 2 suggests that patent activity for ethnobotanical medicines in the United States has undergone a significant surge in recent years. However, as noted in Figure 2, in the period prior to 2001 patents in the United States were only published when granted. The apparent surge in patent activity for ethnobotanical medicines in the United States from 2001 onwards is primarily a consequence of the publication of applications. This can be clearly seen in Figure 6 which provides a breakdown of United States and European Patent Office patents by grants (US-B, EP-B) and applications (US-A, EP-A).

Figure 6: Patent Trends by Patent Type for Ethnobotanical Medicines from Plants (United States and European Patent Convention)



In considering the development of indicators for biodiversity and traditional knowledge it could potentially be argued that indicators for patent grants are more important than indicators for patent applications. However, this argument would be mistaken for three main reasons.

First, and fundamentally, patent applications provide an indicator of demand for protection in areas such as biodiversity and traditional knowledge. Second, the global growth of patent activity through the use of regional and international instruments has resulted in a considerable backlog of patent applications awaiting action by patent offices (EPO, JPO, USPTO 2006; EPO 2007). Applications within this backlog may retain priority claims while awaiting administrative action by patent offices.[28] Finally, patent applications that do not become patent grants form part of the prior art and shape what may be claimed in future.

For these reasons, the development of indicators will logically combine patent applications and grants at the aggregate level and data can then be disaggregated as required. Comparability and validation for data from different sources could be accomplished using baseline data from PATSTAT.

[28] Applicants may also submit applications for a variety of purposes including defensive purposes and speculative "trolling" and "biosquatting" directed towards rent extraction and litigation (EPO 2007; Oldham and Cutter 2006a).Trolling consists of filing "a patent application for a good idea – with no intention to manufacture or exploit the idea- in the hope of catching out a company that uses the same idea later on; or one acquires existing patent portfolios with a view to either selling them later for a higher price or to using them as the basis for future legal proceedings" (EPO 2007: 92). Biosquatting expresses the same basic idea with a focus on misuse of the patent system to appropriate traditional knowledge and biological resources with the aim of maximising rent extraction rather than contributions to inventive or productive activity.

c) Kind Codes and Patent Families:

Patent offices publish and republish patent documents in a variety of forms as they move through the procedure. These documents are awarded "kind codes" to distinguish the type of publication and level of publication (i.e. A1, A2, A3, B1, B2, B3, T etc). Thus, kind code A will generally refer to a patent application and kind code B will generally refer to a patent grant. In the case of the Patent Cooperation Treaty (which does not award patent grants) kind code A1 refers to the publication of a PCT application with the international search report, A2 refers to publication without the search report and A3 to publication of the search report with the front page of an application. In Europe, kind code "T" refers to translations of European Patent Convention patents into the languages of national jurisdictions.

In seeking to address the multiplicity of kind codes in use by patent offices worldwide, WIPO has developed Standard ST.16 "Recommended Standard Code for the Identification of Different Kinds of Patent Documents" within the Handbook on Industrial Property Information and Documentation.[29] However, identifying patent documents by kind code within patent databases can be difficult. Navigating the spectrum of kind codes across multiple jurisdictions on the global level is only likely to be possible using databases such as PATSTAT.

The publication and republication of patent documents raises issues of double counting of the same document in the same jurisdiction.[30] It is here that the concept of the "patent family" becomes central within the international patent system. As defined by the International Patent Documentation Centre (INPADOC) a patent family consists of one or more patent document that links to an earlier patent document by its priority number.[31] Thus an original patent application (kind code A) with a national office and the subsequent grant of that patent (kind code B) will form part of the same patent family by virtue of sharing a common priority number.

The concept of the patent family is also important in the context of the increasing use of regional and international patent instruments. We have seen above that PCT application WO2005094860 links by its priority number to the priority (first) patent filing in Japan. As such, it forms part of the patent family for that priority filing. It should be noted that patent documents may include more than one priority number.[32] Thus, as WO2005094860 moves through the procedure to become applications and grants in regional and national jurisdictions the later documents will record the

[29] Location: <http://www.wipo.int/scit/en/standards/pdf/03-16-01.pdf>. The United States Patent and Trademark Office began using WIPO Standard Kind codes in 2001. See, Location: <http://www.uspto.gov/web/forms/kindcodesum.html>.

[30] esp@cenet "worldwide" seeks to remove duplicate results by presenting one patent family member per jurisdiction. However, the extent of its success is not readily open to testing.

[31] This is not the only use of the term patent family. For example, patent documents falling into the same area of the classification could be considered to form part of a family. Similarly, patents from the major offices (the United States, Europe and Japan, collectively known as the Trilateral Offices) are referred to as "Trilateral Families". The Derwent World Patent Index also operates its own family system in describing documents. For the purposes of international comparative analysis that is consistent with existing economic analysis (i.e. at the OECD) the use of the INPADOC definition is strongly recommended (see Dernis and Khan 2004 for discussion of Triadic Patent Families in OECD statistics). All other uses of the term family should be avoided in the interest of definitional clarity in the development of indicators.

[32] In some cases, notably in the information technology (ICT) and the biosciences large numbers of priority numbers may appear in the priority section. This reflects the incremental nature of claimed inventions in these areas. In general the earliest priority number should feature at the end of the list.

PCT number in the priority list. In the process, a chain of priority numbers is set in motion through which filings can be traced across multiple jurisdictions. This is particularly important for the analysis of regional and international activity.

Thus, under the European Patent Convention, an individual application can be submitted with a view to securing possible grants in up to 30 Contracting States and 5 Extension States.[33] In addition, under the Patent Cooperation Treaty (PCT) applicants may submit a single application that can, in theory, potentially lead to patent grants in 137 Contracting States (OECD 2001).[34] As such, regional and international instruments introduce multiplier effects into the patent system.

The concept of the patent family provides the key to tracking an individual patent through the procedure on the global level through the linkage between the priority number of the first filing and the publication number of subsequent applications. This can be briefly illustrated for a well known patent on steroidal glycosides from the genus *Hoodia* (synonym *Trichocaulon*) from Southern Africa for use as an appetite suppressant.[35] Table Three sets out the partial patent family for the priority filing in South Africa (ZA19973201A) and subsequent family members with their respective kind codes from Europe (EP), Great Britain (GB), Japan (JP), the United States (US) and the Patent Cooperation Treaty (WO).

Table Three demonstrates that members of the patent family include republications in different jurisdictions that are distinguished by their "kind code" (i.e. A2, A8 for EP1213020). However, the wider significance of regional and international patent instruments comes into focus when we consider that the full patent family consists of 69 documents from 55 individual applications in Africa (under the regional African Regional Industrial Property Organisation or ARIPO and the Organisation Africaine de la Propriété Intellectuelle or OAPI), Europe, Austria, Australia, Brazil, Bulgaria, Canada, China, Germany, Denmark, Ireland, Norway, New Zealand, Turkey, Taiwan, among others.[36]

For those who approach patent counts as a measure of inventive activity it may be tempting to reduce the entire patent family to one member (i.e. the earliest priority number as one unique claimed invention). From this perspective the remainder could be classified as 'duplicates'. However, for the purposes of the analysis of indicators of global patent activity for biodiversity and traditional knowledge, this is unlikely to be a suitable approach for three main reasons.

Patent activity in multiple jurisdictions can provide proxy indicators for technology transfer, international collaboration in science and technology and insights into foreign direct investment (FDI). Indeed, patent indicators are among the best available indicators for economic analysis of science and technology trends (i.e. OECD 2006a). However, from a more critical perspective, patent activity in multiple jurisdictions may have impacts on competition (i.e. local innovation, production and exports), societal impacts (i.e. access to medicines/agricultural products) and other

[33] EPO Member States: Location: <http://www.european-patent-office.org/epo/members.htm>. June 2007.

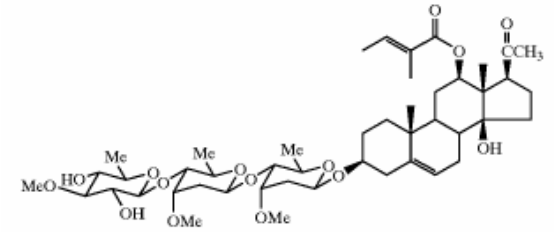
[34] WIPO, Contracting Parties PCT. Location: <http://www.wipo.int/treaties/en/ShowResults.jsp?lang=en&treaty_id=6>. June 2007.

[35] See Chennels (2003) and Wynberg (2004) for discussion of the background to a benefit-sharing agreement between the San people and CSIR.

[36] Source: esp@cenet.

economic effects (i.e. rent transfers to the jurisdictions of patent holders).[37] Finally, in the context of debates on an international certificate of origin/source/legal provenance as it may relate to the patent system, it appears reasonable to assume that a certificate linked to a priority (first) filing would be reflected in the wider patent family.

Table Three: Patent Family for Priority Number - ZA19973201A

Priority Number: ZA19973201A	**Family (Partial)**
Publication No: ZA9803170	EP1213020A2
Title: Pharmaceutical Compositions Having Appetite Suppressant Activity	EP1213020A8
Inventors: VAN HEERDEN FANIE RETIEF (ZA); VLEGGAAR ROBERT (ZA); HORAK ROELOF MARTHINUS (ZA); LEARMONTH ROBIN ALEC (ZA); MAHARAJ VINESH (ZA); WHITTAL RORY DESMOND (ZA)	EP1222927A2
1st Applicant: CSIR (ZA – South Africa)	EP1222927A3
Abstract of **US6376657**[38] A pharmaceutical composition which contains an extract obtainable from a plant of the genus Trichocaulon or Hoodia containing an appetite suppressant agent having the formula (1). A process for obtaining the extract and a process for synthesizing compound (1) and its analogues and derivatives is also provided. The invention also extends to the use of such extracts and compound (1) and its analogues for the manufacture of medicaments having appetite suppressant activity. The invention further provides novel intermediates for the synthesis of compound (1). (1) 	EP1438965A1 EP1598054A2 EP973534A1 EP973534B1 GB2338235A JP2002205997A JP2003026591A US20020168427A1 US20030086984A1 US20040228935A1 US20040234634A1 US6376657B1 US7166611B2 WO1998046243A2 WO1998046243A3

As such, the analysis of full patent family data could play an important role in the development of global indicators for patent activity for biodiversity, traditional knowledge and access and benefit-sharing within the patent system. However, it is important to emphasise that the ability to conduct large scale counts of patent families on the global level in a transparent and verifiable way is presently limited.[38] This could potentially be resolved through the use of PATSTAT.

We now turn to the types of detailed analysis that can be performed using an understanding of country codes and priority and publication code information.

[37] See generally Maskus and Reichmann (eds.) (2005).

[38] Patent family counts can be conducted using the Derwent World Patent Index or, for the main jurisdictions, using Micropatent Aureka and Thomson Data Analyzer. These tools will be prohibitively expensive for most individuals and organisations.

1.4.2 Country of Origin of Patent Filings:

As discussed above, under regional patent instruments and the Patent Cooperation Treaty, patent applicants may submit applications in more than one jurisdiction. This can be tracked using data from the country code provided with the priority number (see Figure 1). Thus, Patent Cooperation Treaty application WO2005094860 was originally filed in Japan (JP) as JP20040101735. Using this information it is possible to identify the country of origin of patent filings in relation to areas of biodiversity and traditional knowledge. For the purpose of illustration this is set out in Table Four for ethnobotanical medicines from plants (A61K35/78; A61K36) in the period 1990-2006 for the top fifteen countries by priority filing (June 2007 dataset).

Table Four: Patent Trends by Country of Filing and Publication

Priority (Filing) Country	**Country Code**	**Country/Instrument of Publication**								
		DE	EP	FR	GB	JP	US	WO	Sub-Total	%
Japan	JP	29	860	13	10	9,935	721	653	12,221	36
United States	US	7	1,685	3	21	677	5,161	2,186	9,740	29
France	FR	16	606	907	2	243	395	438	2,607	8
Germany	DE	925	543	6	1	172	255	389	2,291	7
European Patent Office	EP	1	594	0	0	184	186	243	1,208	4
United Kingdom	GB	7	244	1	192	100	196	242	982	3
Republic of Korea	KR	11	155	14	6	185	235	261	867	3
Italy	IT	1	231	1	0	42	111	132	518	2
China	CN	4	67	1	1	60	76	209	418	1
Australia	AU	1	109	0	3	44	84	116	357	1
India	IN	3	28	1	5	40	71	145	293	1
Ireland	IL	4	46	3	3	23	78	51	208	1
Switzerland	CH	13	70	0	0	26	31	35	175	1
Denmark	DK	1	56	0	0	24	31	45	157	0
Spain	ES	2	46	1	0	24	30	46	149	0
Sub-Total		**1,025**	**5,340**	**951**	**244**	**11,779**	**7,661**	**5,191**	**32,191**	**96**
Total		**1,053**	**5,694**	**959**	**251**	**12,001**	**7,964**	**5,688**	**33,610**	**100**

A total of 78 priority countries (countries of filing) or instruments are recorded in the dataset.[39] We can immediately see that the majority of priority filings are filed with the home country (i.e. Japan) as is well established in the existing literature.[40] However, the growing use of regional and

[39] Depending on the data source the top result may be blank. This will generally correspond with the filing of an application in the home country where recording the country of priority (origin) is not necessary (see EPO, JPO, USPTO 2006).

[40] It should be noted that Micropatent Aureka only contains patent application information for certain jurisdictions. As a result actual national counts will be under-represented by the absence of patent grant information (i.e. Japan, France, the UK). In contrast, given that the United States only published patent grants in the period to 2000 patent activity is not visible for applications inside the United States until 2001.

international instruments by patent applicants is observable in a wide variety of cases (i.e. Japan, United States etc.). This type of analysis demonstrates that it is possible to begin identifying trends in accordance with the origin of applications within particular areas of the patent system i.e. ethnobotanical medicines from plants.

1.4.3 Applicant Analysis:

Figure 1 reveals that esp@cenet and the underlying DOCDB database include information on the names of companies, institutions or individuals and the country code under the entry for "Applicant". The term "assignee" is often preferred to applicant because patents may subsequently be transferred or assigned to other institutions or individuals.[41] The top 15 first Applicants for ethnobotanical medicines within the Micropatent dataset are provided in Table Five (instruments) and Table Six (selected countries).[42]

Table Five: First Applicant by Country/Instrument Code

Country/Instrument	All	Patent Cooperation Treaty	WO	European Patent Convention	EP
UNKNOWN	4,750	COUNCIL SCIENT IND RES (INDIA)	96	INDENA SPA	93
SHISEIDO CO LTD	492	PROCTER & GAMBLE	56	OREAL	81
COUNCIL SCIENT IND RES (INDIA)	336	INDENA SPA	50	COUNCIL SCIENT IND RES (INDIA)	75
KAO CORP	297	COGNIS FRANCE SA	35	SHISEIDO CO LTD	56
OREAL	291	SHISEIDO CO LTD	35	PROCTER & GAMBLE	54
NOEVIR KK	267	KOBAYASHI PHARMA	32	LVMH RECH	47
POLA CHEM IND INC	231	OREAL	32	COGNIS FRANCE SA	46
TSUMURA & CO	215	NUTRICIA NV	30	SCHWABE WILLMAR	42
INDENA SPA	212	SUNTORY LTD	30	NESTLE SA	42
MARUZEN PHARMA	178	LVMH RECH	30	KAO CORP	36
ICHIMARU PHARCOS INC	174	TOYO SHINYAKU CO LTD	28	SUNTORY LTD	33
PROCTER & GAMBLE	173	AVON PROD INC	26	JOHNSON & JOHNSON	25
LION CORP	163	NESTLE SA	25	AVON PROD INC	25
TAISHO PHARMA CO LTD	162	UNILEVER PLC	23	DIOR CHRISTIAN	22
KANEBO LTD	162	SIGMA TAU HEALTHSCIENCE SPA	22	KOREA INST SCIENCE TECHNOLOGY	22
Sub-Total	**8,103**	**Sub-Total**	**550**	**Sub-Total**	**699**
Total	**33,610**	**Total**	**5,688**	**Total**	**5,694**

[41] The term applicant is preferred in this paper on the grounds that the term "assignee" properly refers to the subsequence assignment (transfer) of the ownership of a patent.

[42] More than one applicant may be listed on a patent document. The data presented here refers only to the first applicant in the list.

Table Six: First Applicant by Selected Country

Germany	DE	Japan	JP	United States	US
SCHWABE WILLMAR	33	UNKNOWN	1,486	UNKNOWN	3,255
BEIERSDORF AG	23	SHISEIDO CO LTD	379	COUNCIL SCIENT IND RES (INDIA)	144
HENKEL KGAA	18	NOEVIR KK	266	PROCTER & GAMBLE	55
BIOPLANTA ARZNEIMITTEL	14	POLA CHEM IND INC	231	OREAL	54
MADAUS AG	13	KAO CORP	204	KAO CORP	49
PANDALIS GEORGIOS DR	12	TSUMURA & CO	188	INDENA SPA	42
KOENIGER HELMUT	11	MARUZEN PHARMA	178	MARS INC	40
BIONORICA AG	10	ICHIMARU PHARCOS INC	174	UNIV MICHIGAN	35
PLANTAMED ARZNEIMITTEL	9	LION CORP	160	ACCESS BUSINESS GROUP	26
INDENA SPA	9	KANEBO LTD	155	AVON PROD INC	25
SCHAPER & BRUEMMER	8	TAISHO PHARMA CO LTD	150	LVMH RECH	24
BROSIG STEFAN	7	TOYO SHINYAKU KK	134	SHISEIDO CO LTD	22
COGNIS DEUTSCHLAND	7	KOSE CORP	121	NESTEC SA	21
NUTRINOVA GMBH	7	FANCL CORP	119	CARRINGTON LAB INC	19
BIONORICA ARZNEIMITTEL	6	NONOGAWA SHOJI YK	112	LIU YAGUANG	17
Sub-Total	**181**	**Sub-Total**	**4,057**	**Sub-Total**	**3,828**
Total	**1,053**	**Total**	**12,001**	**Total**	**7,964**

It is observable in Tables Five and Six that a wide variety of companies, organisations and individuals are involved in patent activity for ethnobotanical medicines from plants.

It may be noted that the prevalence of the term unknown in the results for "All" and the "United States" will generally reflect the issue that companies and organizations submitting applications in the United States are not initially required to disclose the name of the applying organization: only inventor names are listed at the application stage. This creates a significant problem from the perspective of representative analysis of applicant data. Furthermore, tracking the subsequent ownership of patents and assignments of patents present formidable challenges.[43] Increased transparency has recently been proposed in relation to assignments and ownership of patents (i.e. IBM 2006).

[43] Patent assignments can be tracked using Public Register (PRS) codes. However, the availability of data on assignments appears to vary considerably and is compounded by issues of company mergers and demergers. For this reason, organizations such as the Thomson Corporation do not track assignments in the Derwent World Patent Index. Further research is merited on this topic.

The applicant analysis for ethnobotanical medicines presented here demonstrates that it is possible to begin identifying companies, organizations and individuals involved in patent activity for particular sectors. This is also possible for a wide range of sectors. However, ranking exercises are affected by the problem of multiple variant spellings of applicant names. This problem is being addressed by the Statistical Office of the European Communities (EUROSTAT) as part of the development of the World Patent Statistics Database (PATSTAT) (see Magerman, Van Looy and Song 2006).

1.4.4 Inventor Analysis:

Inventors seeking to secure patent protection can also be identified based on this approach. Table Seven sets out the top 16 individuals (including unknown) listed as first inventors in the June 2007 dataset for ethnobotanical medicines from plants in the period 1990-2006.

Table Seven: Top 16 Inventors for Ethnobotanical Medicines

1st Inventor	Total
UNKNOWN	1,593
BOMBARDELLI, EZIO	143
TAKAGAKI KINYA	119
PAULY, GILLES	112
YAMAHARA JOJI	62
ANTRAG AUF NICHTNENNUNG DES/DER ERFINDER/S	60
BRETON, LIONEL	54
CAVAZZA, CLAUDIO	49
BONTE, FRÉDÉRIC	47
TOKUYAMA TAKASHI	44
TAO, YUANJIN	41
MAJEED, MUHAMMED	37
1) NISHIBE YUKINAGA 2) MEYBECK, ALAIN*	37
PUSHPANGADAN, PALPU	36
1) KUBO MICHITOKU 2) NANBA TSUNEO*	35
Sub-Total	**2,541**

*Co-ranked at individual values shown

Inventor analysis can, as necessary, be linked with applicant (i.e. company/organization) analysis. However, the presence of "unknown" and the inclusion of "Antrag Auf Nichtnennung" - where multiple inventors appear to have reserved the right not to disclose their names - reveals that in some cases identifying inventors will prove difficult. In other cases there may be multiple variant spellings of inventor names and machine code translation issues i.e. BONTE, FRÉDÉRIC becomes BONTE FRÃ‰DÃ‰RIC. For this reason the ranking for inventors is presently classified as raw.

At a more advanced level of inventor analysis, country code data accompanying inventor names in DOCDB can be used to identify international collaborations (i.e. GB and DE) and to fractionate

inventor data to establish a more accurate measure of country shares.[44] This approach is adopted by the OECD in the preparation of annual patent statistics (i.e. OECD 2006a). However, country code data at the inventor level may not be readily available in either free or commercial databases (i.e. Micropatent Aureka). This type of analysis will best be performed using PATSTAT.

1.4.5 Citation Analysis:

Figure 1 reveals that patent application WO2005094860 contains a number of references to "Cited documents". Citations refer to other patent documents and Non-patent Literature (NPL) that form part of the prior art that affects the scope of a particular patent application. According to the OECD/EPO citations database the vast majority (95%) of patent citations are added by patent examiners during search and examination.[45]

The analysis of citations is an increasing focus of research and sophisticated statistical analysis (i.e. Jaffe, Trajtenberg and Romer 2005; Strandburg 2006). On the international level the most important methodological and database resources in this area are provided by the OECD (i.e. Webb, Dernis, Harhoff and Hoist 2006). However, it is important to emphasise that the interpretation of citation data from multiple jurisdictions (i.e. the United States and European Patent Convention) requires careful attention (Webb, Dernis, Harhoff and Hoist 2006; Hall 2006). These issues will not be addressed in this paper.

For the present purposes citations can simply be regarded as links established between documents. These links take two forms: a) backward, and; b) forward. Taken together, backward and forward citations can be used to map citation networks in particular areas of the patent system. This is of particular relevance for debates on certificates of origin/source/legal provenance under an international regime.

Backwards Citations:

Table Eight provides a summary of raw data on citations to prior patents and other literature within the June 2007 dataset of documents for ethnobotanical medicines (A61K36 and A61K25/78). The data suggests that citations to earlier patents and non-patent literature are limited in this area. However, there is a need to bear in mind that citations are affected by the practices of different patent offices (Webb 2006).[46] The basic issue that is demonstrated here is that citations form a formal part of the system and that counts can be elucidated for this data.

[44] Choices can be made to either allocate multiple inventors to their respective countries or allocate to one country. See OECD (2006) for discussion.

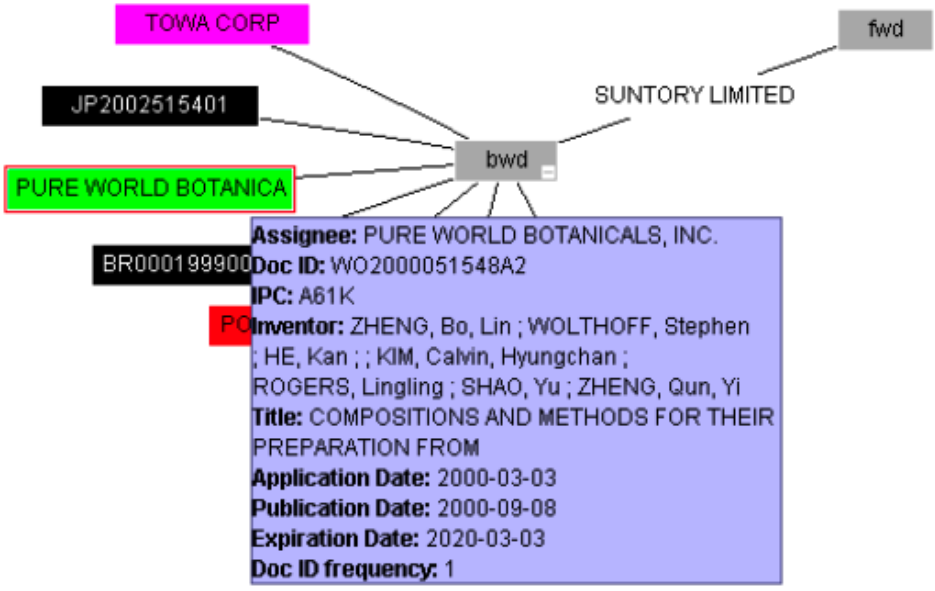
[45] Patent citations have five recognised origins: i) Added during search; ii) Provided by the applicant but not used in the search report; iii) Added during examination; iv) Provided during opposition proceedings, and; v) Other (Colin Webb, personal communication, 24th January 2007). Note also that the 95% refers to European (EPC) and PCT patent documents within the OECD/EPO citations database.

[46] In the United States, applicants are required to include relevant citations. In contrast under the European Patent Convention they are primarily inserted by examiners. As discussed by Harhoff and Hoisl and Webb (2005) and Webb (2006) this has significant impacts upon statistical analysis (see also OECD 2006a). For this reason the aggregated data illustrated here should not be over interpreted.

Table Eight: Backward Citations for Ethnobotanical Medicines

Citing Count	Total	%
0	23,363	69.5
1-10	9,096	27.1
11-20	768	2.3
21-30	215	0.6
31-40	72	0.2
41-50	38	0.1
51-60	18	0.1
61-68	11	0.03
71-80	10	0.03
83-89	5	0.01
92-94	4	0.01
100-124	4	0.01
132	1	0.003
182	1	0.003
244-279	4	0.012
Total	**33,610**	**100.0**

Figure 7: Aureka® Citation Tree for WO2005094860



Furthermore, using advanced analytical tools such as Micropatent Aureka and related services it is increasingly possible to visualise citation relationships. The citation tree in Figure 7 from Micropatent Aureka presents the backward and forward citations for WO2005094860 relating to *Lepidium meyenii* (see Suntory Limited). This reveals a linkage to a patent application entitled "Compositions and Methods for their preparation from Lepidium" that has been a focus of attention in relation to biopiracy (Peru 2003, Oldham 2006). Figure 7 also reveals that the Suntory Limited application has not been cited by other patent applicants (see "fwd"). This is likely to reflect the fact that the application was published in 2005. However, it also exposes the basic issue that many patent applications or grants are never cited by other patents (Strandburg 2006).

Forward Citations:

Forward citations refer to later patent filings that cite an earlier patent or non-patent literature. This has been described as an indicator of the economic importance of a patent, whereby the more frequently cited patents are seen as more valuable (i.e. Jaffe, Trajtenberg and Romer 2005, Strandburg 2006). Once again interpretation of citation data should be approached with caution due to the different citation practices of patent offices. The age of patent documents is also a significant factor because older documents are more likely to be cited (Webb 2006). The data presented here simply demonstrates that it is possible to elucidate forward citation data for a particular area of the patent classification over time as set out in Table Nine.

Table Nine: Forward Citations for Ethnobotanical Medicines

Cited By Count	Total	%
0	24,104	71.7
1-10	8,857	26.4
11-20	452	1.3
21-30	118	0.4
31-39	41	0.1
41-50	21	0.1
51-59	5	0.01
62-69	7	0.02
72-77	2	0.01
92-99	3	0.01
Total	**33,610**	**100**

The top cited patent in the working sample is cited 99 times by other patents. Patent Cooperation Treaty application WO9323069, by Kenneth Graham Edmund from Australia, is concerned with "Health Supplements Containing Phyto-Oestrogens, Analogues or Metabolites Thereof". The patent claims the use of natural phyto-oestrogens and analogues of such oestrogens from soy and red clover in "food additives, tablets or capsules for promoting health in cases of cancer, pre-menstrual syndrome, menopause or hypercholesterolaemia [high cholesterol]". The patent is linked to a range of patents for isoflavones owned by the Australian pharmaceutical company Novogen Research and is associated with over the counter products from red clover such as Promensil (for the relief of symptoms of menopause).

This patent application is of interest for three main reasons. First, a Patent Cooperation Treaty application may result in patent grants in multiple jurisdictions forming part of a patent family. At the time of writing the patent family consists of 32 documents from 25 applications in 14 countries/jurisdictions, including Europe (i.e. EP0656786). These applications include citations to the PCT application and can be regarded as a form of 'duplicate' or 'self-citation' since the original patent document is cited by the same patent document within the patent family in other jurisdictions.

The second reason that the patent is of interest is that while the purpose of the citation system is to describe the relevant prior art affecting patent activity, it can also provide clues on possible licensing agreements. Thus, Novogen licensed a soy isoflavone patent to DuPont Protein Technologies (now The Solae Company) in 1997 for an initial AUS$ 15.7 million plus milestone payments and royalties on product sales.[47] In such cases, linkages may be visible at the level of forward citations (including joint assignee and co-inventor applications). However, it should be emphasised that citation analysis only provides initial clues on possible licensing agreements as a basis for further research. Assignments of patent ownership and licensing are not transparent within the patent system and present significant challenges at the level of indicators.

Finally, because top cited patents are more important (either by virtue of the inventive contribution or scope of the claims) it appears that they are more likely to be a focus of litigation. Thus, the European patent is the subject of opposition proceedings by 12 opponents from Italy, Germany, France, Spain, the Netherlands and the UK.[48] This serves to illustrate the growing economic importance of markets for ethnobotanical medicines in regions such as Europe and the linkage with intellectual property.[49]

Using Micropatent Aureka or similar services it is possible to track patents citing WO9323069 and map citation networks as illustrated in the three citation trees from Micropatent Aureka provided in Figures 8 to 10.

In interpreting these citation trees, Figure 8 provides the backwards and forward citations for the Kenneth Graham Kelly (Novogen) patent. Figure 9 selects a forward citation in the network by Protein Technologies. Figure 10 displays the forward citation network for Protein Technologies to Abbott Laboratories.

[47] Source: Novogen, Intellectual Property and Patents. Location: <http://www.novogen.com/cons/cons0301.cfm?mainsection=03&subsection=08>.

[48] Source: European Register at <http://www.epoline.org/portal/registerplus>.

[49] In this case the opponents allege that the European patent does not meet any of the criteria for patentability and should be revoked. These allegations are contested by the patent holder.

Figure 8: Aureka® Backwards and Forward Citations for WO9323069

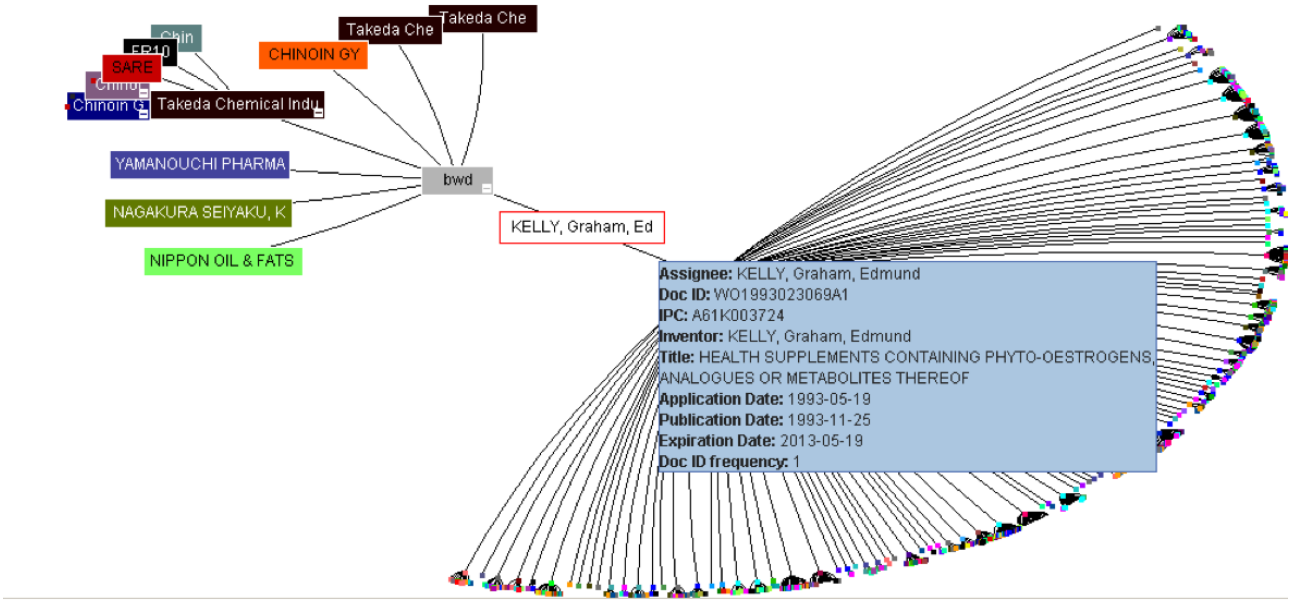


Figure 9: Aureka® Forward Citation by Protein Technologies

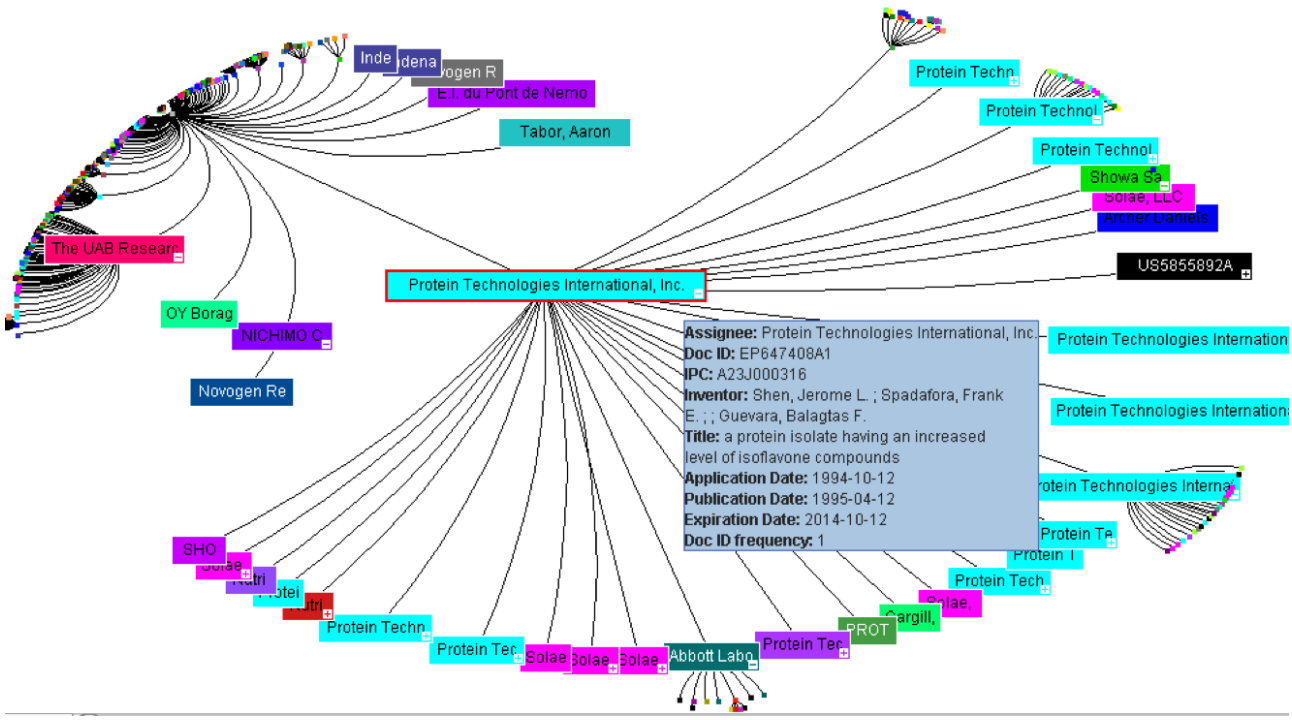
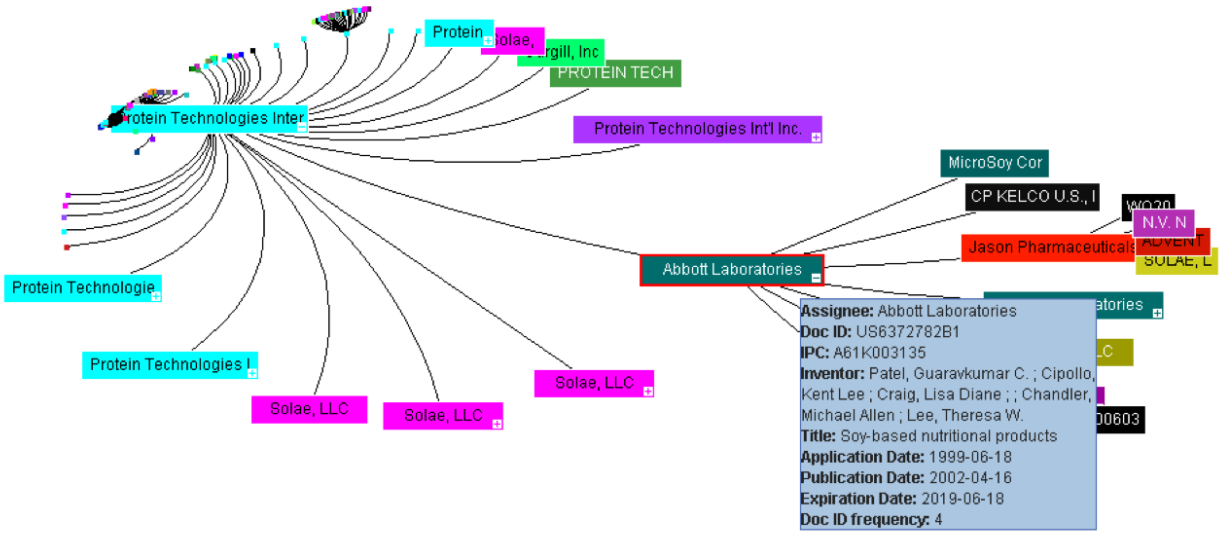


Figure 10: Aureka® Forward Citation Tree linking to Abbott Laboratories



The second most cited patent in this area between 1991 and 2006 is US5569459. This patent is cited 98 times and was granted in 1996 to Bio-Virus Research Incorporated from California with the title "Pharmaceutical Compositions for the Management of Premenstrual Syndrome and Menopausal Disorders".

The patent describes the use of combinations of extracts from dried liquorice root, Valerian root, Ginseng root and *Passiflora incaranta* (passion flower) combined with vitamins and acids in addressing oestrogen related problems in "a prepubescent female mammalian subject", "a female mammalian subject experiencing premenstrual syndrome" (PMS), and "a female mammalian subject with estrogen deficiency following menopause". In contrast with the top cited patent, this patent was subsequently assigned to ACDS Technologies Inc. and expired due to a failure to pay the maintenance fee in 2004. As such it is of historical interest in so far that it indicates the expansive language that may be used to construct claims i.e. female mammalian subject, leading to high citation levels by virtue of the scope of the patent document. On a wider level, it also serves to reveal that many patents are not maintained for the full twenty years and become prior art that shapes and limits future patent claims in the same area.[50]

1.5 Observations:

This section has demonstrated that starting with a basic approach involving two patent classifiers and an understanding of country and instrument codes it is possible to map statistical trends for a specific area of biodiversity and traditional knowledge across multiple countries and patent instruments. In the process some of the key issues and key concepts involved in patent counts have been introduced. We have also seen that it is possible to identify the companies, organizations and individuals involved in particular sectors of activity (i.e. ethnobotanical medicines). Using a basic

[50] For patent maintenance rates in Europe, Japan, and the United States see EPO, JPO, USPTO 2006.

understanding of citations and visualization tools it is then possible to track relationships over time to a sophisticated level of detail.

In considering the development of indicators for biodiversity and traditional knowledge within the patent system a balance needs to be struck between refining data to the highest degree of accuracy possible and the ease and utility of obtaining data on trends to inform policy debates. As the report of the Expert Meeting on Indicators of Biological Diversity argues, it will be desirable to develop indicators on a variety of levels i.e. satellite, core, aggregate and headline to serve the needs of policy makers and other users. The emphasis here should be placed on the usefulness of indicators to policy-makers and other participants in access and benefit-sharing. At the same time such indicators should be based on reliable and verifiable data using transparent and repeatable methods.

The main solution for the development of patent indicators is to use the EPO/OECD World Patent Statistics Database which was released in 2006 as a "no black box" database for the elaboration of statistics. PATSTAT is drawn directly from DOCDB and contains data from 81 countries and regional and international instruments. This will provide a common core and a stable baseline that can be monitored and updated over time.

However, it is important to bear in mind that wide participation in the development of indicators should be encouraged in order to address the scale of patent activity for biodiversity and traditional knowledge and to promote confidence in the use of indicators. As a consequence participants in the development of patent related indicators are likely to use a variety of data sources (i.e. esp@cenet, Patent Lens, Micropatent, DWPI etc.). This issue could best be addressed by ensuring that the data source, coverage, the time period and date for the development of datasets are clearly explained. Furthermore, patent counts by publication year (and where possible by priority year) should constitute the main focus. The resulting data can then be compared with baseline data from PATSTAT. As discussed below, further guidance on the development of indicators is desirable from the OECD and participants in the OECD Patent Statistics Taskforce to avoid duplication of effort and promote methodological rigour in the development of indicators.

Looking beyond the nature and implications of the rights provided by patent instruments, this section demonstrates the importance of classification and coding systems at the level of indicators for tracking and monitoring activity. There are clear lessons here regarding the possible introduction of certificates of origin/source/legal provenance or commons or open source models with respect to the role of classifiers and codes. Specifically the use of standardised coding and numbering systems and citations enables the creation of networks that can be tracked and monitored over time. In short, this provides an insight into how certificate systems or open source models that may be agreed under the Convention on Biological Diversity could be made to work as part of an international regime on access to genetic resources and benefit-sharing.

However, as we have also seen, it is important to understand and recognise some of the limitations of patent data. The key variables here are scale and time. Scale is an important variable in so far that indicators should reflect the spectrum of Parties to the Convention and potential non-Party countries who participate in an international regime. Time is an important variable that reflects the availability of data and the timeliness of data at the level of indicators. Time can be described as a function of scale in so far that the size of the system and bottlenecks within the system affect the timeliness of indicators. As discussed in the conclusion to this paper, a way forward in addressing

these issues both for measures inside or outside the patent system may be to combine attention to classification with careful attention to incentive measures.

In considering the issue of scale it is important to recognise that biodiversity and traditional knowledge within the international patent system extend beyond ethnobotanical medicines from plants to encompass a wide range of activity. It is to demarcating these areas using classifiers to which we now turn.

Section II: Demarcating Biodiversity and Traditional Knowledge within the Patent System

The preceding discussion has focused on the use of basic knowledge of patent classification codes to develop a series of indicators and basic statistics for biodiversity and traditional knowledge within the patent system. However, biodiversity and traditional knowledge are employed in a wide variety of sectors with different characteristics, markets and actors. In an era of emerging developments such as genomics, proteomics, bioinformatics, systems biology and other transformations in science and innovation it is also important to move beyond an overly narrow focus on pharmaceutical compounds that has tended to dominate debates on access and benefit-sharing. A detailed breakdown of classifiers for sectors of activity will be presented in Section III. This section is concerned with demarcating biodiversity and traditional knowledge across the international patent system using classification codes.

A review of IPC7 and the core of IPC8 revealed the major classification codes provided in Table Ten.

Table Ten: Main IPC Classifiers for Biodiversity and Traditional Knowledge

IPC Classifiers	**Summary**
	Classifiers (Class/Sub-Class/Group Level)
Section A	***Human Necessities***
A01	Agriculture; Forestry; Animal Husbandry; Hunting; Trapping; Fishing
A01H	New plants or processes for obtaining them
A01N	Preservation of Bodies of Animals or Plants or Parts thereof; biocides
A23	Food or Foodstuffs; their Treatment
A23L	Foods, Foodstuffs, or Non-Alcoholic Beverages
A61	Medical or Veterinary Science; Hygiene
A61K	Preparations for Medical, Dental or Toilet Purposes
A61K31	Medicinal preparations containing organic active ingredients (i.e. wholly or partially characterised pharmaceutical compounds)
A61K35	Medicinal preparations containing material or reaction products thereof with undetermined constitution.
A61K35/78	Medicinal preparations involving plants (replaced by A61K36 from 01/01/2006)
A61K36	Medicinal preparations of undetermined constitution containing material from algae, lichens, fungi or plants, or derivatives thereof, e.g. traditional herbal medicines (replaced A61K35/78 from 01/01/2006)
A61P	Therapeutic activity of chemical compounds or medicinal preparations
Section B	***Transportation***
B82	Nanotechnology
B82B	Nanostructures, Manufacture or treatment thereof

Table Ten: Main IPC Classifiers for Biodiversity and Traditional Knowledge (Continued)

Section C	***Chemistry; Metallurgy***
C07	Organic Chemistry
C07C	Acyclic or Carbocyclic compounds
C07D	Heterocyclic compounds
C07H	Sugars; derivatives thereof; nucleosides, nucleotides; nucleic acids
C07K	Peptides
C08	Organic macromolecular compounds
C08H	Derivatives of natural macromolecular compounds
C08L	Compositions of macromolecular compounds
C09	Dyes (C09B); Paints (C09D); Natural Resins (C09F); Polishes (C09G); Adhesives (C09J); Other Applications (C09K)
C11	Animal or vegetable oils, fats, fatty substances or waxes
C12	Biochemistry; Beer; Spirits; Wine; Vinegar; Microbiology; Enzymology; Mutation or Genetic Engineering
C12N	Microorganisms or Enzymes; Compositions thereof
C12N5	Undifferentiated human, animal or plant cells
C12N9	Enzymes, proenzymes, compositions thereof
C12N15	Mutation or genetic engineering
C12P	Fermentation or Enzyme using processes to synthesise chemical compounds
C12Q	Measuring or testing processes involving enzymes or microorganisms
C12R	Indexing classifier for microorganisms & biochemistry.
C12S	Processes using enzymes or microorganisms to liberate, separate or purify a compound, to treat textiles or clean solid surfaces
C40	Combinatorial Technology (from 01/01/2006)
Section G	***Physics***
G01	Measuring; Testing
G01N	Investigating or analysing materials by determining their chemical or physical properties i.e. for biochemical electrodes, proteomics.
G06	Computing
G06F	Electrical Digital Data Processing i.e. for bioinformatics.

A full list of classification codes used in the underlying review of global status and trends in intellectual property claims for biological and genetic material is provided in the Annex. It may be noted that the list may not be complete and additional guidance will ideally be sought from specialists in classification within the International Bureau of WIPO.[51]

[51] Attention is drawn to classifiers under C02 for 'Treatment of water, waste water, sewage, or sludge' and in particular C02F3/34 for 'Biological treatment of water, waste water, or sewage characterised by the micrioorganisms used' within the OECD (i.e. 2006a) working definition of biotechnology patents. This is a significant area of activity (see Table 15 on page 58 below). Additional areas of the classification that are of relevance have been identified by the International Bureau of WIPO in response to an OECD survey on the validation of biotechnology indicators. The indicators identified in the OECD working definition and by the International Bureau are provided in the Annex and marked *. Attention is also drawn to classifier A01K for animals provided in the Annex.

2.1 Capturing Patent Activity for Biodiversity and Traditional Knowledge:

The key classifiers provided in Table Ten can be used to conduct searches of whole text patent databases for species, genera and their components using Boolean search terms. In essence, these search formulas consist of simple terms (operators) such as AND or OR, and characters that permit the construction of a formula that can be understood by a patent database. Further guidance on methods is provided in the companion paper *Biodiversity and the Patent System: An Introduction to Research Methods*.[52]

The objective in the use of the codes is to confine the search to areas of the patent system of known relevance to biodiversity and traditional knowledge. For example a basic generic working formula for biological and genetic material and traditional knowledge on the class level is as follows:

> (species or genera or family or common name or components) and (A01 or A23 or A61 or B82 or C07 or C08 or C09 or C11 or C12 or C40 or G01 or G06)

This formula confines the search for a particular species, genera, family, common name or the biochemical components of organisms to specific areas of the patent system. Other classifiers can be added or removed as required (see below).

On a more detailed level it is also possible to construct searches for biodiversity on the sub-class, group and sub-group level. The sub-class level is the main level at which international statistics are presently prepared by organisations such as the OECD and allows for the greatest degree of international comparability (i.e. OECD 2006a). A formula consisting of the sub-classes provided in Table Ten would read as follows:

> (species or genera or family or common name or components) and (A01H or A01N or A23L or A61K or B82B or C07C or C07D or C07H or C07K or C08H or C08L or C09B or C09D or C09F or C09H or C09J or C09K or C11B or C11C or C11D or C12N or C12P or C12Q or C12R or C40B or G01N or G06F)[53]

Levels of data capture for the working formulas above were tested against a series of examples using the Micropatent "Aureka" whole text database in December 2006 for the period 1990-2005. This was achieved by comparing the search results for a simple search of the whole text of patents with the search results including the classification codes. The results are presented in Table Eleven and refer to patent applications and grants for the United States and the European Patent Convention, Germany**,** and patent applications (only) in the UK, France, Japan and under the Patent

[52] The companion paper on research methods focuses on the use of free patent database tools (i.e. the USPTO database) to construct search formulas. To accommodate the limitations of the USPTO database the search formulas presented in that paper are shorter versions of the extended formula presented here.

[53] Data on animals and agriculture can be captured by incorporating classifier A01K (Animal Husbandry; Care of Birds, Fishes, Insects; Fishing or Breeding Animals, not otherwise provided for; New Breeds of Animals). However, further exploration is merited in this area in relation to actual claims over animals or their components.

Cooperation Treaty. It should be noted that the totals presented in Table Eleven are running rather than absolute totals. This reflects the ongoing addition of new documents for recent years.[54]

Table Eleven: IPC Data Capture for Test Examples[55]

Search Terms	Running Totals 1990-2005	Class Indicators	Capture %	Sub-Class Indicators	Capture %
"oryza"	8,409	8,352	99.32	8,324	98.98
"oryza" or "rice"	102,050	82,837	81.17	71,732	70.29
"azardichta" or "azardichtin" or "neem"	956	911	95.29	842	88.07
"banisteriopsis" or "caapi" or "harmine" or "harmaline"	164	150	91.46	137	83.53
"lepidium" or "p-methozybenzyl isothiocyanate"	2,138	2,132	99.71	2,126	99.43
"alkaloid"	8,762	8,504	97.05	8,245	94.09
"DNA" or "deoxyribonucleic acid"	306,336	300,003	97.93	291,898	95.28
"RNA" or "ribonucleic acid"	196,376	193,809	98.69	190,164	96.83
"polypeptide"	170,488	169,059	99.16	166,116	97.43
"enzyme"	355,144	346,099	97.45	332,628	93.66
"microorganism" or "bacteria" or "microbe" or "microbial"	321,033	283,113	88.18	247,573	77.11
"genome"	130,138	129,367	99.40	128,479	98.72
"proteome"	3,748	3,643	97.19	3,609	96.29
"proteome" or "proteomic" or "proteomics"	10,218	9,752	95.43	9,548	93.44
"stem cell" or "meristem" or "pluripotent" or "totipotent"	37,778	37,593	99.51	36,732	97.23
"mitochondria" or "mitochondrion"	20,727	20,492	98.86	19,905	96.03
"bioinformatics"	9,633	9,524	98.86	9,444	98.03

[54] This point should also be borne in mind in approaching the underlying research papers (i.e. Oldham 2004a, Oldham 2004b, Oldham and Cutter 2006a, 2006b).

[55] It should be noted that the data presented in Table Ten differs from similar data presented in *Biodiversity and the Patent System: An Introduction to Research Methods* which covered the period 1991-2005 (rather than 1990-2005) and explored data capture for the whole text and claims sections of patent documents.

This test demonstrates the principle that it is possible to identify the areas of the international patent system that relate to biodiversity and traditional knowledge to a considerable degree of accuracy. However, in considering the variations in results it is important to note four points.

First, comparison of the results of a search for the genus *Oryza* with the results for the combined terms "Oryza or rice" reveals considerable divergences. The reason for this is that as the world's major cereal rice is a focus of activity across a broad spectrum of technology. This includes areas such as kitchen equipment (A47J) or industrial machinery for processing or transporting rice. Patent activity in these areas will not generally involve actual claims over rice or its components. One strength of using classification codes is that it becomes possible to exclude irrelevant areas (i.e. A47J) in a structured way.

Second, a common problem involved in searching the patent system is that there may be multiple uses of terms such as "rice". Similar issues are found with the use of other terms such as "maca" for *Lepidium meyenii* (i.e. a surname, macaroni, macaque, as a compound name MACA etc.).[56] Problems are also encountered with searches for country names or the names of indigenous peoples within patent documents. The use of classification codes limits results to areas of the patent system that are directly concerned with biodiversity and traditional knowledge.

Nevertheless, the use of common names represents a very significant source of "noise" in identifying patent activity for biodiversity and traditional knowledge and results in "noisy datasets" (Scheu *et. al*. 2006). The use of advanced bibliometric techniques and "text mining" software such as Aureka or the Thomson Patent Analyzer represents one possible solution in this area. However, a superior solution would involve a combination of enhanced disclosure and clarity of disclosure (i.e. species and genus name, country of origin, indigenous peoples) and the further development of classification codes.[57]

A third factor relates to the wide diversity of uses that may be made of a particular chemical compound or other components of organisms. For example, the search results for selected chemical components found in *Banisteriopsis* reveal that the beta-carboline harmine (in a variety of forms) is used by companies such as Xerox in patent applications relating to recording sheets and imaging.[58] These documents (14 in total) fall in an area of the classification under physics concerning electrography, electrophotography or magnetography (G03G) that are not encompassed in the existing classifiers. This can be addressed in a variety of ways.[59] However, further refinement is needed in relation to the range of classifiers for biodiversity and traditional knowledge and would ideally be conducted in consultation with specialists from WIPO, other relevant organisations, and include indigenous peoples and civil society participation.

[56] Misspellings, multiple spellings and machine code errors are also a common issue as in Figure 1 for "myenii".

[57] In considering enhanced disclosure of the names of families, genera and species, care should be taken to ensure that administrative measures do not lead to the expansion of patent claims. This could be achieved by classifying such information as "non-inventive".

[58] According to Wikipedia harmine was originally isolated in the Middle Eastern plant Syrian Rue (*Peganum harmala*) from which the chemical name is derived.

[59] The easiest way to achieve this is to reverse the formula using ANDNOT or NOT to focus on all areas of the patent system including the terms outside the selected classifiers.

Finally, while data capture will generally be possible to over 90% achieving data capture to 100% will frequently prove difficult. The reason for this is that the addition of individual classifiers produces diminishing returns in terms of additional results above approximately 95%.

As this discussion makes clear it is possible to capture the presence of biodiversity and traditional knowledge within the patent system to a considerable level of detail. However, the scale of the patent system and the scale of activity for biodiversity and traditional knowledge also presents significant challenges. These challenges could be addressed through enhanced disclosure requirements and, where necessary, enhanced clarity of disclosure in relation to the family, genus, species, and components of organisms along with the country and indigenous peoples of origin (see European Community and its Member States 2004).[60]

While representing an important foundation for clarifying the origin and nature of patent activity for biodiversity and traditional knowledge within the patent system, enhanced disclosure measures will ideally be accompanied by the increased use of classification codes and administrative codes (i.e. country codes). The reason for this is that the use of coding systems dramatically reduces the problem of "noise" and facilitates statistical analysis through which activity can be made visible to science, society and policy-makers. Furthermore, the use of classification codes as quantitative indicators would be particularly important for monitoring compliance with measures developed under an international regime on access to genetic resources and benefit-sharing.

In considering the importance of classification in facilitating the demarcation of areas of the patent system it may be observed that the test examples in Table Eleven cover a spectrum of patent activity ranging from agriculture to genomics and bioinformatics. In the process, the examples point to the emergence of patent activity involving biodiversity and/or traditional knowledge within a wide variety of sectors and sub-sectors of activity. These sectors can best be explored through the use of classifiers as indicators.

An understanding of indicators for the spectrum of sectors of patent activity for biodiversity and traditional knowledge is likely to be of central importance to any measures that may be adopted under an international regime on access to genetic resources and benefit-sharing. Specifically, indicators will be central to the capacity of Parties and other participants in access and benefit-sharing arrangements to monitor compliance and the success of these arrangements in relation to the patent system. It is to the use of classifiers as indicators for sectors and sub-sectors of activity across the spectrum from agriculture to emerging developments such as bionanotechnology to which we now turn.

[60] See also UNEP/CBD/WG-ABS/5/4/Add.1.

Section III: Sectors and Trends

Existing research on the commercial and non-commercial uses of biodiversity and traditional knowledge reveals that a particular species, members of a particular genus or the components of organisms may be used in a variety of ways across a range of different economic sectors (i.e. Kate and Laird 1999, Parry 2004, Laird and Wynberg 2006, Oldham 2006, Oldham and Cutter 2006).

With respect to intellectual property and access and benefit-sharing these sectors may involve different actors, serve different markets, and use distinct technologies. Patent activity within these sectors may also involve intellectual property claims over biodiversity and traditional knowledge at very different levels. Thus, patent activity for a raw extract from a plant for use in medicines originating from research with indigenous peoples will have different implications to patent activity involving the genomes of organisms (O'Malley, Bostanci and Calvert 2005, Oldham 2004a, 2006).

An understanding of these sectors, trends within sectors, and the diversity of actors involved is desirable at the level of quantitative indicators in developing effective measures under an international regime on access and benefit-sharing. Specifically, the development of statistical indicators that can be combined with economic analysis and qualitative assessment criteria will provide governments, civil society organisations, indigenous peoples organisations, the scientific community and industry with a clearer view of activity, its implications, and the effectiveness of measures that may be adopted under an international regime.

The development of statistical indicators in these areas has been pioneered by the OECD using the International Patent Classification (IPC) across a range of industry sectors (i.e. OECD 2006a). Work by the OECD, the major patent offices and the research community is increasingly extending into the development of detailed indicators in areas such as biotechnology and nanotechnology. The OECD and other members of the research community are also leading the development of standardised methodologies and frameworks for linking intellectual property data with wider economic and related indicators (i.e. OECD 2005a). Any further development of patent indicators for biodiversity and traditional knowledge will ideally be conducted in cooperation with the work of the OECD and the OECD Patent Statistics Taskforce consisting of the OECD, the European Patent Office, the United States Patent and Trademark Office, the Japan Patent Office, the World Intellectual Property Organisation, the European Commission, and the National Science Foundation (US).

Capacity to develop internationally comparable indicators for patent activity for biodiversity and traditional knowledge will be greatly strengthened by the recent release of the European Patent Office 'World Patent Statistics Database' (PATSTAT). PATSTAT represents the European Patent Office's contribution to the work of the OECD Patent Statistics Taskforce and consists of patent data from 81 authorities including national offices and regional and international patent instruments.[61] Updated versions of PATSTAT are made available every six months at marginal cost.[62] In particular, PATSTAT will make possible the development of statistical indicators that reflect the broad range of Parties to the Convention on Biological Diversity.

[61] EPO 'Global Patent Data Coverage'. Location: <http://patentinfo.european-patent-office.org/_resources/data/pdf/global_patent_data_coverage.pdf>.

[62] PATSTAT is available from the European Patent Office for non-commercial purposes. Email: PatentData@epo.org

This section provides a basic introduction to the main indicators for international patent activity for biodiversity and traditional knowledge based on data generated for the underlying review of global status and trends in intellectual property claims. This review consisted of the use of a combination of the publicly available EPO esp@cenet worldwide patent database and the commercial Micropatent "Aureka" whole text database service operated by the Thomson Corporation. Data from esp@cenet covers over 70 countries, regional patent instruments and the Patent Cooperation Treaty.

This section is based upon material and underlying data presented in three open access papers (Oldham and Cutter 2006a, Oldham and Cutter 2006b, Oldham 2006). This section reproduces summary data and graphs from the underlying research. The data is presented in the form of a series of brief snapshots of sectoral trends with comments on methodological issues. More detailed discussion is provided in the underlying research papers.

In approaching the data presented in this section it is important to emphasise four points. First, as described above, a number of methods are available for counting patent data. These methods focus on the choice of the year. For the purpose of economic analysis the OECD uses counts by priority year (the year of first filing). In contrast, the data presented below uses counts by publication year. This is generally at least 18 months after the priority date and introduces a lag time in terms of economic analysis. Researchers and others interested in reproducing the data provided in this paper using free tools will find that the use of the publication year and IPC codes provides the easiest method.[63] Nevertheless, harmonisation with the methods developed by the OECD will facilitate analysis for a wider variety of purposes. Additional harmonisation may be desirable with the work of EUROSTAT in allocating patent activity for biodiversity and traditional knowledge to economic sectors (Van Looy and du Plessis and Magerman 2006).

Second, the data does not discriminate between patent applications and patent grants and includes republication of patent applications as they move through the procedure in multiple jurisdictions around the world. As such the data provides an overview of overall trends in global patent activity at the systemic level. Data on applications and grants can be discriminated through the use of "kind codes" (i.e. A or B). However, as discussed above, the use of kind codes is complex on the global level and is best performed using PATSTAT.

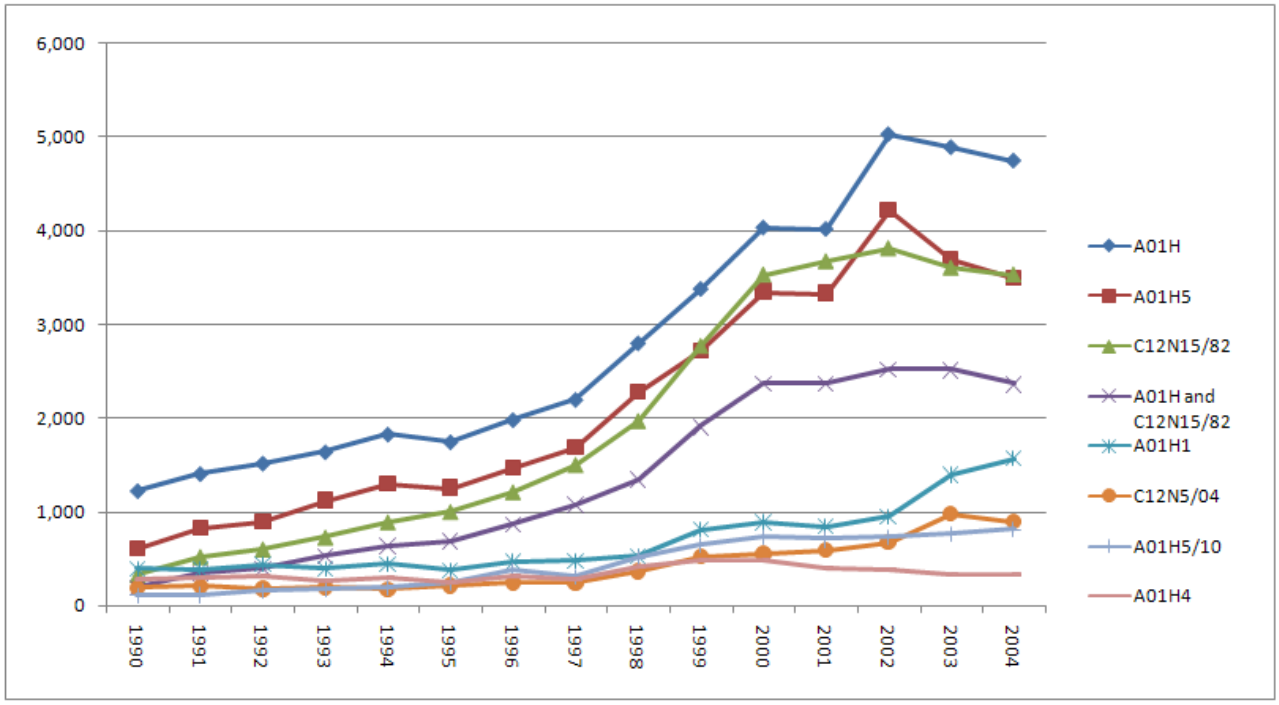
Third, the data refers to available information within the esp@cenet database at the time of the searches (June 2006). Data for recent years will frequently display an apparent decline due to a lack of available documents within esp@cenet and the underlying DOCDB database (i.e. 2001-2006). For this reason the data presented in this section focuses on the period 1990-2004.

Finally, it is important to recall that patent applications will frequently be awarded more than one classification code and trends towards the use of multiple classifiers to describe applications will increase under IPC8. This means that an application or grant in one area of the patent system may also fall into other areas of the classification and corresponding indicators.

[63] The data presented in this section can readily be reproduced by entering the relevant classification code into the International Patent Classification section of the Advanced Search page of esp@cenet i.e. A61K35/78 or A61K36. The year can be delimited by entering a relevant year in the Publication Number box. Country code delimitation is also possible. However, searches by publication year must be conducted by hand. Location: <http://ep.espacenet.com/advancedSearch?locale=en_EP>.

3.1 Agriculture:

Figure 11: Patent Publication Trends for Agriculture



Source: Oldham and Cutter 2006a

The main indicators for agriculture are located under A01H for "New plants or processes for producing them" and C12N as the main indicator for biotechnology and genetic engineering. Figure 11 demonstrates that patent activity in this area is dominated by flowering plants (A01H5) closely followed by genetic engineering and plants (C12N15/82). The search results for the combined classifiers (A01H and C12N15/82) compared with the results for C12N15/82 suggest that patent examiners commonly award one classifier for applications under genetic engineering.

Other relevant areas of patent activity for plant agriculture include: "processes for modifying genotypes "(A01H1); "undifferentiated plant cells or tissues" (C12N5/04); seeds (A01H5/10), and; "plant reproduction by tissue culture techniques" (A01H4).

The use of classifiers as indicators under agriculture is particularly relevant in relation to activity for foodstuffs and forages under Annex 1 of the International Treaty on Plant Genetic Resources for Food and Agriculture and understanding emerging trends in technology under the Biosafety Protocol. Further work may be desirable in this area.

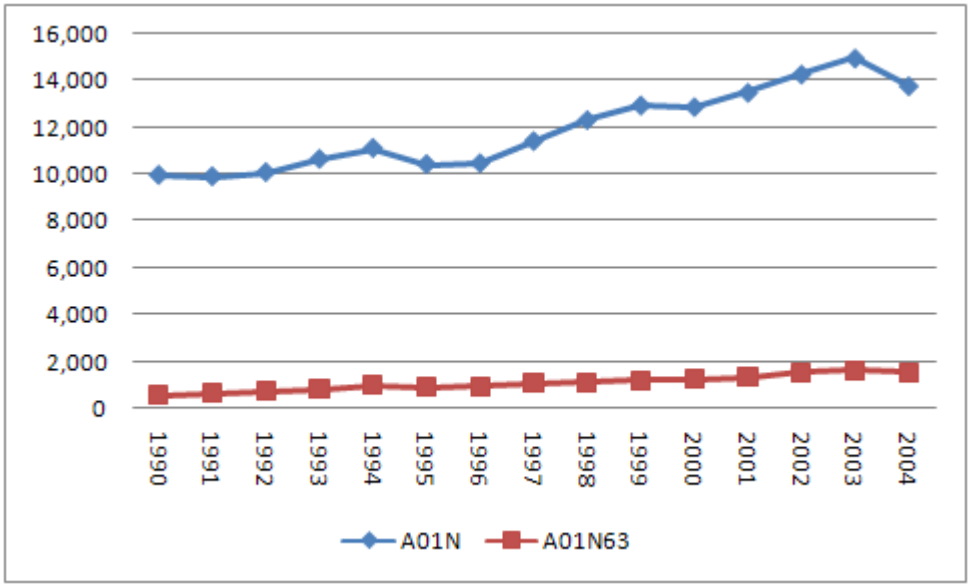
Data on patent activity for animals and agriculture was not included in the present research. However, data for agriculture and animals can be captured through the use of the indicator A01K (for Animal Husbandry and breeding) along with sub-groups under C12N15 for genetic engineering involving animals and C12N5/06 for undifferentiated animal cells or tissues.

3.2 Biocides:

The main indicators for biocides fall within "Preservation of Bodies of Animals or Plants or Parts thereof; biocides" (A01N) (Figure 12). On a more detailed level, the indicator for "Biocides, pest repellents or attractants, or plant growth regulators containing microorganisms, viruses, microbial fungi, enzymes, fermentates or substances producing or extracted from microorganisms or animal materials or extracts thereof" (A01N63) and related sub-classifiers merit greater attention.

These classifiers can, as necessary, be combined with classifiers under Human Necessities, Chemistry or Biochemistry for detailed sectoral analysis of the role of biodiversity and traditional knowledge within biocides.

Figure 12: Patent Publication Trends for Biocides



Source: Oldham and Cutter 2006b

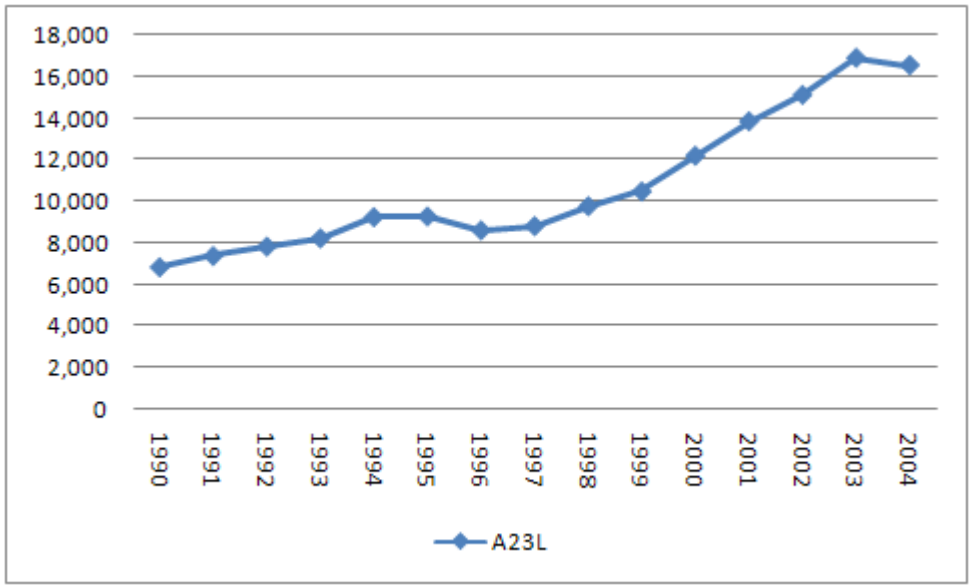
3.3 Foodstuffs:

The main classes for foodstuffs stretch from class A21 for Baking and Baking Equipment, to class A22 for Butchering, and Meat Treatment and processing of Poultry and Fish to A23 Food or Foodstuffs or their treatment not covered elsewhere. As this suggests foodstuffs are a large area of the patent system.

However, many of the classifiers for foodstuffs do not appear to involve direct claims to biodiversity or will be covered by other classifiers addressed in Table Ten (above). The use of combined classifiers as indicators will facilitate the capacity to discriminate between patent activity that makes direct claims over biodiversity and traditional knowledge. For example, classifiers for ethnobotanical medicines (A61K36) can be combined with classifiers under foodstuffs (i.e. A61K36 and A23L) to elucidate trends in this area.

In the specific case of the use of microorganisms or enzymes in baking, this can be captured under classifier C12S "Processes using enzymes or microorganisms to liberate, separate or purify a pre-existing compound or composition" as set out in Table Ten

Figure 13: Patent Publication Trends for Foodstuffs



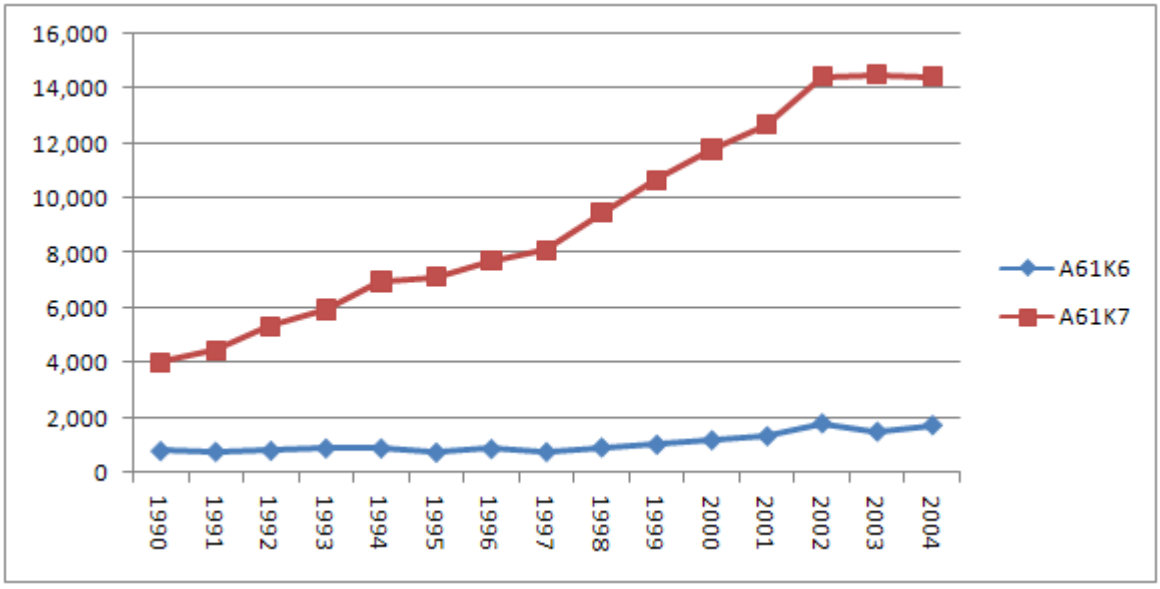
Source: Oldham and Cutter 2006b

Within foodstuffs the main indicator for patent claims over biodiversity or traditional knowledge appears to be located in sub-class A23L (over 100,000 publications worldwide, see Figure 13). The use of a particular plant or organism and traditional knowledge in nutritional supplements or foodstuffs will logically be located here. Additional attention is also merited for animal fodder (A23K) and the relationship between indicators under foodstuffs with the main indicators for ethnobotanical medicines (A61K35 and A61K36 see below).

3.4 Cosmetics and Dental Preparations:

Figure 14 demonstrates that general trends in this area are dominated by cosmetics (A61K7). The relationship between patent activity for biodiversity and traditional knowledge in this area of the patent system can be established through the use of combined classifiers as indicators as set out in Figure 16 (below) in relation to ethnobotanical medicines.

Figure 14: Patent Publication Trends for Cosmetics and Dental Preparations



Source: Oldham and Cutter 2006b

It is also important to emphasise that in IPC8 a new classifier was introduced for cosmetics (A61K8) that replaces A61K7. Under A61K8 a series of sub-groups are provided for the type of material used in patent applications. These classifiers are set out in Table Twelve with guide numbers for overall publications in esp@cenet worldwide across all years collated in December 2006.

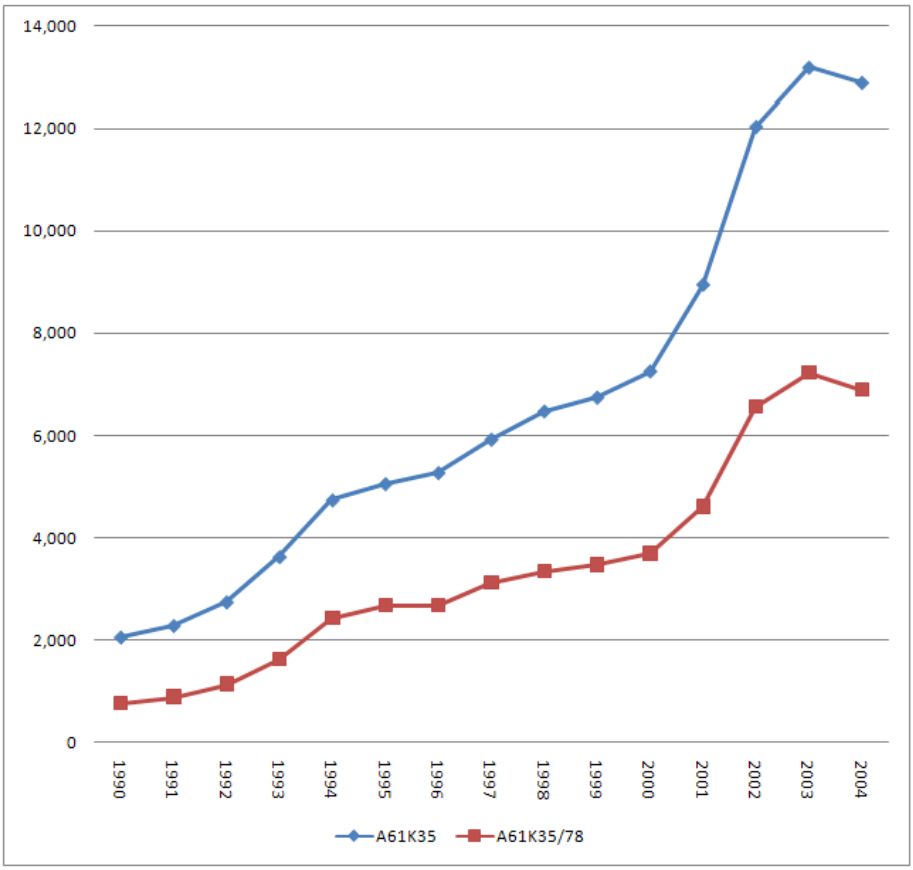
Table Twelve: New Indicators for Cosmetics

Description	**IPC**	**esp@cenet whole database**
Cosmetics or similar toilet preparations	**A61K8**	+99,999
Containing organic compounds	A61K8/30	+99,995
Containing heterocyclic compounds	A61K8/49	43,857
Sugars; derivatives thereof	A61K8/60	15,929
Steroids; derivatives thereof	A61K8/63	5,244
Proteins; Peptides; Derivatives or degradation products thereof	A61K8/64	17,587
Enzymes	A61K8/66	7,696
Organic macromolecular compounds	A61K8/72	83,480
Containing materials, or derivatives thereof, of undetermined constitution	A61K8/96	45,508
Of vegetable origin, e.g. plant extracts	A61K8/97	33,466
Of animal origin	A61K8/98	11,155
From microorganisms	A61K8/99	4,574

Further research is desirable in refining indicators relating to biodiversity and traditional knowledge in this sector of activity. It may be noted that preparations for dental purposes (i.e. the use of plant extracts in toothpastes) will commonly be linked with classifiers for ethnobotanical medicines.

3.5 Ethnobotanical Medicines:

Figure 15: Patent Publication Trends for Ethnobotanical Medicines



Source: Oldham and Cutter 2006a

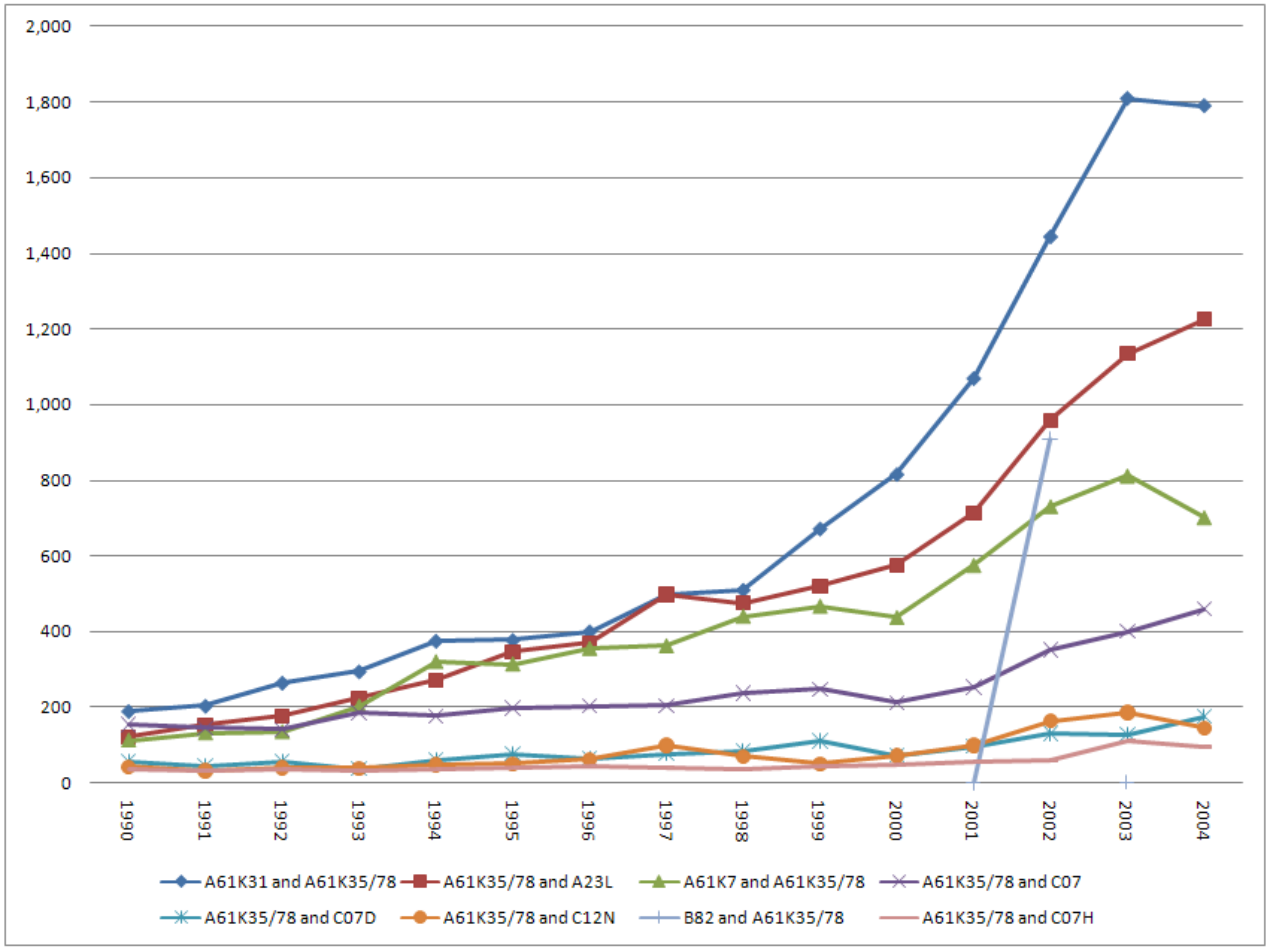
Ethnobotanical Medicines are primarily located under "Medicinal Preparations containing material or reaction products thereof with undetermined constitution" (A61K35) and A61K36 (not shown, see below). These materials consist of raw extracts or partially characterised compounds and may be further defined using classification codes for the source of the material (i.e. mammals and birds, ovaries or eggs, snakes, fish, fungi etc.) as set out in the Annex. However, Figure 15 clearly demonstrates that in the period between 1990 and 2004 patent activity was dominated by material from plants (A61K35/78). International activity in this sector now significantly outstrips agriculture.[64]

Between 1990 and 2004 the majority of patent applications in this area were awarded a single classification code (A61K35/78). However, it is possible to gain a partial insight into trends in this sector and links to other sectors by combining classifiers to identify relationships between

[64] For detailed discussion of a range of patents for natural products see Sukhwani (1995).

ethnobotanical medicines and pharmaceuticals and other areas of interest as set out in Figure 16. This is achieved by searching only for patent documents that contain combinations of specific classifiers (i.e. A61K31 AND A61K35/78).

Figure 16: Sub-sector Trends for Ethnobotanical Medicines



Source: Oldham and Cutter 2006a

Figure 16 demonstrates that the most significant area of patent activity for ethnobotanical medicines falls under A61K31 concerning "Medicinal preparations containing organic active ingredients". This is the main indicator for pharmaceutical compounds and is a major area of patent activity. As noted above we can see that this is followed by foodstuffs under A23L (for supplements, nutraceuticals etc.) Additional areas of importance are organic chemistry (C07) and heterocyclic compounds (C07D).

Using this approach it is also possible to gain an insight into emerging sectors of activity such as biotechnology as revealed by emerging trends for the main indicator for biotechnology (C12N) and DNA (C07H). While these trends are low they are suggestive of emerging areas of activity for medicinal plants. The sharp spike for medicinal plants and nanotechnology (B82) demonstrates that it is increasingly possible to capture cross-overs between sectors through an understanding of the

use of classifiers as indicators.[65] This case is dominated by a single individual, a Yang Mengjun, from China and is discussed in detail elsewhere in relation to biosquatting (ETC Group 2005, Oldham and Cutter 2006a).

The dramatic surge of patent activity for ethnobotanical medicines has led to the introduction of a new series of classification codes within IPC8 under A61K36 which replaced A61K35/78 from the 1st of January 2006 (see Section I). The introduction of A61K36 has been accompanied by the inclusion of 203 sub-group classifiers which describe the family or genus. Additional indexing classifiers are also provided for the parts of plants involved. The first ten of 203 new sub-group classifiers are provided in Table Thirteen for the purpose of illustration using guide numbers from December 2006. The full list is provided in the Annex.

Table Thirteen: New Indicators for Ethnobotanical Medicines

Description	**IPC**	**esp@cenet whole database**
Medicinal preparations of undetermined constitution containing material from algae, lichens, fungi or plants, or derivatives thereof, e.g. traditional herbal medicines	**A61K36**	42,452
Algae	A61K36/02	1,539
Phaeophycota or phaeophyta (brown algae), e.g. Fucus	A61K36/03	18
Rhodophycota or rhodophyta (red algae), e.g. Porphyra	A61K36/04	2
Chlorophycota or chlorophyta (green algae), e.g. Chlorella	A61K36/05	276
Fungi, e.g. yeasts	A61K36/06	4,497
Ascomycota	A61K36/062	2
Saccharomycetales, e.g. baker's yeast	A61K36/064	27
Clavicipitaceae	A61K36/066	2
Cordyceps	A61K36/068	16
Basidiomycota, e.g. Cryptococcus	A61K36/07	2004
Ganoderma	A61K36/074	47

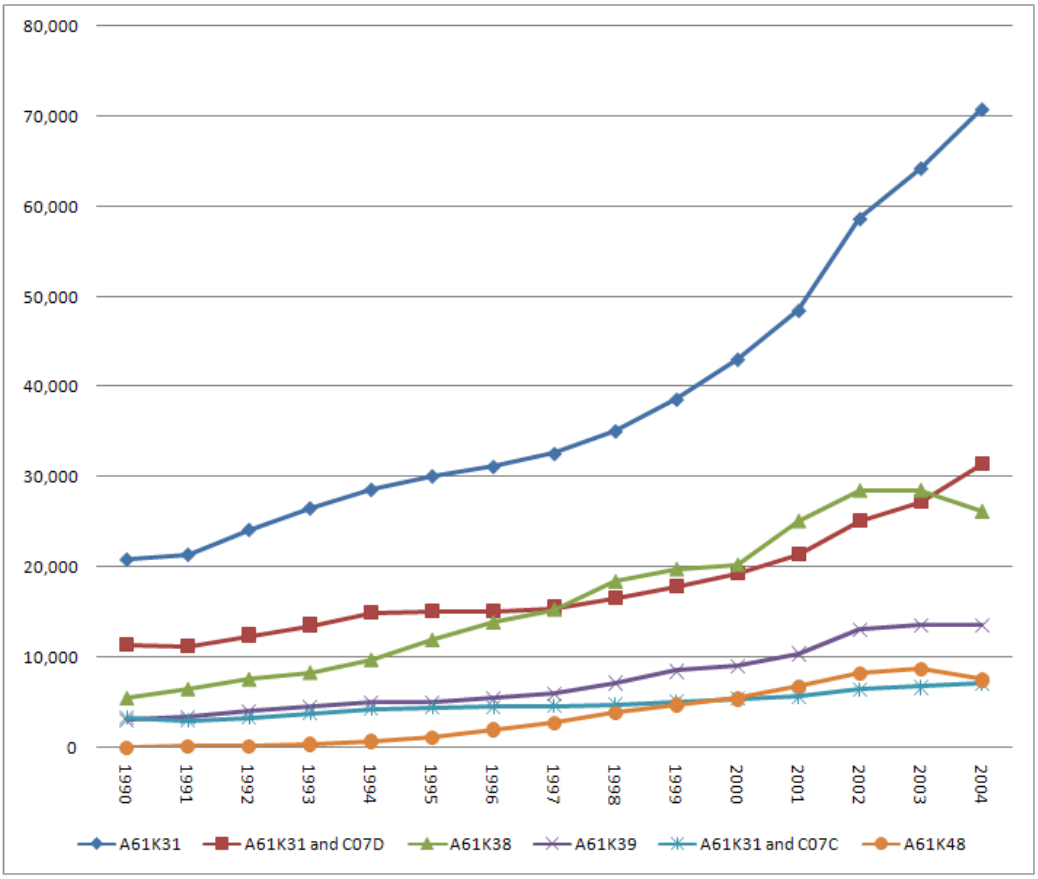
The introduction of the new classification codes within IPC8 should greatly enhance the capacity to track and monitor activity in this area. At present the use of A61K36 classifiers is limited as a result of the recent introduction of IPC8. However, trends should become clearer with time as patent offices use IPC8 to complete the reclassification of their collections. For the present the combination of the historic A61K35/78 and the new A61K36 will be the most reliable way of engaging in analysis of this sector of activity and its relationship with other sectors (see Section I).[66]

[65] In practice, the extent to which classifier B82 will capture all nanotechnology related patents is limited. This appears to reflect definitional issues and the diversity of sectors of activity involving nanotechnology. In response to these difficulties the European Patent Office has introduced classifier Y01N for nanotechnology patents within the European Classification (ECLA) (see below for discussion and Scheu *et. al.* 2006).

[66] This is achieved by conducting searches using a formula (A61K36 or A61K35/78) to capture documents classified under individual or both classifiers. Further guidance is provided in the companion paper *Biodiversity and the Patent System: An Introduction to Research Methods*.

3.6 Medicinal/Pharmaceutical Compounds:

Figure 17: Patent Publication Trends for Medicinal/Pharmaceutical Compounds



Source: Oldham and Cutter 2006a

We have seen above that the main indicators for raw extracts and partly characterised compounds are A61K35 and A61K36. In contrast the main indicator for compounds that are wholly or partially described and synthetics in the pharmaceutical sector is A61K31 concerning "medicinal preparations containing organic active ingredients" (A61K31) (Figure 17). Where pharmaceutical compounds are new they will also be classified under the relevant section of chemistry (i.e. C07D for heterocyclic compounds).[67]

Classifier A61K31 encompasses a variety of types of chemical compounds arising from biodiversity. They range from partially described organic compounds from plants and other organisms using biological trivial names, to semi-systematic names for natural compounds, fully described or "characterised" compounds and their derivatives, and synthetic compounds and their derivatives. As Newman, Cragg and Snader (2003) have demonstrated "yet again", compounds originating from, modelled on, or mimicking natural compounds remain central to the

[67] It should be noted that patent protection for a chemical compound that has been previously disclosed and forms part of the public domain will commonly be limited to the specified new and novel use of the said compound (see EPC Art. 54(5)). These compounds should generally only be classified under A61K31 rather than within organic chemistry. In contrast *per se* protection is provided for new compounds.

pharmaceutical sector at the level of actual approvals of new pharmaceuticals (Oldham and Cutter 2006a).

However, it is important to note that the relationship between compounds originating from biodiversity or traditional knowledge and patent activity can be difficult to discern within the patent system. The reason for this is that the relationship between a compound originating in a plant or other organism (i.e. A61K35/78 or A61K36) may not be retained at the level of classification once a compound is fully characterised and synthesized. Furthermore, compounds originating with biodiversity and traditional knowledge may enter the patent system in a variety of forms, i.e. partially or wholly characterised, synthetics or as mimics. This would suggest that the importance of compounds originating with biodiversity and traditional knowledge within the pharmaceutical sector may be underestimated by the use of combined classifiers as indicators such as "A61K36 or A61K35/78 and A61K31" for pharmaceutical compounds (see Figure 16 above). In short the history of a compound originating from biodiversity and traditional knowledge may disappear from view.

Further research is therefore desirable in this area. Options in this area include further analysis of sub-groups under A61K31, the use of the nomenclature of natural compounds developed by the International Union of Pure and Applied Chemistry (IUPAC) and analysis of patent landscapes for lists of known approved drugs of natural origin as provided by Newman, Cragg and Snader.[68] This work would best be performed by specialists in chemistry and biochemistry.[69]

Figure 17 also reveals the importance of emerging areas and cross-overs between technologies. Thus, Figure 17 suggests that heterocyclic compounds (C07D) are being overtaken by "medicinal preparations containing peptides" (A81K38) and is followed by "medicinal preparations containing antigens or antibodies" (i.e. monoclonal antibodies) (A61K39). On a wider level there are strong associations between patent activity for pharmaceuticals within chemistry under peptides (C07K) and trends in biotechnology such as genomics, proteomics and bioinformatics (see below). The growing importance of combinatorial chemistry and libraries will in future become clearer under the new indicator C40 for "Combinatorial chemistry; libraries e.g. chemical libraries, *in silico* libraries".

The remaining data reveals that carbocyclic compounds (A61K31 and C07C) are a relatively limited area of interest for pharmaceuticals and are being overtaken by trends for gene therapy (A61K48). Additional information is provided in the underlying datasets (Oldham and Cutter 2006b).

[68] P. Giles. International Union of Pure and Applied Chemistry, Commission on Nomenclature of Organic Chemistry. Revised Section F: Natural Products and Related Compounds (IUPAC Recommendations 1999). Pure Applied Chemistry 1999; 71 (4): 587-643. Location: <http://www.chem.qmul.ac.uk/iupac/sectionF/app.html>. The online version of the Nomenclature for Natural products includes a small number of additions to the list as set out in H. Favre et al. Errata Revised Section F: Natural products and related compound (IUPAC Recommendations 1999). Corrections and Modifications (2004). Pure Applied Chemistry 2004; 76 (6): 1283-1292.

[69] A complementary approach would focus on the analysis of literature citations within patent documents i.e. The Journal of Natural Products.

3.7 Disorders and Diseases:

In the year 2000 descriptive classifiers were introduced for disorders under A61P. A selection of these classifiers focusing on neglected diseases are presented in Table Fourteen using data from esp@cenet worldwide.

Table Fourteen: Selected Indicators for Diseases and Disorders

Description	IPC	esp@cenet whole database
Non-central analgesic, antipyretic or anti-inflammatory agents	A61P29	+100,000
Anti-infectives, i.e. antibiotics, antiseptics, chemotherapeutics	A61P31	+100,000
. Local antiseptics	A61P31/02	1,411
. Antibacterial agents	A61P31/04	+100,000
. . for tuberculosis	A61P31/06	3,588
. . for leprosy	A61P31/08	984
. Antimycotics	A61P31/10	17,106
. Antivirals	A61P31/12	70,017
. . for RNA viruses	A61P31/14	7,726
. . . for influenza or rhinoviruses	A61P31/16	5,873
. . . for HIV	A61P31/18	31,959
. . for DNA viruses	A61P31/20	5,564
. . . for herpes viruses	A61P31/22	9,714
Antiparasitic agents	A61P33	31,380
. Antiprotozoals, e.g. for leishmaniasis, trichomoniasis, toxoplasmosis	A61P33/02	10,765
. . Amoebicides	A61P33/04	395
. . Antimalarials	A61P33/06	4,822
. . for Pneumocystis carinii	A61P33/08	317
. Anthelmintics	A61P33/10	6,935
. . Schistosomicides	A61P33/12	663

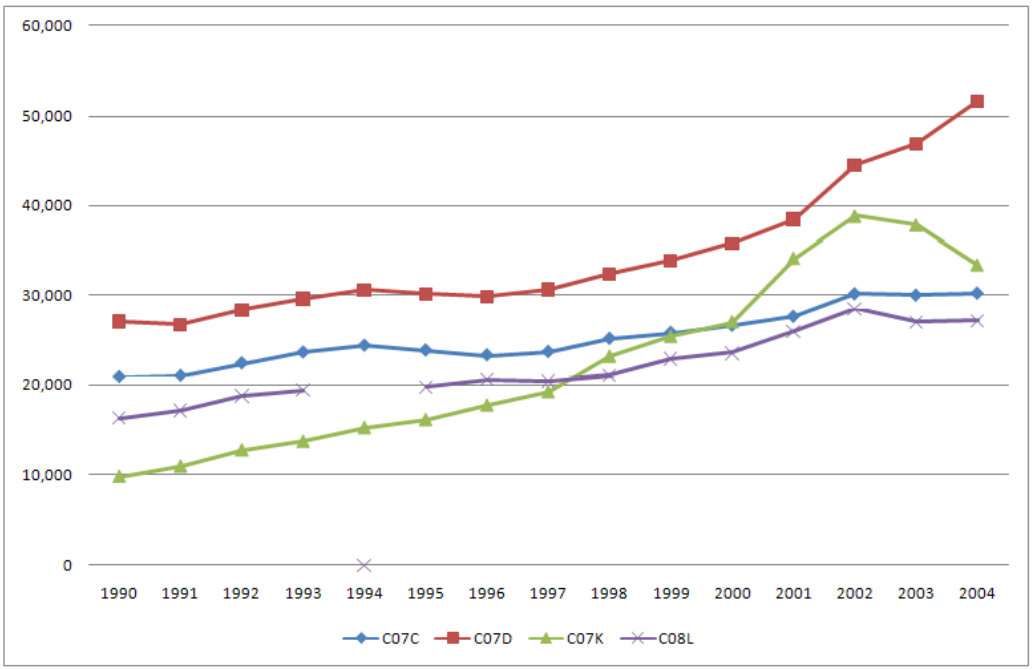
The development of indicators for patent activity for biodiversity and traditional knowledge for disorders and diseases is particularly relevant in the context of growing concern about the type, orientation, and costs of new pharmaceuticals (i.e. FDA 2004, WHO 2006). Looking beyond the patent system further consideration is merited on the potential role of indicators under an international regime on access to genetic resources and benefit-sharing in promoting research and cooperation in critical areas such as neglected diseases in developing countries. Furthermore, the use of indicators could potentially be linked with Adjustable Incentive Measures to promote research and cooperation in these key areas while providing clarity in terms of the purposes for which knowledge and material were provided (see below).

In connection with patent activity further research is desirable on the extent to which patent classification codes capture intellectual property activity directed towards neglected diseases. This will best be achieved using whole text databases.

3.8 Organic Chemistry:

Organic Chemistry encompasses a wide range of activities and sub-sectors. At the most general level the main classifiers are C07 (Organic Chemistry) and C08 (Organic macromolecular compounds). In the case of biodiversity and traditional knowledge initial attention might usefully focus on heterocyclic compounds (C07D), carbocyclic compounds (C07C), and peptides (C07K). Additional research may be merited on "Derivatives of natural macromolecular compounds" (C08H) and "Compositions of Macromolecular compounds" (C08L). As Figure 18 demonstrates Organic Chemistry is a major area of activity within the international patent system.

Figure 18: Patent Publication Trends for Organic Chemistry[70]



Source: Oldham and Cutter 2006b

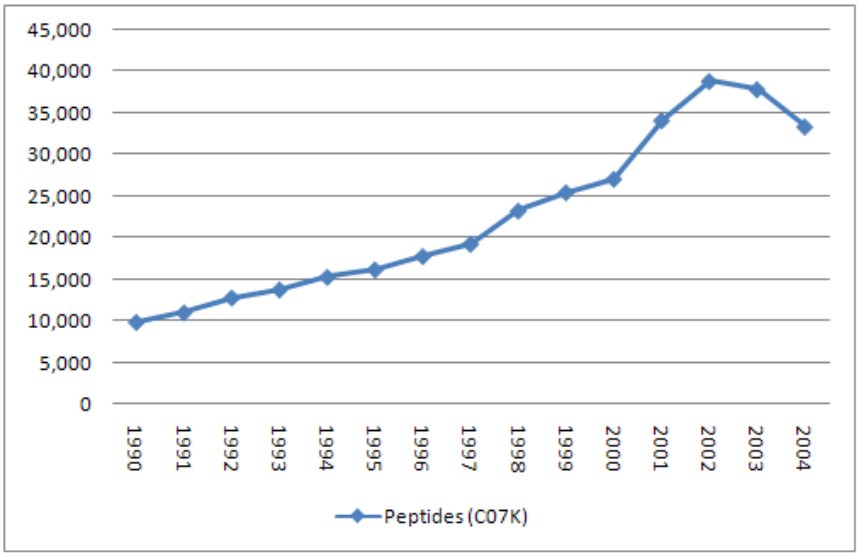
3.8.1 DNA:

Patent activity for DNA (deoxyribonucleic acid) is located in two main areas of the patent system. First, under CO7H for "Sugars, Derivatives thereof, Nucleosides, Nucleotides and Nucleic Acids". Second, under biochemistry within class C12. Indicators for DNA will be more accurate where both C07H and classifiers under C12 are used (see below). The reason for this is that some patent offices generally classify DNA under C07H while others will only classify DNA under the main classifiers for biotechnology in C12 (i.e. C12N to S). Combining the classifiers enhances data capture. For this reason data on C07H is presented under biotechnology below. Additional research is desirable in identifying classifiers for RNA (ribonucleic acid), transcription factors and transcriptomics (Laird and Wynberg 2005).

[70] Data for macromolecular compounds (C08L) is excluded for the year 1994 due to a data entry error.

3.8.2 Peptides:

Figure 19: Patent Publication Trends for Peptides



Source: Oldham and Cutter 2006b

Peptides are short strings of amino acids that form part of a protein. The main indicator for peptides is CO7K and is a very significant area of demand for patent protection (Figure 19). Peptides may be used in a variety of sectors of activity and classifiers can as necessary be combined to target associations (i.e. A61K31 and C07K). Associations between peptides under C07K within Organic Chemistry and the main classifiers for biotechnology (C12N to S) are extremely strong and are linked to areas such as genomics, proteomics and bioinformatics (see below). It may also be noted that while much attention has focused on patent activity for DNA, proteins are of greater importance in relation to drug discovery.

3.8.3 Dyes, Paints, Resins, Adhesives:

Specific areas of interest in industrial chemistry include C09 which encompasses "Dyes; Paints; Polishes; Natural Resins; Adhesives: Compositions not otherwise provided for; Applications of materials not otherwise provided for". See in particular: C09B for Organic Dyes; C09D for Coatings, paints and varnishes; C09F for natural resins; C09H for glues, C09J for adhesives, and; C09K for other materials and applications. This area has not been a focus of detailed research in the underlying review. Further work is merited in developing indicators for biodiversity and traditional knowledge in this area.

3.8.4 Oils, Fats, Waxes and Perfumes:

In connection with animal or vegetable oils, fats and waxes the main indicator is class C11. This classifier includes: Producing or refining fats, oils and waxes (C11B), Fatty acids (C11C), and Detergents (C11D). Research in relation to biodiversity, traditional knowledge and the perfumes sector will logically target classifier C11B9 (Essential oils; perfumes). This is an emerging area of demand for patent protection with approximately 20,703 publications worldwide by December

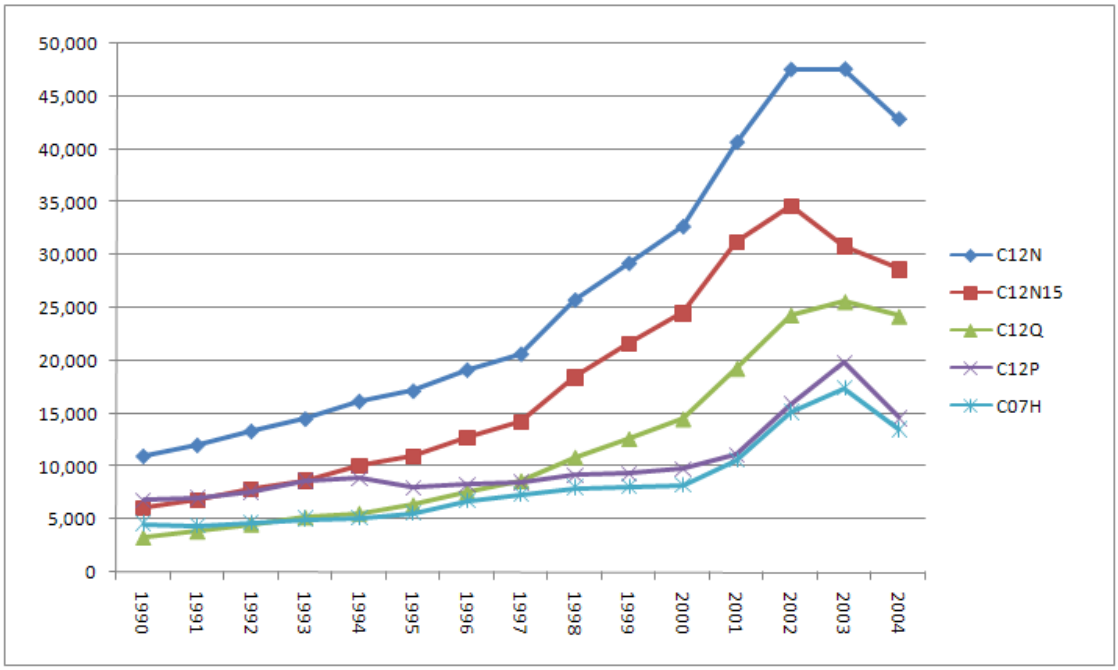
2006.[71] A significant association exists between patent activity for foodstuffs under A23L and C11B9 for perfumes (approximately 5,258 publications worldwide) and C11B9 for perfumes and C07D for heterocyclic compounds (approximately 4,093 publications worldwide).

Further research is recommended on other areas of industrial chemistry that may involve biodiversity and traditional knowledge.

3.9 Biochemistry and Biotechnology:

An underlying review of global patent activity using an OECD working definition of biotechnology consisting of 30 IPC classifiers revealed that the main indicator for Biochemistry and Biotechnology is class C12.[72] Within this class the most important indicators in relation to biotechnology are sub-classes C12N, C12P, C12Q and to a lesser extent C12M and C12S. As noted above, indicator C07H for DNA under Chemistry is also important in this area and is included in Figure 20.

Figure 20: Patent Publication Trends for Biotechnology



Key: C12N-Microorganisms or Enzymes; C12N15-Mutation or Genetic Engineering; C12Q-Measuring or Testing processes involving enzymes or microorganisms; C12P-Fermentation or enzyme using processes to synthesize chemical compounds; C07H-Sugars, derivatives thereof; nucleosides, nucleotides, nucleic acids. Source: Oldham and Cutter 2006a.

[71] Search of esp@cenet worldwide conducted on the 28th of December 2006.

[72] Oldham, P (2004) Global Status and Trends in Intellectual Property Claims: Genomics, Proteomics and Biotechnology. *Global Status and Trends in Intellectual Property Claims*, Issue No. 1. Location: <http://cesagen.lancs.ac.uk/resources/papers.htm>

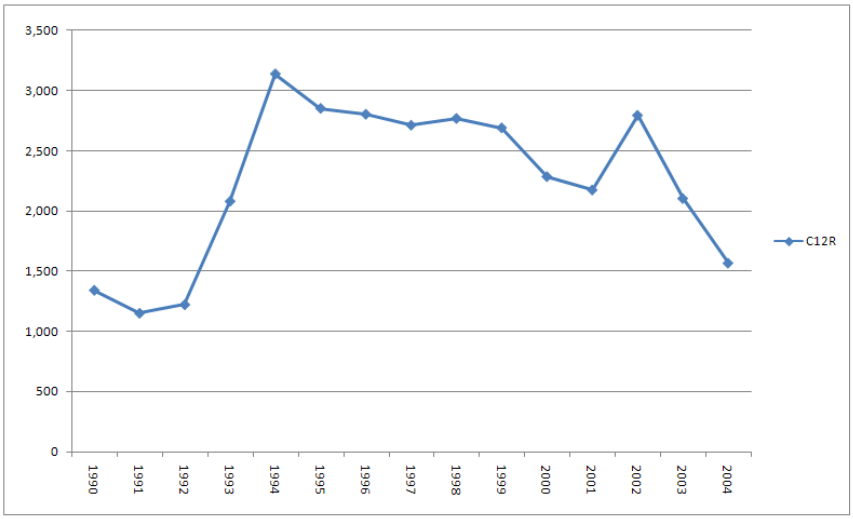
It may be noted that the OECD is presently reviewing the working definition of biotechnology indicators to provide a greater degree of accuracy. Patent classifiers identified by the International Bureau of WIPO in response to a survey by the OECD are incorporated within the Annex as a contribution to further research. Further harmonization of methodologies and definitions is likely to be desirable in any future work.

3.9.1 Microorganisms:

Microorganisms (Archaea and Bacteria) are a focus of interest across a variety of industry sectors (Lohan and Johnston 2003, Oldham 2004b, Arico and Salpin 2005, Laird and Wynberg 2005). Within the patent system there are a wide variety of references to microorganisms, bacteria, protozoa etc., that relate to microorganisms. However, identifying microorganisms as they are understood in scientific terms (i.e. Archaea and Bacteria) is rendered somewhat difficult by the classification of material (i.e. from humans) that is not generally understood to constitute a microorganism in areas of the classification under biochemistry (Oldham 2004b, Oldham and Cutter 2006a).

Within the patent system the indexing classifier C12R is used for microorganisms that have been taxonomically described and extends to cell lines. Trends in this area are set out in Figure 21. However, the classification of microorganisms under C12R appears to be based on an old version of *Bergey's Manual of Determinative Bacteriology* and is unlikely to be indicative of actual trends.[73]

Figure 21: Patent Publication Trends C12R (Microorganisms)



Source: Oldham and Cutter 2006a

While representing a useful starting point, further work is required in relation to indicators for microorganisms under C12N, C12P, C12Q and C12S and elsewhere in the classification. A provisional list of additional classifiers including guide numbers from esp@cenet is provided in

[73] See the *Bergey's Manual Trust* website. Location: <http://www.bergeys.org/publications.html>.

Table Fifteen as a contribution to further research. It should be noted that the list may not be exhaustive.

Table Fifteen: Additional Indicators for Microorganisms

Description	IPC	esp@cenet whole database
Biocides, pest repellents or attractants, or plant growth regulators containing microorganisms, viruses, microbial fungi, enzymes, fermentates or substances producing or extracted from microorganisms or animal materials or extracts thereof.	A01N63	24,596
Fermentates or substances produced by or extracted from microorganisms or animal material.	A01N63/02	8,704
Fermentation with addition of micro-organisms or enzymes.	A23F3/10	162
Proteins from microorganisms or unicellular algae.	A23J3/10	855
Fermentation of farinaceous cereal or cereal material; Addition of enzymes or microorganisms.	A23L1/105	2,323
Clarifying or fining of non-alcoholic beverages; Removing unwanted matter; using microorganisms or biological material, e.g. enzymes.	A23L2/84	1,384
Cosmetics or similar toilet preparations…from microorganisms	A61K8/99	4,574
Medicinal preparations containing material or reaction products thereof with undetermined constitution, from - Microorganisms	A61K35/66	36,243
from – Protozoa	A61K35/68	306
from – Bacteria	A61K35/74	21,395
Medicinal preparations containing antigens or antibodies from – Protozoa	A61K39/002	4,786
…Bacterial antigens	A61K39/02	13,210
…Bacterial antibodies	A61K39/40	4,218
Chemical or biological purification of waste gases.	B01D53/34	45,873
Separation by biological methods.	B01D59/36	18
Reclamation of contaminated soil microbiologically or by using enzymes.	B09C1/10	4,397
Biological treatment of water, waste water, or sewage: characterized by the microorganisms used.	C02F3/34	14,287
Biological treatment of sludge; devices thereof.	C02F11/02	5,195
Peptides having up to 20 amino acids in an undefined or only partially defined sequence; Derivatives thereof; from - bacteria	C07K4/04	233
Peptides having more than 20 amino acids; Gastrins; Somatostatins; Melanotropins; Derivatives thereof (Viruses); from - protozoa	C07K14/44	2,434
Peptides having more than 20 amino acids; Gastrins; Somatostatins; Melanotropins; Derivatives thereof (Viruses); from - bacteria	C07K14/195	42,783
Micro-organisms, e.g. protozoa; Compositions thereof: Processes of propagating, maintaining or preserving micro-organisms or compositions thereof; Processes of preparing or isolating a composition containing a micro-organism; Culture media thereof	C12N1	+100,000
Protozoa; Culture media thereof	C12N1/10	1,328
Bacteria; Culture media thereof	C12N1/20	49,917
Proteinases, from – Bacteria	C12N9/52	6,896
Preparation of hybrid cells by fusion of two or more cells, e.g. protoplast fusion - for Bacteria.	C12N15/03	598

Table Fifteen: Additional Indicators for Microorganisms (Continued)

Description	IPC	esp@cenet whole database
Extraction of metal compounds from ores or concentrates by wet processes with the aid of microorganisms or enzymes, e.g. bacteria or algae.	C22B3718	0
Libraries contained in or displayed by microorganisms, e.g. bacteria or animal cells; Libraries contained in or displayed by vectors, e.g. plasmids; Libraries containing only microorganisms or vectors.	C40B40/02	58
Bleaching fibres, threads, yarns, fabrics, feathers, or made-up fibrous goods, leather, or fur using enzymes.	D06L3/11	950
Treating liquids, processing by biological processes.	G21F9/18	114
Biochemical fuel cells, i.e. cells in which microorganisms function as catalysts.	H01M8/16	430

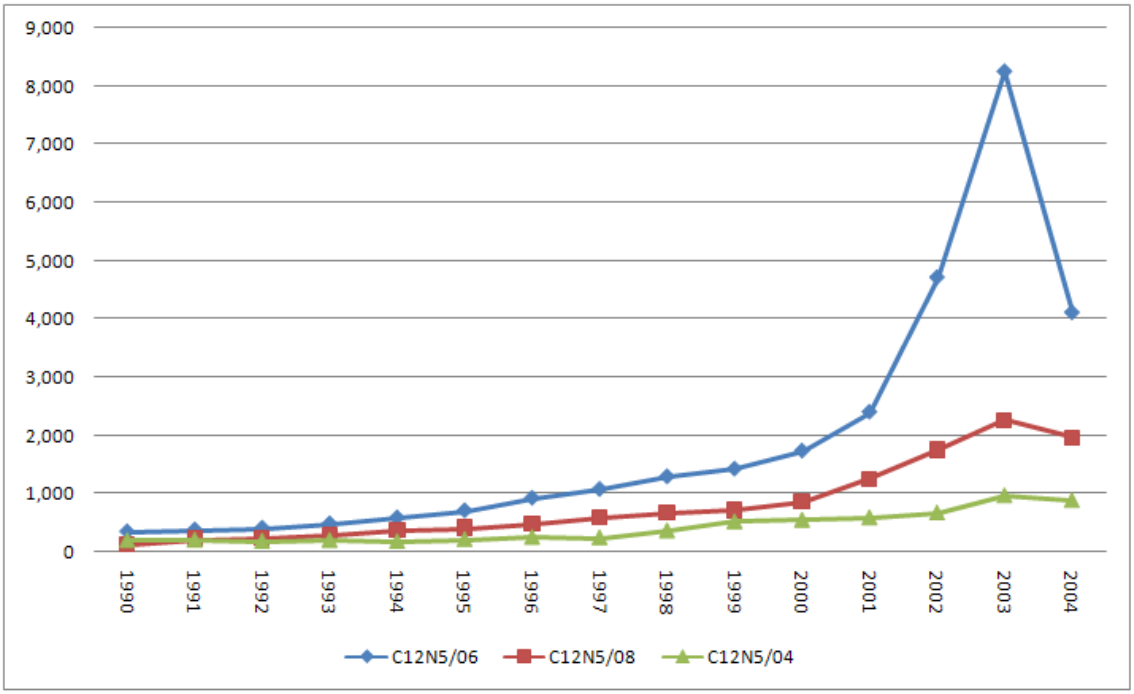
3.9.2 Human and Animal biological and genetic material:

As a general observation, it may be noted that the international patent classification does not clearly distinguish between human and animal biological or genetic material. One reason for this is that it does not appear to make a great deal of biological sense. Patent claims are frequently constructed in such a way that biological and genetic homologies (similarities) between animals and other organisms and humans are extended to humans (i.e. for primates, mammals) (Oldham 2004b, Oldham and Cutter 2006a). Humans are, after all, simultaneously primates, mammals and animals. However, it is likely that the vast majority of human biological and genetic material within the patent system will be located within classifiers under C12 and C07H (for DNA). Additional classifiers of relevance include C12N5 for undifferentiated human, animal and plant cells or tissues and A01K for animals within agriculture (i.e. for transgenic animals and chimeras). It may be noted that in decision II/11 para. 2 the Conference of the Parties reaffirmed "that human genetic resources are not included within the framework of the Convention" (see also decision VI/24, Annex, para. 9). However, in light of trends within the biosciences and the nature of intellectual property claims, further exploratory research may be merited on these issues with due regard to expertise and regulatory competence.

3.9.3 Undifferentiated human, animal and plant cells or tissues (stem cells):

In the case of research on undifferentiated human, animal, and plant tissues or stem cells and plant meristems the main indicator is C12N5. Targeted indicators are available for: human material under C12N5/08; animal material under C12N5/06, and; C12N5/04 for plant material (Figure 22). Once again, it may be noted that the Conference of the Parties has reaffirmed that human genetic resources are not included in the framework of the Convention. However, further exploratory research may be merited in this area (Oldham 2004b, Oldham and Cutter 2006a).

Figure 22: Patent Publication Trends Undifferentiated Human, Plant, Animal Cells or Tissues



Source: Oldham and Cutter 2006a

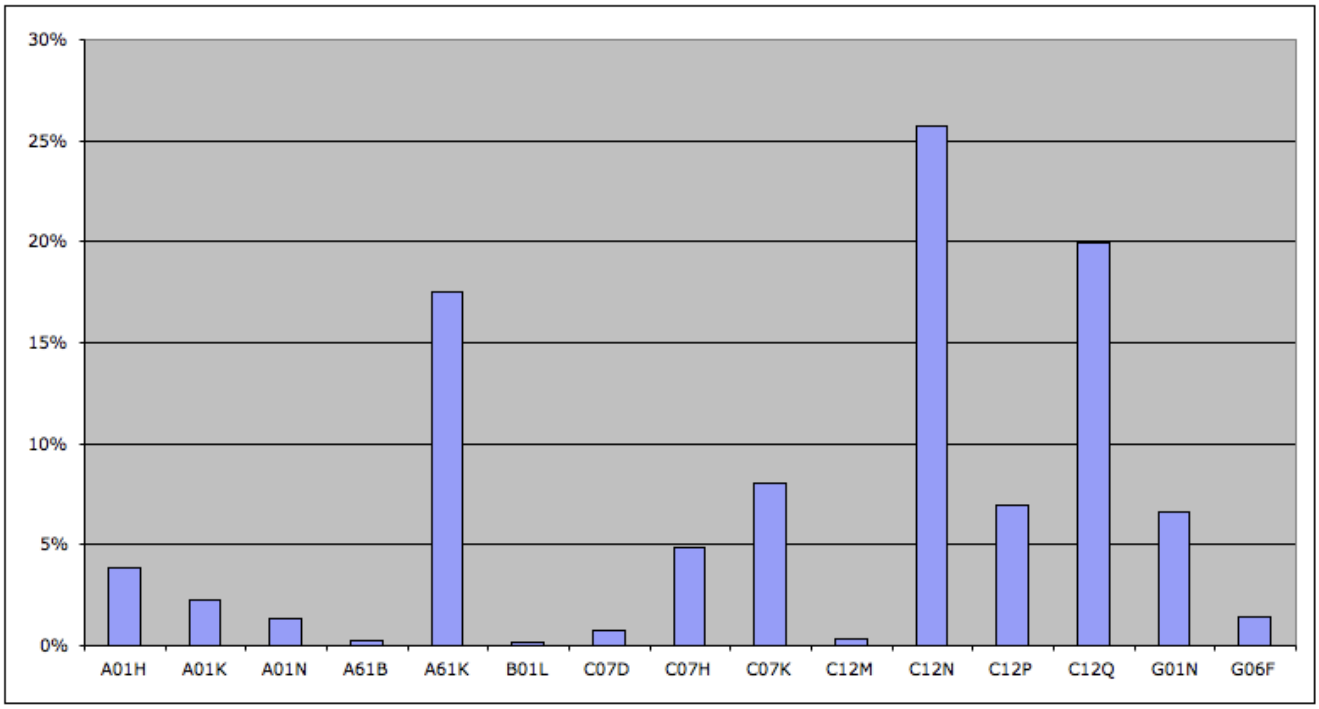
3.9.4 Genomics:

Genomics is concerned with the analysis of the genetic complement of a cell or organism constituting its genome. In common with other emerging areas of the biosciences no single indicator is provided in the IPC for genomics. During searches in late 2006 a running total of 130,138 patent publications were recorded for the single term "genome" in the main jurisdictions between 1990-2005 (see also Oldham 2004a, Oldham and Cutter 2006a).[74] Trends in this area have accelerated dramatically with the completion of the first maps of the genomes of a range of organisms in recent years and genomics represents a very strong area of growth in the international patent system (Oldham 2004a).

Using the Micropatent Aureka service it is possible to gain an initial insight into the technology sectors involved in a sample for the term genome of 50,454 patent documents published between 2001 and 2003 using IPC classifiers as set out in Figure 23.

[74] Search conducted using Micropatent Aureka Gold for US (applications and grants), EP (applications and grants), PCT (applications), Japan (applications), Germany (applications), France (applications) and UK (applications). As previously reported in Oldham and Cutter (2006a) the reported total in mid 2006 for the same data period (1990-2005) was 128,400. This reveals that patent activity in this area is expanding rapidly but also exposes the limitations of data availability for recent documents within patent databases. The use of the term running total is therefore to be preferred to accommodate this issue. It should be noted that the resulting count for "genome" is deliberately conservative. Expanded search terms i.e. genomics, genomic or the composite genom* provide a fuller quantitative picture but require controls for noise.

Figure 23: Draft Primary IPC Profile for the Term Genome 2001-2003



Key (additional classifiers only): A01K-Agriculture and Animals; A61B-Diagnosis, Surgery, Identification; B01L-Chemical or Physical Laboratory Apparatus for General Use. Source: Micropatent Aureka®.

It should be noted that the data in Figure 23 refers to the first (primary) classifier listed in the documents rather than whole series of classifiers within the working sample. An important limitation with this method is that the first classifier in the series may not be the most important. Use of the full list of classifiers awarded to the documents in the sample is therefore desirable.[75] However, for the purpose of illustration the fifteen primary IPC classifiers provided in Figure 23 accounted for 49,098 (97.3%) of the 50,454 documents within the sample while 20 classifiers encompass 98% of the overall sample containing 219 primary classification codes. The indicators for the sample cross a spectrum from agriculture (A01H and A01K) through to pharmaceuticals (A61K) and into chemistry (DNA under C07H and peptides under C07K) before entering into the main areas of the patent system for biotechnology under indicators (C12M to Q) and areas of the classification falling in section G for physics, notably "Investigating or analysing materials by determining their chemical or physical properties" (G01N) and "Electrical Digital Data Processing" (G06F).

It should also be emphasised that the profile provided here is preliminary and further methodological work is desirable using full classification data. Further research will ideally also

[75] As reported in Oldham and Cutter (2006a) an alternative methodological approach using live data from Micropatent and a series of ANDNOT exercises using classifiers for the same sample revealed that 8 classifiers C12N, C12Q, C12P, C07H, A61K, C07K, G01N and G06F captured 96% of the sample (43,364). This reveals the importance of methodological experimentation using a variety of approaches. Further refinements will be provided in future work.

examine trends over time and within particular jurisdictions. These limitations also apply to the draft IPC profiles set out below.

However, for the present purposes the sample demonstrates that it is possible to capture patent activity in emerging areas of science and technology at the level of classification in developing indicators. Once again, the limitations of searches for key terms such as "genome" could best be overcome through the introduction of classification codes.

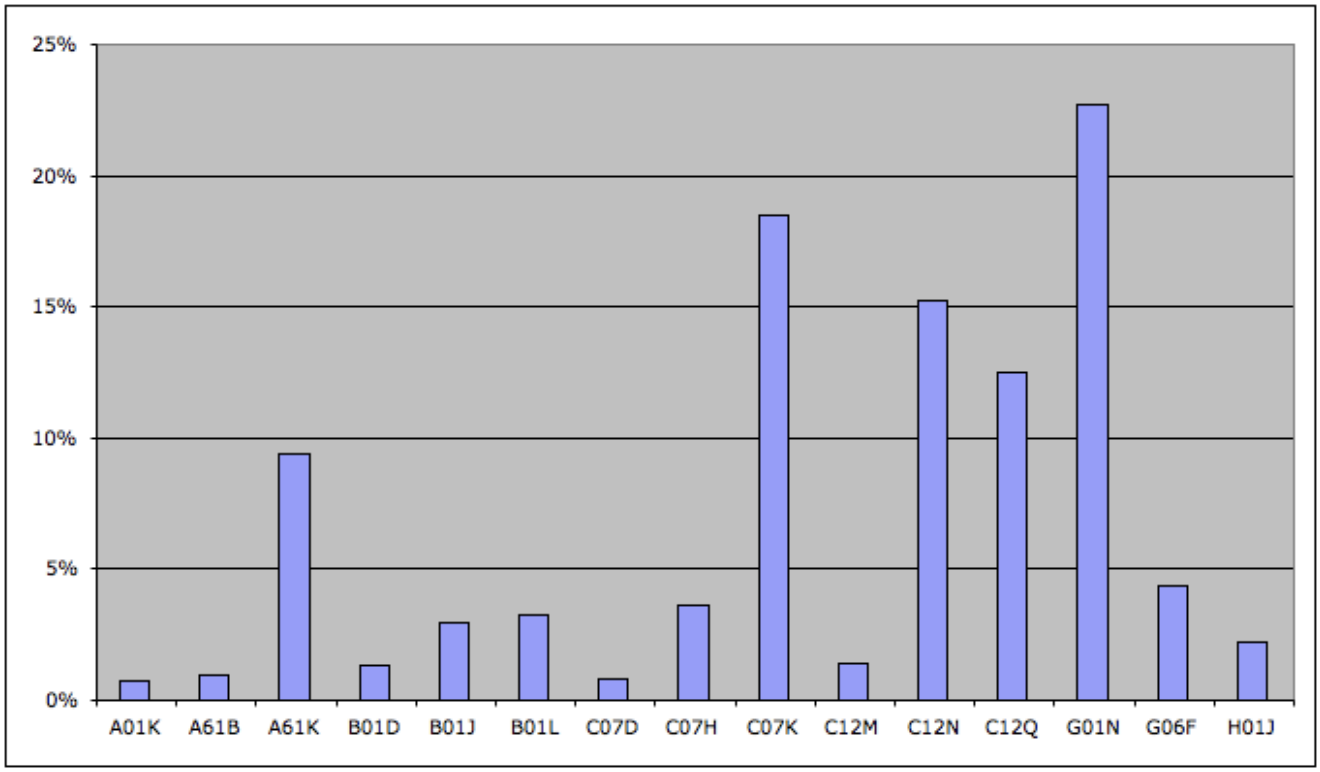
3.9.5 Proteomics:

Proteomics consists of the analysis and manipulation of the protein complement of a cell or organism. During 2006 a running total of 3,748 patent documents were recorded in the main jurisdictions between 1990 and the end of 2005 containing the term proteome. On a wider level a running total of 10,218 documents published between 1990 and 2005 contained the term proteome or proteomics or proteomic. Figure 24 sets out the top fifteen primary IPC classifiers for this expanded sample.

In considering Figure 24 the top fifteen primary IPC classifiers capture 9,311 (92%) of a sample of 10,130 documents containing a total of 125 primary classification codes.[76] Five classifiers (G01N, C07K, C12N, C12Q and A61K) account for 7,289 documents (72%) of the sample containing classification codes. Once again it should be noted that the profile is preliminary and intended to stimulate further work.

[76] 88 documents in the working sample are unclassified.

Figure 24: Draft Primary IPC Profile for Proteomics



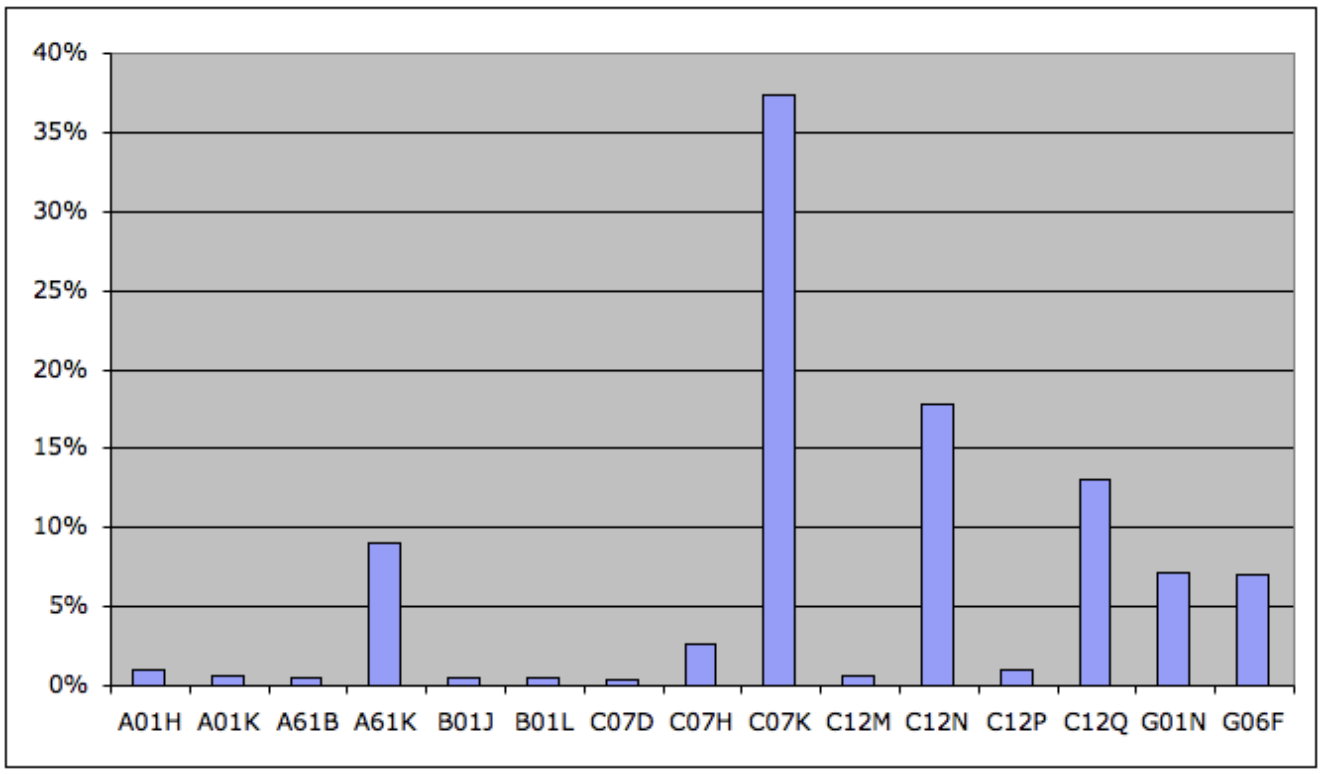
Key (additional classifiers only): A61B - Diagnosis; Surgery; Identification; B01D - Separation; B01J - Chemical or Physical Processes e.g. catalysis; B01L - Chemical or Physical Laboratory Apparatus for General Use; H01J - Electric Discharge Tubes or Discharge Lamps. Source: Micropatent Aureka®.

3.9.6 Bioinformatics:

The convergence of scientific disciplines and technologies around biodiversity on the cellular and the genetic level has largely been made possible by the application of information technology in the area of "bioinformatics". Once again, indicators are limited. Figure 25 provides a landscape of the top 15 classifiers for a sample of 9,563 patent documents published in the period 1990-2005 containing the term bioinformatics. This reveals the presence of an apparently fictitious classifier (I00N).[77] Following removal of this classifier the top 15 classifiers accounted for 96.3% of a sample containing a total of 77 primary classifiers. Once again, the profile is preliminary and intended to stimulate further research.

[77] This is likely to be a data translation error but illustrates issues such as errors in classification and their impacts on patent counts.

Figure 25: Draft Primary IPC Profile for Bioinformatics



Key (additional classifiers only): A61B - Diagnosis; Surgery; Identification; B01J - Chemical or Physical Processes e.g. catalysis; B01L - Chemical or Physical Laboratory Apparatus for General Use. Source: Micropatent Aureka®.

3.9.7 Bionanotechnology:

Patent activity in relation to nanotechnology has become an increasing focus of international demand and public and policy attention. In response to this IPC classifiers have been introduced for nanotechnology. The main indicators in this area within the IPC are B82B (parent B82) and A61K9/51 for nanocapsules for medicinal preparations.[78] In addition the USPTO has introduced classifier 977 and the European Patent Office has now incorporated a "tag" Y01N within the European Classification (ECLA) to facilitate the identification of nanotechnology patents in esp@cenet (Scheu *et. al*. 2006).

The introduction of classifier Y01N has been accompanied by the classifier Y01N2 for bionanotechnology. The use of Y01N2 can, as necessary, be combined with other biodiversity related classifiers provided in this paper.[79] However, classifier Y01N2 will only be applied to documents passing through the European system.

[78] The extent to which B82 and A61K9/51 will capture the patent universe for nanotechnology across diverse fields is questionable. See Scheu *et. al.* 2006.

[79] In the case of esp@cenet this functions by searching using the ECLA search category combined with biodiversity indicators. Note that in some cases it may be necessary to consult the ECLA via esp@cenet to identify relevant classifiers in ECLA format.

3.9.8 Emerging Areas:

The preceding discussion of IPC profiles for genomics, proteomics, bioinformatics and bionanotechnology demonstrates the challenges involved in defining emerging areas of science and technology involving biodiversity and/or traditional knowledge within the international patent system. The introduction of the Y01N classification tag in Europe demonstrates the importance of flexibility in addressing emerging trends. Here it may be noted that the growing importance of systems biology and synthetic biology will present similar challenges to those discussed above (Allarakhia and Wensley 2005, Oldham and Cutter 2006a, ETC Group 2007). In the context of the development of indicators for access to genetic resources and benefit-sharing this also suggests a need for flexibility in the use of indicators to monitor emerging transformations in the uses of, and intellectual property claims over, biodiversity and traditional knowledge.

Conclusion:

> "Everything that can be counted does not necessarily count; everything that counts cannot necessarily be counted" (Albert Einstein).[80]

This paper has focused on the controversial relationship between biodiversity and traditional knowledge and the international patent system. Rather than addressing substantive issues concerning the legal rights and implications of the extension of patentability to biodiversity and traditional knowledge this paper has examined the basic issue of the use of classifiers as indicators within the international patent system. However, in the process a series of insights have emerged with direct relevance to potential options for indicators for access to genetic resources and benefit-sharing under the Convention on Biological Diversity.

The first of these insights is that the international patent system includes an extensive list of classification codes that are directly relevant to biodiversity and traditional knowledge. These codes are in use by patent offices worldwide. As we have seen in Section I knowledge of the classification system and related administrative coding systems facilitates statistical analysis of trends and the identification of organisations and individuals to a sophisticated level of detail. However, we have also seen that there are significant difficulties involved in identifying biodiversity and traditional knowledge at the level of genera, species and the components of organisms and the origin of material and knowledge within patent applications.

This raises the question of how the situation could be improved both in terms of increased transparency within the international patent system and in terms of the pursuit of equitable benefit-sharing within or outside the patent system. With respect to proposals for enhanced disclosure of origin or source under patent instruments as set out by the European Community and its Member States and a range of other countries and groups (see UNEP/CBD/WG-ABS/5/4/Add.1), the analysis provided in this paper suggests that such measures would ideally include a requirement (where such a requirement is not in place) to include the genus and species name, the country of origin and the names of the relevant indigenous people/society within the non-inventive information

[80] Einstein was a technical assistant at what is now the Swiss Federal Institute of Intellectual Property between 1902 and 1909.

that is disclosed.[81] In the case of genera/species and their components transparency could be improved through further elaboration of the international patent classification.

In the case of the country of origin a requirement to disclose the origin of knowledge and material would provide a foundation for the use of the existing country code system to make such disclosure visible to the relevant authorities. With regard to indigenous peoples and the knowledge, innovations and practices of indigenous peoples it may be remarked that introducing a requirement to name the indigenous people/society concerned within documents could contribute to the effectiveness of policy measures by enhancing the basic capacity to know that activity is taking place. Bearing in mind that all indigenous peoples possess names this would suggest that a coding system similar to country codes could be developed for indigenous peoples.[82]

With regard to this proposal it should be noted that indigenous peoples representatives have repeatedly expressed the view that *sui generis* systems must be considered alongside instruments such as patents. However, the disclosure of the name of the people/society from whom material and knowledge within patent applications originates does not imply acceptance of patentability: it is confined to identifying and monitoring activity. Furthermore, it may be remarked that from a human rights perspective it is people and peoples who are the subject of human rights protections (CESCR 2001, 2005, Human Rights Council 2006). A requirement to disclose the names of the indigenous societies from whom material and knowledge contained in patent applications originates could thus contribute to monitoring activity relevant to human rights obligations. Any developments in relation to this option should take place with the full and effective participation of indigenous peoples authorities, organisations and representatives. In particular, the United Nations Permanent Forum on Indigenous Issues could logically play an important role in guiding the pursuit of this option in cooperation with the Convention and WIPO (see E/C.19/2007/10).

It may also be noted that national and international collections (such as botanic gardens and museums) are increasingly confronted by Material Transfer Agreements involving intellectual property issues. However, the capacity of such institutions to monitor compliance with intellectual property arrangements may be limited. In this regard, disclosure of the source of material within applications could potentially be linked to the development of coding systems to facilitate monitoring. Once again the emphasis here is upon the capacity to know that activity is taking place.

In connection with these three options it may be noted that patent information management systems already manage many millions of data items. The pursuit of these options is therefore unlikely to be

[81] Enhanced disclosure of species, genus and family names within patent applications may potentially impact upon the scope of patent claims. For this reason, care should be taken to ensure that any additional administrative requirements for enhanced disclosure do not expand the scope of patent claims (Oldham 2006). This could be achieved by classifying such information as non-inventive.

[82] All indigenous societies possess one or more names. These names commonly take the form of an auto-denomination used internally within a society and one or more common names. This could be addressed through compiling names in consultation with indigenous peoples organisations and creating an online "catchword index" linked to two letter country code style designations. The use of such an index may contribute to overcoming the problem of multiple variant names. The patent system already operates an extensive catchword index and this approach could potentially be adapted in relation to indigenous peoples. The development of such an index, and its potential wider uses, could be considered in relation to advancing the programme of work on Article 8(j) and related provisions and the wider work of the United Nations Permanent Forum on Indigenous Issues.

particularly burdensome. Furthermore, the adoption of such measures could contribute to improving the integrity and transparency of the international patent system.

Proposals regarding certificates of origin/source/provenance have become an increasing focus of attention in recent debates on access and benefit-sharing under the Convention. Here it may be noted that the patent system already codes a range of information into the front pages of patent documents (see Section I, Figure 1).

This suggests that one potential option would be to include relevant codes for such certificate systems as may be agreed in the front page of documents in databases using standardised codes and unique numbering systems. Possible options in this area include: a) Country of Origin/Certificate of Origin (COO); b) Certificate of Source (COS) i.e. for collections; c) Certificate of Indigenous Peoples and Local Communities (CIPLC or CILC).

The pursuit of these options would require the development of standardised codes as shorthand designations and unique identification numbers. In the author's view a great deal could be achieved by providing information in the front pages of patent documents within patent databases. This information could be limited to relevant areas of the patent classification rather than the entire patent system through the use of key classifiers. Patent examiners in relevant areas of the system would then be responsible for coding the data into the front pages of applications. This could include electronic links to a copy of the certificate as within existing patent information management systems (i.e. patent documents and citations) and appear in the patent family. Certificates could be stored in a central repository outside patent databases for use for a variety of other purposes.[83]

In order to promote flexibility, patent applicants initially lacking relevant certificates could be provided with an opportunity to obtain a certificate from the relevant authorities. Here it may be noted that patent applications are only published 18 months after the date of filing (the priority date). This therefore provides a possible window of opportunity for applicants to obtain certificates.[84] Certificates could then be tracked over time using patent families and citation trees. Applicants who refused, or otherwise failed, to provide relevant certificates could be addressed through the use of Adjustable Incentive Measures (AIMs) discussed below.

This paper has focused on organizational and systemic issues relating to indicators on the global level. However, substantive concerns about the patenting of biological and genetic material and traditional knowledge matter. Thus, there is an increasingly widespread view that there is something seriously amiss with the international patent system and emerging markets in intellectual property. Key issues here include, inter alia: whether material and knowledge should enter the system at all; the terms and conditions through which material and knowledge enters the system; the quality of patents; the transparency of the system; the integrity of the system and actors participating in intellectual property markets; problems of valuation of intellectual property assets, and; the need for increased flexibility to recognise different contexts and to promote innovation across a spectrum of sectors (see in particular IBM 2006; see also Scotchmer 2004a, Scotchmer 2004b, EPO 2007).

[83] See UNEP/CBD/WG-ABS/5/2

[84] To accommodate the priority system established by the Paris Convention a period of 12 months could also be considered.

In the case of biodiversity and traditional knowledge addressing these problems is likely to become more pressing in connection with the pursuit of the "knowledge based bioeconomy" and articulations between systems in the context of the existence of multiple bioeconomies on the global level (OECD 2005b, 2006b). Biodiversity is and will remain fundamental to human economic and creative activity.

Flexibility will be central to the capacity to address existing problems and to respond to emerging challenges presented by scientific developments in areas such as the biosciences. In connection with knowledge based economic activity and the biosciences, a consensus appears to be emerging between civil society organisations, scientific bodies and major industry actors that greater openness and flexibility in the options available to participants in knowledge based economic activity is desirable.

One of the most striking proponents of openness in this area is IBM. The publication of "Building a New IP Marketplace" in 2006 as part of a series entitled Global Innovation Outlook sponsored by IBM represents a significant contribution to debate and creative thought in this area. In particular, debates on "creative commons", "science commons" and "open source" licensing models are an increasingly prominent focus of attention across a spectrum ranging from software to biology.

These models commonly focus on providing participants with a series of options for making knowledge and material available i.e. non-commercial, commercial non-exclusive, commercial exclusive etc., that are linked to "human readable", "lawyer readable" and "machine readable" licensing agreements.[85] Other important developments include "open patent" initiatives in the life sciences and the introduction of "licences of right" in Germany, France and the United Kingdom (Jefferson 2007; Kamiyama, Sheehan and Martinez 2006). Under "licenses of right" models patent holders receive generous fee discounts in return for non-exclusive licensing of their patents (Kamiyama, Sheehan and Martinez 2006, EPO 2007). The nature and substantive content of proposed certificates under the Convention on Biological Diversity is a subject of ongoing discussion with an emerging focus on a certificate of compliance with national law.[86] However, it may be observed that certificates could be conceived and designed in a complementary manner as forms of licensing models.

In a major contribution to the analysis of the role of the patent system the European Patent Office has recently published a report entitled *Scenarios for the Future* focusing on how intellectual property regimes might evolve by 2025 (EPO 2007). The report posits fours scenarios entitled: "Market Rules" (business driven); "Whose Game" (geopolitics driven); "Trees of Knowledge" (society driven), and; "Blues skies" (technology driven). The report then considers the possible implications of each of these scenarios and their possible consequences if each is pushed to an extreme. This is a very valuable exercise in gathering a large body of evidence and opinions in order to open space for creative thinking. In practice, the report highlights the desirability of an increasing range of choices and models through which knowledge and resources might be made available to serve a variety of purposes. This is particularly important in the context of rapid and global transformations in science, innovation and communications. As the report highlights, this is a world in which one size does not, and will not, fit all. Licences of right, commons, and open source

[85] See for example the Creative Commons and related Science Commons websites. Locations: <http://creativecommons.org/> and <http://creativecommons.org/>

[86] See UNEP/CBD/WG-ABS/5/2

models are increasingly understood to play an important role in promoting choice and flexibility in a changing world.

However, in considering the emergence of "commons" and "open source" models it is notable that the development of common agreed standards are central to the success of such initiatives.[87] In areas such as biodiversity and traditional knowledge that involve a wide range of participants and sectors of activity, the use of classification systems as protocols to facilitate cooperation through the use of a common language could be applied to the development of *sui generis* models for access and benefit-sharing. The use of the International Patent Classification, or developments based on or aligned with it, as a classification system for *sui generis* models would have three main advantages.

The first advantage is that the use of classification codes would overcome the problem of the use of multiple languages and provide a standardised but flexible organizational system. As this paper has demonstrated, the use of a classification system would facilitate monitoring because classification codes are also indicators. In practical terms the application of the IPC, or developments based on or aligned with it, to *sui generis* models could draw on the experience of the European Patent Office in classifying non-patent literature citations (XP documents) using the European Classification (ECLA). Options for automating classification at the point of issue of certificates/licences, perhaps using sub-class style classification codes, could also be considered.

A second advantage of the use of classification codes from the IPC, or developments based on or aligned with it, is that *sui generis* measures/models that may be agreed or recognised under the Convention would become visible and transparent to the wider intellectual property regime. Once again, the important issue here is organizational. Where *sui generis* measures and models involve some form of documentation (however minimal), the use, and/or further development, of classification systems could significantly contribute to making these measures visible within the wider intellectual property regime.

Third, this paper has demonstrated that biodiversity and traditional knowledge are relevant across a wide range of different sectors that involve different actors, different technologies and serve different markets. Furthermore, these sectors involve intellectual property claims over biodiversity and traditional knowledge at very different levels. The key advantage of the use of classification codes as indicators is that it is possible to make these sectors of activity and the actors involved visible over time.

Finally, an understanding of indicators also opens up the potential option to develop what may be called Adjustable Incentive Measures (AIMs) that could be targeted to indicators (i.e. for ethnobotanical medicines, pharmaceuticals, genomics etc.). The important principle here is that the incentive measures should be adjustable and adaptable to promote and reward certain forms of desired behaviour and to discourage or penalise other forms of behaviour. Furthermore, Adjustable Incentive Measures could be adopted both with respect to particular areas of the patent system for biodiversity and traditional knowledge and to *sui generis* measures that may be agreed.

Adjustable Incentive Measures could include the development of variable fee structures and tax or other incentives i.e. for Research and Development. For example, participants using *sui generis* or

[87] Creative commons licences are structured around basic principles that are translated into the relevant national legal context to comply with relevant laws (i.e. contract and copyright). Location: <http://creativecommons.org/>.

open models could be provided with a central point for registering a non-commercial licence to use knowledge or material based on attribution and share-alike principles. Fees could be charged for registering licences for commercial purposes and scheduled in accordance with their provisions on exclusivity. Applicants to the patent system who adopt certificates could be rewarded with reduced fees and facilitated access to examination.[88] Such facilitated access could potentially be tied to measures such as "licences of right" or open patents.

In contrast applicants who refuse, or otherwise fail, to provide certificates could be penalised through the use of incremental increases in fees. This could be considered to be a form of tax. Applicants seeking to exploit the availability of monopoly in the absence of compliance with internationally agreed measures for biodiversity, traditional knowledge and access and benefit-sharing would be penalised and the resulting income could be disbursed for agreed compensatory measures. This approach would encourage use of the certificate system and at the same time recognise that no system will be perfect by providing a compensation mechanism.[89] As part of a non-discriminatory approach tools such as Purchasing Power Parity (PPP) schedules could potentially be used to promote equity in the application of such measures in developed and developing countries. It may be noted that the patent system already employs incremental fee schedules and possesses sophisticated means for collecting fees (i.e. EPO 2005).

In considering the concept of Adjustable Incentive Measures (AIMs) a suite of incentive measures is likely to be desirable. The potential development of such a suite of incentives would clearly merit fuller consideration and debate than is provided in this paper. However, as this paper has argued, an understanding of indicators for biodiversity and traditional knowledge within the international patent system opens up potential new options in debates on access to genetic resources and benefit-sharing. In particular, it is reasonable to argue that those who pursue monopoly over biodiversity and traditional knowledge should be expected to contribute to its conservation and sustainable use and to meeting international human rights obligations. With respect to opposition to enhanced disclosure and related measures on alleged economic grounds it may be useful to remind ourselves that there is no such thing as a free lunch.

[88] The concept of facilitated or accelerated access to examination is an emerging response to the problem of the backlog of low quality patent applications. The USPTO is presently trialling a "Pilot Concerning Public Submission of Peer Reviewed Prior Art" to permit the public to peer review patent applications. The trial emerged as an initiative from the New York Law School for 'Community Patent Review' (also known as The Peer to Peer Patent Project). For further details see <http://dotank.nyls.edu/communitypatent/>. For details of USPTO participation see the Official Gazette. Location: <http://www.uspto.gov/web/offices/pac/dapp/opla/preognotice/peerreviewpilot.pdf>.

[89] For detailed discussion of the concept of a compensatory–liability regime see Reichmann and Lewis (2005).

Annex: Indicators

Listed in Order of the International Patent Classification (IPC)

General Notes:

1. Numerical Data:

   a) Numerical data refers to patent publications for all years within the European Patent Office esp@cenet worldwide database and all results are approximate. The data is purely provided as a guide to patent activity in areas of the classification;
   b) A single patent publication will commonly be awarded more than one IPC classifier and will therefore feature in the results under all classifiers awarded to the publication;
   c) Search results for +99999 or +100,000 indicate +/-100,000 entries across the worldwide database and reflect the limitation of the search algorithm;
   d) Searches were conducted in December 2006.

2. IPC7 and IPC8:

   a) The list of indicators was developed using IPC7 and has been reviewed and updated to reflect changes in the Eighth edition of the IPC (IPC8);
   b) Particular attention is drawn to the inclusion of A61K36 for medicinal plants within IPC8. This classifier replaces A61K35/78 (medicinal preparations involving plants) from the 1st of January 2006. Searches for medicinal plants should make use of both classifiers;
   c) Detailed classifiers for medicinal plants (A61K36) are drawn from the advanced level of IPC8.

3. The use of classifiers in specific areas:

   a) Readers are referred to the *Guide to the IPC* for detailed guidance on the use of the classification;
   b) This paper incorporates an OECD working definition of biotechnology patents (i.e. OECD 2006a) and a reply by the International Bureau of WIPO to an OECD survey for the Validation of Biotechnology Classes. These classifiers are marked *.
   c) Chemical compounds are only awarded classifiers under Organic Chemistry (i.e. C07) when they are new. Any new subsequent use of a compound falling within the prior art is classified only in relation to its specified new novel use (i.e. under A61K31). This has the effect that patent claims in relation to such compounds are restricted to the specified use. This also has the effect that compounds of natural origin become de-linked from classification under Organic Chemistry and are locatable elsewhere (i.e. A61K31). This subject is addressed in the formulas provided in Section I;
   d) Classifiers for the description of disorders under A61P were introduced in 2000 and should be used in conjunction with other classifiers for biodiversity and traditional knowledge provided in the list;
   e) Classifier C12R relating to microorganisms and cell lines is used only in conjunction with C12C-C12Q and C12S to describe the microorganism concerned. Classifier C12R is available in the electronic version of IPC7 and IPC8 based on “Bergey's Manual of Determinative Bacteriology”, Eighth Edition, 1975.

Section/Class/*Sub-Class*/Group/Sub-Group	**IPC**	esp@cenet whole database
Human Necessities	**A**	+100000
Agriculture; Forestry; Animal Husbandry; Hunting; Trapping; Fishing	**A01**	**+100000**
Immunising Seed	A01C1/08*	1681
New Plants or Process for Obtaining Them; Plant Reproduction by Tissue Culture Techniques	***A01H***	65542
Plants, processes for modifying genotypes	A01H1*	18413
Plants, processes for modifying phenotypes	A01H3	1609
Plant reproduction by tissue culture techniques	A01H4*	7665
Flowering Plants	A01H5	49633
Flowers	A01H5/02	9474
Stems	A01H5/04	310
Roots	A01H5/06	274
Fruits	A01H5/08	2572
Seeds	A01H5/10	8775
Leaves	A01H5/12	900
Gymnosperms	A01H7	424
Pteridophytes	A01H9	164
Bryophytes	A01H11	200
Algae	A01H13	323
Fungi; Lichens	A01H15	468
Symbiotic or parasitic combinations	A01H17	176
Animal Husbandry; Care of Birds, Fishes, Insects; Fishing; Rearing or Breeding Animals, not otherwise provided for; New Breeds of Animals	***A01K***	***+100000***
Culture of fish, mussels, crayfish, lobsters, sponges, pearls, or the like:	A01K61	19534
Preservation of Bodies of Humans or Animals or Plants or parts thereof; biocides, e.g. as disinfectants, as pesticides, as herbicides.	***A01N***	+100000
Biocides, pest repellants or attractants, or plant growth regulators, characterised by their forms, or by their non-active ingredients or by their methods of application	A01N25*	80324
Biocides, pest repellents or attractants, or plant growth regulators containing microorganisms, viruses, microbial fungi, enzymes, fermentates or substances producing or extracted from microorganisms or animal materials or extracts thereof	A01N63	24596
Fermentates or substances produced by or extracted from microorganisms or animal material	A01N63/02	8704
Biocides, pest repellents or attractants, or plant growth regulators containing microbial fungi or extracts thereof	A01N63/04	3254

Section/Class/*Sub-Class/*Group/Sub-Group	**IPC**	esp@cenet whole database
Biocides, pest repellents or attractants, or plant growth regulators containing plant material e.g. mushrooms, derris root, or extracts thereof.	A01N65	13172
Biocidal, pest repellent, pest attractant or plant growth regulatory activity of chemical compounds or preparation (for material already classified under A01N or C12N, C01, C07 or C08)	***A01P***	698
Disinfectants; Antimicrobial compounds or mixtures thereof	A01P1	109
Fungicides	A01P3	232
Nematocides	A01P5	31
Arthropodicides	A01P7	176
.Acaricides	A01P7/02	34
.Insecticides	A01P7/04	131
Molluscicides	A01P9	11
Rodenticides	A01P11	3
Herbicides; Algicides	A01P13	152
.selective	A01P13/02	15
Biocides for specific purposes not provided for in A01P1-A01P13	A01P15	13
Pest repellents	A01P17	24
Pest attractants	A01P19	7
Plant growth regulators	A01P21	36
Chemosterilants	A01P23	1
Treating Dough with microorganisms or enzymes	A21D8/04*	4808
Foods or Foodstuffs; Their Treatment, Not Covered by Other Classes	**A23**	**+100000**
Preserving, e.g. by canning, meat, fish, eggs, fruit, vegetables, edible seeds; chemical ripening of fruit or vegetables; the preserved ripened or canned products (i.e. 4/027. 4/20. 5/15, 7/154 and 9/26)	***A23B****	***59647***
Dairy Products, e.g. milk, butter, cheese; milk or cheese substitutes; making thereof (i.e. 9/12, 13/16, 17/02 and 19/032, 21/02)	***A23C****	***60161***
Fermentation with addition of micro-organisms or enzymes	A23F3/10*	162
Proteins from microorganisms or unicellular algae	A23J3/20*	855
Fodder	A23K	-
Animal Feeding stuffs supplemented with steroids, hormones or enzymes	A23K1/165*	7305
Foods, Foodstuffs, or non-alcoholic beverages not covered by Subclasses A23B to J; their preparation or Treatment…; Preservation of Foods or Foodstuffs in General.	***A23L***	+100000
Physical treatment containing gelling or thickening agents of vegetable origin	A23L1/052	9192
Starch	A23L1/0522	5055
Pectin; derivatives thereof	A23L1/0524	2564
From seeds, e.g. locust bean gum, guar gum	A23L1/0526	1889

Section/Class/*Sub-Class*/Group/Sub-Group	**IPC**	esp@cenet whole database
From corms, tubers or roots e.g. glucomannan	A23L1/0528	2288
Exudates e.g. gum arabic, gum acacia, gum karaya, tragacanth	A23L1/053	504
From seaweeds, e.g. alginates, agar, carrageenan	A23L1/0532	3122
cellulose, derivatives thereof	A23L1/0534	1697
Foods or foodstuffs containing gelling or thickening agents of microbial origin e.g. xanthan, dextran.	A23L1/054	2734
Gelling or thickening agents of animal origin	A23L1/056	320
Marmalades, jams; jellies; Other similar fruit or vegetable compositions; Simulated fruit products	A23L1/06	8054
derived from fruit or vegetable solids	A23L1/064	1436
derived from fruit or vegetable juices	A23L1/068	629
Products from apiculture, e.g. royal jelly or pollen (apiculture A01K47/00 to 59/00); Substitutes thereof;	A23L1/076	1881
Honey; Honey substitutes	A23L1/08	1164
Food or foodstuffs, preparation or treatment, containing cereal derived products	A23L1/10	19782
Fermentation of farinaceous cereal or cereal material; Addition of enzymes or microorganisms (1/16, 1/185, 1/238 take precedence)	A23L1/105*	2315
Malt products (malt products of pulse 1/202; preparation of malt for brewing C12C)	A23L1/185	737
Treatment of pulse, i.e. fruits of leguminous plants, for production of fodder or food; Preparation of products from legumes; Chemical means for rapid cooking of these foods, e.g. treatment with phosphates (animal foods A23K)	A23L1/20	14935
Malt products; fermented malt products (1/22 takes precedence; malt products of cereals 1/185)	A23L1/202	2057
Preparation of fruits or vegetables (of pulse A23L 1/20; treating harvested fruit or vegetables in bulk A23N)	A23L1/212	14607
Preparation of tuberous or like starch containing root crops	A23L1/214	8819
Natural spices, flavouring agents, or condiments; extracts thereof	A23L1/221	8766
From fruit, e.g. essential oils (essential oils in general C11B9/00)	A23L1/222	1374
Dried spices	A23L1/223	683
Onions	A23L1/224	123
Mustard	A23L1/225	289
Edible extracts or preparations of fungi (for medicinal purposes A61K)	A23L1/28	4478
Meat products; Meat meal (working up proteins for foodstuffs A23J3/00)	A23L1/31	11277
Egg products	A23L1/32	5543
Food from the sea products; fish products; fish meal; fish-egg substitutes	A23L1/325	13810

Section/Class/*Sub-Class*/Group/Sub-Group	**IPC**	esp@cenet whole database
Fish meal or powder; Granules, agglomerates or flakes	A23L1/326	883
Fish extracts	A23L1/327	489
Fish eggs, e.g. caviar; Fish-egg substitutes	A23L1/328	1040
Shell-fish	A23L1/33	2081
Molluscs	A23L1/333	1504
Edible seaweed	A23L1/337	6679
Food consisting mainly of nut meats or seeds	A23L1/36	4872
Food compositions or treatment thereof not covered by the preceding subgroups	A23L1/48	8032
Non-alcoholic beverages, dry compositions or concentrates thereof,; their preparation - containing fruit or vegetable juices	A23L2/02	9369
Clarifying or fining of non-alcoholic beverages; removing unwanted matter (purifying water C02F) using micro-organisms or biological material, e.g. enzymes	A23L2/84	1379
Preservation of foods or foodstuffs, in general, e.g. pasteurising, sterilising, specially adapted for food or foodstuffs	A23L3*	59265
Preservation of foods or foodstuffs in general – by treatment with chemicals containing – Organic compounds; Micro-organisms; Enzymes	A23L3/3463	12567
Compounds of undetermined constitution obtained from animals or plants	A23L3/3472	2177
Micro-organisms; Enzymes	A23L3/3571	1882
Machines or apparatus for treating harvested fruit, vegetables, or flower bulbs in bulk, not otherwise provided for; peeling vegetables or fruit in bulk; apparatus for preparing animal feeding-stuffs.	***A23N***	**35232**
Biochemical treatment	A24B15/20*	518
A61 Medical or Veterinary Science; Hygiene	**A61**	**+100000**
Gynaecological or obstetrical instruments or methods for reproduction or fertilisation	A61B17/425*	0
Instruments or methods for reproduction or fertilisation	A61D19*	2808
Coffins; wrappings; urns characterized by the construction material used, e.g.. biodegradable material; use of several material	A61G17/007*	603
Preparations for Medical, Dental or Toilet Purposes	***A61K***	**+99999**
Cosmetics or similar toilet preparations (transferred to A61K8 below from the 01/01/2006 and A61Q in relation to the use of materials)	A61K7	+100000
Cosmetics or similar toilet preparations (new in IPC8)	A61K8	+99999
Containing organic compounds	A61K8/30	+99995
Containing heterocyclic compounds	A61K8/49	43857
Sugars; derivatives thereof	A61K8/60	15929
Steroids; derivatives thereof	A61K8/63	5244
Proteins; Peptides; Derivatives or degradation products thereof	A61K8/64	17587

Section/Class/*Sub-Class*/Group/Sub-Group	**IPC**	esp@cenet whole database
Enzymes	A61K8/66	7696
Organic macromolecular compounds	A61K8/72	83480
Containing materials, or derivatives thereof, of undetermined constitution	A61K8/96	45508
Of vegetable origin, e.g. plant extracts	A61K8/97	33466
Of animal origin	A61K8/98	11155
From microorganisms	A61K8/99	4574
Medicinal preparations characterised by special physical form	A61K9	+99997
nanocapsules for medicinal preparations	A61K9/51	6030
Medicinal preparations containing organic active ingredients	A61K31	+100000
Medicinal preparations containing material or reaction products thereof with undetermined constitution, from	A61K35	+100000
…mammals; from birds	A61K35/12	21270
…Reproductive organs/embryos	A61K35/48	5002
…Ovary, eggs, embryos	A61K35/54	1848
…Snakes	A61K35/58	890
…Fish	A61K35/60	2202
…Leeches	A61K35/62	728
…Insects	A61K35/64	4125
…Microorganisms	A61K35/66	36243
…Protozoa	A61K35/68	306
…Lower fungi	A61K35/70	1081
…Yeasts	A61K35/72	1300
Materials from Bacteria	A61K35/74	21395
…Viruses	A61K35/76	15951
…Material from plants	A61K35/78	67395
…Algae	A61K35/80	1638
…Lichens	A61K35/82	69
…Higher Fungi	A61K35/84	3662
Medicinal preparations of undetermined constitution containing material from algae, lichens, fungi or plants, or derivatives thereof, e.g. traditional herbal medicines	A61K36/00	42452
In this group, it is desirable to add the indexing codes A61K 125/00-A61K 135/00	-	-
Algae	A61K36/02	1539
Phaeophycota or phaeophyta (brown algae), e.g. Fucus	A61K36/03	18
Rhodophycota or rhodophyta (red algae), e.g. Porphyra	A61K36/04	2
Chlorophycota or chlorophyta (green algae), e.g. Chlorella	A61K36/05	276
Fungi, e.g. yeasts	A61K36/06	4497
Ascomycota	A61K36/062	2
Saccharomycetales, e.g. baker's yeast	A61K36/064	27
Clavicipitaceae	A61K36/066	2

Section/Class/*Sub-Class*/Group/Sub-Group	**IPC**	esp@cenet whole database
Cordyceps	A61K36/068	16
Basidiomycota, e.g. Cryptococcus	A61K36/07	2004
Ganoderma	A61K36/074	47
Poria	A61K36/076	10
Lichens	A61K36/09	78
Bryophyta (mosses)	A61K36/10	16
Pteridophyta or Filicophyta (ferns)	A61K36/11	20
Filicopsida or Pteridopsida	A61K36/12	4
Drynaria	A61K36/126	2
Coniferophyta (gymnosperms)	A61K36/13	106
Cupressaceae (Cypress family), e.g. juniper or cypress	A61K36/14	26
Pinaceae (Pine family), e.g. pine or cedar	A61K36/15	58
Ginkgophyta, e.g. Ginkgoaceae (Ginkgo family)	A61K36/16	144
Gnetophyta, e.g. Ephedraceae (Mormon-tea family	A61K36/17	5
Magnoliophyta (angiosperms)	A61K36/18	12676
Magnoliopsida (dicotyledons)	A61K36/185	16512
Acanthaceae (Acanthus family)	A61K36/19	17
Strobilanthes	A61K36/195	1
Aceraceae (Maple family)	A61K36/20	5
Amaranthaceae (Amaranth family), e.g. pigweed, rockwort or globe amaranth	A61K36/21	15
Anacardiaceae (Sumac family), e.g. smoketree, sumac or poison oak	A61K36/22	13
Apiaceae or Umbelliferae (Carrot family), e.g. dill, chervil, coriander or cumin	A61K36/23	1176
Angelica	A61K36/232	41
Bupleurum	A61K36/233	9
Cnidium (snowparsley)	A61K36/234	5
Foeniculum (fennel)	A61K36/235	8
Ligusticum (licorice-root)	A61K36/236	6
Notopterygium	A61K36/237	6
Saposhnikovia	A61K36/238	8
Apocynaceae (Dogbane family), e.g. plumeria or periwinkle	A61K36/24	160
Araliaceae (Ginseng family), e.g. ivy, aralia, schefflera or tetrapanax	A61K36/25	977
Acanthopanax or Eleutherococcus	A61K36/254	52
Panax (ginseng)	A61K36/258	149
Aristolochiaceae (Birthwort family), e.g. heartleaf	A61K36/26	2
Aristolochia (Dutchman's pipe)	A61K36/264	1
Asarum (wild ginger)	A61K36/268	6
Asclepiadaceae (Milkweed family), e.g. hoya	A61K36/27	18
Asteraceae or Compositae (Aster or Sunflower family), e.g. chamomile, feverfew, yarrow or echinacea	A61K36/28	2695
Artemisia, e.g. wormwood or sagebrush	A61K36/282	31
Atractylodes	A61K36/284	6
Aucklandia	A61K36/285	2

Section/Class/*Sub-Class*/Group/Sub-Group	**IPC**	esp@cenet whole database
Carthamus (distaff thistle)	A61K36/286	28
Chrysanthemum, e.g. daisy	A61K36/287	9
Taraxacum (dandelion)	A61K36/288	16
Vladimiria	A61K36/289	4
Berberidaceae (Barberry family), e.g. barberry, cohosh or mayapple	A61K36/29	140
Epimedium	A61K36/296	18
Boraginaceae (Borage family), e.g. comfrey, lungwort or forget-me-not	A61K36/30	21
Brassicaceae or Cruciferae (Mustard family), e.g. broccoli, cabbage or kohlrabi	A61K36/31	79
Isatis, e.g. Dyer's woad	A61K36/315	5
Burseraceae (Frankincense family)	A61K36/32	11
Boswellia, e.g. frankincense	A61K36/324	28
Commiphora, e.g. mecca myrrh or balm of Gilead	A61K36/328	23
Cactaceae (Cactus family), e.g. pricklypear or Cereus	A61K36/33	12
Campanulaceae (Bellflower family)	A61K36/34	3
Adenophora	A61K36/342	0
Codonopsis	A61K36/344	6
Platycodon	A61K36/346	8
Caprifoliaceae (Honeysuckle family)	A61K36/35	23
Lonicera (honeysuckle)	A61K36/355	17
Caryophyllaceae (Pink family), e.g. babysbreath or soapwort	A61K36/36	18
Celastraceae (Staff-tree or Bittersweet family), e.g. tripterygium or spindletree	A61K36/37	12
Clusiaceae, Hypericaceae or Guttiferae (Hypericum or Mangosteen family), e.g. common St. Johnswort	A61K36/38	62
Convolvulaceae (Morning-glory family), e.g. bindweed	A61K36/39	6
Cornaceae (Dogwood family)	A61K36/40	14
Crassulaceae (Stonecrop family)	A61K36/41	29
Cucurbitaceae (Cucumber family)	A61K36/42	646
Gynostemma	A61K36/424	4
Trichosanthes	A61K36/428	11
Cuscutaceae (Dodder family), e.g. Cuscuta epithymum or greater dodder	A61K36/43	10
Ebenaceae (Ebony family), e.g. persimmon	A61K36/44	9
Ericaceae or Vacciniaceae (Heath or Blueberry family), e.g. blueberry, cranberry or bilberry	A61K36/45	74
Eucommiaceae (Eucommia family), e.g. hardy rubber tree	A61K36/46	7
Euphorbiaceae (Spurge family), e.g. Ricinus (castorbean)	A61K36/47	526
Fabaceae or Leguminosae (Pea or Legume family); Caesalpiniaceae; Mimosaceae; Papilionaceae	A61K36/48	3859
Astragalus (milkvetch)	A61K36/481	114
Cassia, e.g. golden shower tree	A61K36/482	23
Gleditsia (locust)	A61K36/483	6
Glycyrrhiza (licorice)	A61K36/484	84

Section/Class/*Sub-Class*/Group/Sub-Group	**IPC**	esp@cenet whole database
Gueldenstaedtia	A61K36/485	1
Millettia	A61K36/486	6
Psoralea	A61K36/487	8
Pueraria (kudzu)	A61K36/488	32
Sophora, e.g. necklacepod or mamani	A61K36/489	32
Fagaceae (Beech family), e.g. oak or chestnut	A61K36/49	12
Fumariaceae (Fumitory family), e.g. bleeding heart	A61K36/50	10
Corydalis	A61K36/505	1
Gentianaceae (Gentian family)	A61K36/51	10
Gentiana	A61K36/515	10
Juglandaceae (Walnut family)	A61K36/52	19
Lamiaceae or Labiatae (Mint family), e.g. thyme, rosemary or lavender	A61K36/53	1891
Agastache, e.g. giant hyssop	A61K36/532	4
Leonurus (motherwort)	A61K36/533	24
Mentha (mint)	A61K36/534	113
Perilla (beefsteak plant)	A61K36/535	14
Prunella or Brunella (selfheal)	A61K36/536	13
Salvia (sage)	A61K36/537	135
Schizonepeta	A61K36/538	5
Scutellaria (skullcap)	A61K36/539	66
Lauraceae (Laurel family), e.g. cinnamon or sassafras	A61K36/54	88
Linaceae (Flax family), e.g. Linum	A61K36/55	34
Loganiaceae (Logania family), e.g. trumpetflower or pinkroot	A61K36/56	28
Magnoliaceae (Magnolia family)	A61K36/57	35
Magnolia	A61K36/575	27
Meliaceae (Chinaberry or Mahogany family), e.g. Azadirachta (neem)	A61K36/58	20
Menispermaceae (Moonseed family), e.g. hyperbaena or coralbead	A61K36/59	14
Moraceae (Mulberry family), e.g. breadfruit or fig	A61K36/60	505
Morus (mulberry)	A61K36/605	30
Myrtaceae (Myrtle family), e.g. teatree or eucalyptus	A61K36/61	95
Nymphaeaceae (Water-lily family)	A61K36/62	15
Oleaceae (Olive family), e.g. jasmine, lilac or ash tree	A61K36/63	40
Forsythia	A61K36/634	35
Ligustrum, e.g. Chinese privet	A61K36/638	10
Orobanchaceae (Broom-rape family)	A61K36/64	10
Paeoniaceae (Peony family), e.g. Chinese peony	A61K36/65	21
Papaveraceae (Poppy family), e.g. bloodroot	A61K36/66	51
Piperaceae (Pepper family), e.g. Jamaican pepper or kava	A61K36/67	49
Plantaginaceae (Plantain Family	A61K36/68	32
Polygalaceae (Milkwort family)	A61K36/69	8
Polygonaceae (Buckwheat family), e.g. spineflower or dock	A61K36/70	466
Polygonum, e.g. knotweed	A61K36/704	48
Rheum (rhubarb)	A61K36/708	61
Ranunculaceae (Buttercup family), e.g. larkspur, hepatica, hydrastis, columbine or goldenseal	A61K36/71	655

Section/Class/*Sub-Class*/Group/Sub-Group	**IPC**	esp@cenet whole database
Aconitum (monkshood)	A61K36/714	64
Clematis (leather flower)	A61K36/716	13
Coptis (goldthread)	A61K36/718	45
Rhamnaceae (Buckthorn family), e.g. buckthorn, chewstick or umbrella-tree	A61K36/72	13
Ziziphus, e.g. jujube	A61K36/725	51
Rosaceae (Rose family), e.g. strawberry, chokeberry, blackberry, pear or firethorn	A61K36/73	1479
Chaenomeles, e.g. flowering quince	A61K36/732	13
Crataegus (hawthorn)	A61K36/734	102
Prunus, e.g. plum, cherry, peach, apricot or almond	A61K36/736	107
Rosa (rose)	A61K36/738	20
Sanguisorba (burnet)	A61K36/739	19
Rubiaceae (Madder family)	A61K36/74	114
Gardenia	A61K36/744	72
Morinda	A61K36/746	20
Oldenlandia or Hedyotis	A61K36/748	14
Rutaceae (Rue family)	A61K36/75	1176
Citrus, e.g. lime, orange or lemon	A61K36/752	197
Evodia	A61K36/754	21
Phellodendron, e.g. corktree	A61K36/756	91
Zanthoxylum, e.g. pricklyash	A61K36/758	32
Salicaceae (Willow family), e.g. poplar	A61K36/76	34
Sapindaceae (Soapberry family), e.g. lychee or soapberry	A61K36/77	30
Saururaceae (Lizard's-tail family	A61K36/78	157
Schisandraceae (Schisandra family)	A61K36/79	36
Scrophulariaceae (Figwort family)	A61K36/80	26
Rehmannia	A61K36/804	204
Scrophularia (figwort)	A61K36/808	33
Solanaceae (Potato family), e.g. tobacco, nightshade, tomato, belladonna, capsicum or jimsonweed	A61K36/81	1094
Lycium (desert-thorn)	A61K36/815	143
Theaceae (Tea family), e.g. camellia	A61K36/82	210
Thymelaeaceae (Mezereum family), e.g. leatherwood or false ohelo	A61K36/83	22
Aquilaria	A61K36/835	11
Valerianaceae (Valerian family), e.g. valerian	A61K36/84	31
Verbenaceae (Verbena family)	A61K36/85	56
Clerodendrum, e.g. glorybower	A61K36/855	29
Violaceae (Violet family)	A61K36/86	35
Vitaceae or Ampelidaceae (Vine or Grape family), e.g. wine grapes, muscadine or peppervine	A61K36/87	178
Liliopsida (monocotyledons)	A61K36/88	7141
Acoraceae (Calamus family), e.g. sweetflag or Acorus calamus	A61K36/882	39
Alismataceae (Water-plantain family)	A61K36/884	107
Aloeaceae (Aloe family), e.g. aloe vera	A61K36/886	67

Section/Class/*Sub-Class*/Group/Sub-Group	**IPC**	esp@cenet whole database
Araceae (Arum family), e.g. caladium, calla lily or skunk cabbage	A61K36/888	92
Arisaema, e.g. Jack in the pulpit	A61K36/8884	12
Pinellia	A61K36/8888	76
Arecaceae, Palmae or Palmaceae (Palm family), e.g. date or coconut palm or palmetto	A61K36/889	239
Calamus, e.g. rattan	A61K36/8895	0
Cyperaceae (Sedge family)	A61K36/89	78
Cyperus (flatsedge)	A61K36/8905	33
Dioscoreaceae (Yam family)	A61K36/894	10
Dioscorea, e.g. yam, Chinese yam or water yam	A61K36/8945	168
Liliaceae (Lily family), e.g. daylily, plantain lily, Hyacinth or narcissus	A61K36/896	1581
Allium, e.g. garden onion, leek, garlic or chives	A61K36/8962	92
Anemarrhena	A61K36/8964	75
Asparagus, e.g. garden asparagus or asparagus fern	A61K36/8965	71
Fritillaria, e.g. checker lily or mission bells	A61K36/8966	53
Lilium, e.g. tiger lily or Easter lily	A61K36/8967	34
Ophiopogon (Lilyturf)	A61K36/8968	100
Polygonatum (Solomon's seal)	A61K36/8969	114
Orchidaceae (Orchid family)	A61K36/898	114
Dendrobium	A61K36/8984	55
Gastrodia	A61K36/8988	106
Poaceae or Gramineae (Grass family), e.g. bamboo, corn or sugar cane	A61K36/899	2702
Coix (Job's tears)	A61K36/8994	75
Hordeum (barley)	A61K36/8998	17
Smilacaceae (Catbrier family), e.g. greenbrier or sarsaparilla	A61K36/90	60
Sparganiaceae (Bur-reed family)	A61K36/902	27
Stemonaceae (Stemona family), e.g. croomia	A61K36/904	80
Zingiberaceae (Ginger family	A61K36/906	152
Alpinia, e.g. red ginger or galangal	A61K36/9062	36
Amomum, e.g. round cardamom	A61K36/9064	134
Curcuma, e.g. common turmeric, East Indian arrowroot or mango ginger	A61K36/9066	455
Zingiber, e.g. garden ginger	A61K36/9068	256
Indexing codes for A61K36 classifiers		
Containing or obtained from roots, bulbs, tubers, corms or rhizomes	A61K125/00	35
Containing or obtained from leaves	A61K127/00	19

Section/Class/*Sub-Class/*Group/Sub-Group	**IPC**	esp@cenet whole database
Containing or obtained from bark	A61K129/00	7
Containing or obtained from seeds, nuts, fruits or grains	A61K131/00	28
Containing or obtained from flowers or blossoms	A61K133/00	11
Containing or obtained from stems, stalks, branches, twigs or shoots	A61K135/00	19
	A61K38*	+ 99999
Peptides having more than 20 amino acids; Gastrins; Somatostatins; Melanotropins; Derivatives thereof;	A61K38/16	23330
Peptides from animals; from humans	A61K38/17	40879
Protease inhibitors	A61K38/55	19697
…From plants	A61K38/56	212
…From animals; from humans	A61K38/57	2716
…From leeches e.g. hirudin, eglin	A61K38/58	688
Medicinal preparations containing antigens or antibodies	A61K39*	+ 99999
…Protozoa	A61K39/002	4786
…Bacterial antigens	A61K39/02	13210
…Chlamydiaceae	A61K39/118	1383
…Viral antigens	A61K39/12	15385
…Allergens	A61K39/35	3262
…Antigens from snakes	A61K39/38	1622
…Haptens or antigens bound to carriers	A61K39/385	8825
…Antibodies; immunoglobulins; immune serum	A61K39/395	87943
…Bacterial antibodies	A61K39/40	4218
…Viral antibodies	A61K39/42	3795
…Antibodies bound to carriers	A61K39/44	3887
Treatments for genetic diseases, Gene therapy	A61K48*	86306
Methods or apparatus for sterilising materials or objects in general; disinfection, sterilisation, or deodorisation of air; chemical aspects of bandages, dressings, absorbent pads, or surgical articles; materials for bandages, dressings, absorbent pads, or surgical articles (e.g. 15/38. 27/54,29/16, 31/16)	**A61L***	**+100000**

IPC Indicators for Disease and Disorders

(Therapeutic Activity of Chemical Compounds or Medicinal Preparations A61P)

Notes:

1. The A61P classifiers provided below were introduced in the year 2000 to describe the therapeutic activity of compounds or other medicinal preparations (i.e. traditional medicines, pharmaceuticals, other drugs). The classifiers are used in conjunction with classifiers under A61K or C12N, or in classes C01, C07 or C08 (i.e. A61K35/78 and A61K36 with A61P in relation to medicinal preparations involving plants);
2. The A61P classifiers are important for identifying patent activity in relation to specific diseases including neglected diseases;
3. For statistical purposes it is important to note that in some cases patent offices have reclassified their collections to include A61P in the period prior to 2000. Full data is only available from the year 2000 onwards.

Section/Class/*Sub-Class/*Group/Sub-Group	**IPC**	esp@cenet coverage whole database
Therapeutic Activity of Chemical Compounds or Medicinal Preparations	***A61P***	+ ***100000***
Drugs for disorders of the alimentary tract or the digestive system	A61P1	+ 100000
.Stomatological preparations, e.g. drugs for caries, aphtae, periodontitis	A61P1/02	15803
.for ulcers, gastritis or reflux esophagitis, e.g. antacids, inhibitors ofacid secretion, mucosal protectants	A61P1/04	54151
.Anti-spasmodics, e.g. drugs for colics, esophagic dyskinesia	A61P1/06	2169
.for nausea, cinetosis or vertigo; Antiemetics	A61P1/08	10728
.Laxatives	A61P1/10	3207
.Antidiarrhoeals	A61P1/12	8620
.Prodigestives, e.g. acids, enzymes, appetite stimulants, antidyspeptics,tonics, antiflatulents	A61P1/14	10554
.for liver or gallbladder disorders, e.g. hepatoprotective agents, cholagogues, litholytics	A61P1/16	29283
.for pancreatic disorders, e.g. pancreatic enzymes	A61P1/18	6793
Drugs for disorders of the metabolism (of the blood or the extracellular fluid 7/00)	A61P3	+ 100000
.Nutrients, e.g. vitamins, minerals	A61P3/02	12338
.Anorexiants; Antiobesity agents	A61P3/04	32776
.Antihyperlipidemics	A61P3/06	40254
.for glucose homeostasis (pancreatic hormones 5/48)	A61P3/08	20521
.. for hyperglycaemia, e.g. antidiabetics	A61P3/10	64831
.for electrolyte homeostasis	A61P3/12	1507
.. for calcium homeostasis	A61P3/14	7730
Drugs for disorders of the endocrine system	A61P5	37806
.of the hypothalamic hormones, e.g. TRH, GnRH, CRH, GRH, somatostatin	A61P5/02	1685

Section/Class/*Sub-Class/*Group/Sub-Group	**IPC**	esp@cenet coverage whole database
.. for decreasing, blocking or antagonising the activity of the hypothalamic hormones	A61P5/04	559
.of the anterior pituitary hormones, e.g. TSH, ACTH, FSH, LH, PRL, GH	A61P5/06	2278
.. for decreasing, blocking or antagonising the activity of the anteriorpituitary hormones	A61P5/08	400
.of the posterior pituitary hormones, e.g. oxytocin, ADH	A61P5/10	1211
.. for decreasing, blocking or antagonising the activity of the posteriorpituitary hormones	A61P5/12	1064
.of the thyroid hormones, e.g. T3, T4	A61P5/14	4651
.. for decreasing, blocking or antagonising the activity of the thyroid hormones	A61P5/16	862
.of the parathyroid hormones	A61P5/18	1351
.. for decreasing, blocking or antagonising the activity of PTH	A61P5/20	197
.. for decreasing, blocking or antagonising the activity of calcitonin	A61P5/22	50
.of the sex hormones	A61P5/24	3819
.. Androgens	A61P5/26	1153
.. Antiandrogens	A61P5/28	1270
.. Oestrogens	A61P5/30	2934
.. Antioestrogens	A61P5/32	1769
.. Gestagens	A61P5/34	664
.. Antigestagens	A61P5/36	676
.of the suprarenal hormones	A61P5/38	3194
.. Mineralocorticosteroids, e.g. aldosterone; Drugs	A61P5/40	464
.. for decreasing, blocking or antagonising the activity of mineralocorticosteroids	A61P5/42	570
.. Glucocorticosteroids; Drugs increasing or potentiating the activity of glucocorticosteroids	A61P5/44	633
.. for decreasing, blocking or antagonising the activity of glucocorticosteroids	A61P5/46	391
.of the pancreatic hormones	A61P5/48	1849
.. for increasing or potentiating the activity of insulin	A61P5/50	2455
Drugs for disorders of the blood or the extracellular fluid	A61P7	+100000
.Antithrombotic agents; Anticoagulants; Platelet aggregation inhibitors	A61P7/02	51303
.Antihaemorrhagics; Procoagulants; Haemostatatic agents; Antifibrinolyticagents	A61P7/04	10765
.Antianaemics	A61P7/06	10752
.Plasma substitutes; Perfusion solutions; Dialytics or haemodialytics; Drugs for electrolytic or acid-base disorders, e.g. hypovolemic shock (artificial tears 81)	A61P7/08	3446
.Antioedematous agents; Diuretics	A61P7/10	9848
.Antidiuretics, e.g. drugs for diabetes insipidus (ADH5/10)	A61P7/12	1206

Section/Class/*Sub-Class/*Group/Sub-Group	**IPC**	esp@cenet coverage whole database
Drugs for disorders of the cardiovascular system	A61P9	+100000
.Non-specific cardiovascular stimulants, e.g. drugs for syncope, antihypotensives	A61P9/02	7321
.Inotropic agents, i.e. stimulants of cardiac contraction; Drugs for heartfailure	A61P9/04	21356
.Antiarrhythmics	A61P9/06	20111
.Vasodilators for multiple indications	A61P9/08	35959
.for treating ischaemic or atherosclerotic diseases, e.g. antianginal drugs, coronary vasodilators, drugsfor myocardial infarction, retinopathy,arteriosclerosis	A61P9/10	+100000
.Antihypertensives	A61P9/12	67612
.Vasoprotectives; Antihaemorrhoidals; Drugs for varicose therapy; Capillarystabilisers	A61P9/14	6111
Drugs for disorders of the respiratory system	A61P11	+99999
. Nasal agents, e.g. decongestants	A61P11/02	8982
. for throat disorders	A61P11/04	1887
. Antiasthmatics	A61P11/06	40482
. Bronchodilators	A61P11/08	14763
. Expectorants	A61P11/10	1885
. Mucolytics	A61P11/12	454
. Antitussive agents	A61P11/14	4634
. Central respiratory analeptics	A61P11/16	2377
Drugs for disorders of the urinary system (diuretics 7/10)	A61P13	70090
. of urine or of the urinary tract, e.g. urine acidifiers	A61P13/02	29253
. for urolithiasis	A61P13/04	659
. Anti-spasmodics	A61P13/06	464
. of the prostate	A61P13/08	10454
. of the bladder	A61P13/10	5245
. of the kidneys	A61P13/12	29602
Drugs for genital or sexual disorders (for disorders of sex hormones 5/24);Contraceptives	A61P15	65219
. for disorders of the vagina	A61P15/02	1978
. for inducing labour or abortion; Uterotonics	A61P15/04	1514
. Antiabortive agents; Labour repressants	A61P15/06	3195
. for gonadal disorders or for enhancing fertility, e.g. inducers of ovulation or of spermatogenesis	A61P15/08	7462
. for impotence	A61P15/10	10375
. for climacteric disorders	A61P15/12	3226
. for lactation disorders, e.g. galactorrhoea	A61P15/14	1544
. Masculine contraceptives	A61P15/16	1857
. Feminine contraceptives	A61P15/18	4167

Section/Class/*Sub-Class/*Group/Sub-Group	**IPC**	esp@cenet coverage whole database
Drugs for dermatological disorders	A61P17	+ 99997
. for treating wounds, ulcers, burns, scars, keloids, or the like	A61P17/02	24664
. Antipruritics	A61P17/04	7501
. Antipsoriatics	A61P17/06	31003
. Antiseborrheics	A61P17/08	2106
. Anti-acne agents	A61P17/10	4807
. Keratolytics, e.g. wart or anti-corn preparations	A61P17/12	1610
. for baldness or alopecia	A61P17/14	8698
. Emollients or protectives, e.g. against radiation	A61P17/16	8784
Drugs for skeletal disorders	A61P19	75978
. for joint disorders, e.g. arthritis, arthrosis	A61P19/02	46027
. for non-specific disorders of the connective tissue	A61P19/04	3355
. Antigout agents, e.g. antihyperuricemic or uricosuric agents	A61P19/06	6274
. for bone diseases, e.g. rachitism, Paget's disease	A61P19/08	13488
. . for osteoporosis	A61P19/10	26898
Drugs for disorders of the muscular or neuromuscular system	A61P21	27696
. Muscle relaxants, e.g. for tetanus or cramps	A61P21/02	7613
. for myasthenia gravis	A61P21/04	8710
. Anabolic agents (androgens 5/26)	A61P21/06	245
Anaesthetics	A61P23	5248
. Local anaesthetics	A61P23/02	2245
Drugs for disorders of the nervous system	A61P25	+99997
. for peripheral neuropathies	A61P25/02	28050
. Centrally acting analgesics, e.g. opioids	A61P25/04	60764
. Antimigraine agents	A61P25/06	19807
. Antiepileptics; Anticonvulsants	A61P25/08	29663
. . for petit-mal	A61P25/10	513
. . for grand-mal	A61P25/12	192
. for treating abnormal movements, e.g. chorea, dyskinesia	A61P25/14	16844
. . Anti-Parkinson drugs	A61P25/16	28369
. Antipsychotics, i.e. neuroleptics; Drugs for mania or schizophrenia	A61P25/18	39094
. Hypnotics; Sedatives	A61P25/20	36125
. Anxiolytics	A61P25/22	24053
. Antidepressants	A61P25/24	49002
. Psychostimulants, e.g. nicotine, cocaine	A61P25/26	22750
. for treating neurodegenerative disorders of the central nervous system,e.g. nootropic agents,	A61P25/28	84869
. for treating abuse or dependence	A61P25/30	14442
. . Alcohol-abuse	A61P25/32	6604

Section/Class/*Sub-Class*/Group/Sub-Group	**IPC**	esp@cenet coverage whole database
. . Tobacco-abuse	A61P25/34	4555
. . Opioid-abuse	A61P25/36	4506
Drugs for disorders of the senses	A61P27	64288
. Ophthalmic agents	A61P27/02	46678
. . Artificial tears; Irrigation solutions	A61P27/04	843
. . Antiglaucoma agents or miotics	A61P27/06	13478
. . Mydriatics or cycloplegics	A61P27/08	92
. . for accommodation disorders, e.g. myopia	A61P27/10	465
. . for cataracts	A61P27/12	3788
. . Decongestants or antiallergics	A61P27/14	4633
. Otologicals	A61P27/16	12353
Non-central analgesic, antipyretic or anti-inflammatory agents	A61P29	+ 100000
Anti-infectives, i.e. antibiotics, antiseptics, chemotherapeutics	A61P31	+ 100000
. Local antiseptics	A61P31/02	1411
. Antibacterial agents	A61P31/04	+100000
. . for tuberculosis	A61P31/06	3588
. . for leprosy	A61P31/08	984
. Antimycotics	A61P31/10	17106
. Antivirals	A61P31/12	70017
. . for RNA viruses	A61P31/14	7726
. . . for influenza or rhinoviruses	A61P31/16	5873
. . . for HIV	A61P31/18	31959
. . for DNA viruses	A61P31/20	5564
. . . for herpes viruses	A61P31/22	9714
Antiparasitic agents	A61P33	31380
. Antiprotozoals, e.g. for leishmaniasis, trichomoniasis, toxoplasmosis	A61P33/02	10765
. . Amoebicides	A61P33/04	395
. . Antimalarials	A61P33/06	4822
. . for Pneumocystis carinii	A61P33/08	317
. Anthelmintics	A61P33/10	6935
. . Schistosomicides	A61P33/12	663
. Ectoparasiticides, e.g. scabicides	A61P33/14	1639
Antineoplastic agents	A61P35	+100000
. specific for leukemia	A61P35/02	20155
. specific for metastasis	A61P35/04	12095
Drugs for immunological or allergic disorders	A61P37	+100000
. Immunomodulators	A61P37/02	28896
. . Immunostimulants	A61P37/04	26309
. . Immunosuppressants, e.g. drugs for graft rejection	A61P37/06	38235

Section/Class/*Sub-Class/*Group/Sub-Group	**IPC**	esp@cenet coverage whole database
. Antiallergic agents (antiasthmatic agents 11/06; ophthalmic antiallergics27/14)	A61P37/08	54395
General protective or antinoxious agents	A61P39	15722
. Antidotes	A61P39/02	7498
. Chelating agents	A61P39/04	372
. Free radical scavengers or antioxidants	A61P39/06	5220
Drugs used in surgical methods, e.g. surgery adjuvants for preventing adhesion or for vitreum substitution	A61P41	3908
Drugs for specific purposes, not provided for in groups 1/00 to 41/00	A61P43	+ 100000

Chemistry, Biochemistry, Biotechnology and Emerging Technologies

Notes:

1. Classifiers for nanotechnology should be used in conjunction with other IPC classifiers relating to biodiversity; Coverage will dramatically improve through the use of Y01N and related classifiers under the ECLA within esp@cenet.
2. Except where specified the patent classification system does not clearly distinguish between material of animal or human origin.

Section/Class/*Sub-Class*/Group/Sub-Group	**IPC**	esp@cenet coverage whole database
Section B: Performing Operations; Transporting	**B**	+ **100000**
Biochemical methods	B01D37/36*	1
Chemical or biological purification of waste gases	B01D53/34*	45873
Separation by biological methods	B01D59/36*	18
Reclamation of contaminated soil microbiologically or by using enzymes	B09C1/10*	4397
Nanotechnology	***B82***	***8948***
Nano-Structures; Manufacture or Treatment thereof	***B82B***	***8946***
Nano-structures	B82B1	5322
Manufacture or treatment of nano-structures	B82B3	4864
Section C: Chemistry, Metallurgy	**C**	**+ 100000**
Biological treatment of water wastewater, or sewage characterised by microorganism used;	C02F3/34*	14287
Biological treatment of sludge; devices thereof	C02F11/02*	5195
Multistep treatment of water, waste water, or sewage, at least one step being a biological treatment	C02F9/14*	1051
Organic fertilisers not covered by subclasses C05B, C05C, e.g. Fertilisers from waste or refuse. i.e. see 9/04, 11/10	***C05F****	***33440***
Organic Chemistry	**C07**	**+ 100000**
Acyclic or carbocyclic compounds	***C07C***	***+ 100000***
Heterocyclic compounds	***C07D***	***+ 100000***
Acyclic, carbocyclic, or heterocyclic compounds containing elements other than carbon, hydrogen, halogen, oxygen, nitrogen, sulfur, selenium, or tellurium	***C07F***	***+ 99998***
Compounds of unknown constitution	***C07G***	***31390***
Lignin; lignin derivatives	C07G1	1266
Glycosides	C07G3	1533
Alkaloids	C01G5	2322
Antibiotics	C07G11*	6908
Vitamins	C07G13*	235
Hormones	C07G15*	507

Section/Class/*Sub-Class/*Group/Sub-Group	**IPC**	esp@cenet coverage whole database
Other compounds of unknown constitution	C07G17	7718
Sugars, Derivatives thereof; Nucleosides; Nucleotides; Nucleic acids	***C07H***	+ ***100000***
Nucleosides (and nucleotides)	C07H19	36576
Nucleotides (and nucleic acids)	C07H21	+100000
Nucleic Acids (and nucleotides)	C07H21	+100000
Steroids	***C07J***	***71183***
Peptides	***C07K***	***+ 100000***
Peptides having up to 20 amino acids in an undefined or only partially defined sequence; Derivatives thereof	C07K4*	2888
From viruses	C07K4/02	108
From bacteria	C07K4/04	233
From fungi	C07K4/06	21
From algae; from lichens	C07K4/08	11
From plants	C07K4/10	71
From animals; from humans	C07K4/12	659
Peptides having 5 to 20 amino acids in a fully defined sequence; derivatives thereof;	C07K7*	62466
Peptides having more than 20 amino acids; Gastrins; Somatostatins; Melanotropins; Derivatives thereof (Viruses);	C07K14*	+ 99999
From viruses (see also order, genera, species classifiers)	C07K14/005	44166
From bacteria	C07K14/195	42783
From fungi	C07K14/37	5783
From algae	C07K14/405	290
From lichens	C07K14/41	8085
From plants	C07K14/415	16950
From animals; from humans	C07K14/435	+**99999**
From protozoa	C07K14/44	2434
From vertebrates	C07K14/46	3256
From birds	C07K14/465	711
From mammals	C07K14/47	76281
Immunoglobulins, e.g. monoclonal or polyclonal antibodies	C07K16*	+ 99999
Carrier-bound or immobilised peptides	C07K17*	15551
Hybrid peptides	C07K19*	36211
Organic Macromolecular Compounds; Their Preparation or Chemical Working-Up; Compositions based thereon.	**C08**	+ 99889
Polysaccharides; Derivatives thereof	***C08B***	***71439***
Treatment or chemical modification of rubbers	***C08C***	***23552***

Section/Class/*Sub-Class/*Group/Sub-Group	**IPC**	esp@cenet coverage whole database
Macromolecular compounds obtained by reactions only involving carbon-to-carbon unsaturated bonds	***C08F***	***+ 99970***
Macromolecular compounds obtained otherwise than by reactions only involving carbon-to-carbon unsaturated bonds	***C08G***	***+99958***
Derivatives of natural macromolecular compounds	***C08H***	***10244***
Macromolecular products derived from proteins	C08H1*	3890
Use of inorganic or non-macromolecular organic substances as compounding ingredients	***C08K***	***+ 99974***
Compositions of macromolecular compounds	***C08L***	***+99951***
Compositions of unspecified macromolecular compounds being biodegradeable	C08L101/16*	12917
Dyes; Paints; Polishes; Natural Resins; Adhesives; Miscellaneous compositions; Miscellaneous Applications of Materials	**C09**	**+100000**
Organic Dyes	***C09B***	***+100000***
Coating compositions e.g. paints and varnishes	***C09D***	***+100000***
Natural Resins; French Polish etc.	***C09F***	***7480***
Preparation of Glue or Gelatin	***C09H***	***3186***
Adhesives etc.	***C09J***	***+100000***
Materials for Miscellaneous Applications not provided for elsewhere	***C09K***	***+100000***
Oils, Fats, Waxes and Perfumes	**C11**	**+100000**
Producing or refining fats, oils and waxes	***C11B***	***49196***
Essential Oils; Perfumes	C11B9	20703
Fatty Acids	***C11C***	***21276***
Detergents	***C11D***	***+100000***
Compositions of detergents based essentially on non-surface-active compounds… preparations containing enzymes	C11D 3/386*	17912
Other compounding ingredients of detergent compositions covered in group C11D1.. preparations containing enzymes	C11D7/42*	2434
Biochemistry; Beer; Spirits; Wine; Vinegar; Microbiology; Enzymology; Mutation or Genetic Engineering	**C12**	**+100000**
Apparatus for Enzymology or Microbiology	***C12M****	***73602***
Microorganisms or Enzymes, compositions thereof; propagating, preserving, or maintaining microorganisms; Mutation or Genetic Engineering; Culture Media	***C12N****	***+100000***
Micro-organisms, e.g. protozoa; Compositions thereof: Processes of propagating, maintaining or preserving micro-organisms or compositions thereof; Processes of preparing or isolating a composition containing a micro-organism; Culture media thereof	C12N1	+100000
Protozoa; Culture media thereof	C12N1/10	1328
Unicellular algae; Culture media thereof	C12N1/12	3606
Fungi, Culture media thereof	C12N1/14	11382
Yeasts; Culture media thereof	C12N1/16	8975

Section/Class/*Sub-Class*/Group/Sub-Group	**IPC**	esp@cenet coverage whole database
Bacteria; Culture media thereof	C12N1/20	49917
Undifferentiated human, animal or plant cells, e.g. cell lines; Tissues; Cultivation or maintenance thereof; Culture media thereof	C12N5	+100000
Undifferentiated Plant cells or tissues	C12N5/04	9479
Undifferentiated Animal cells or tissues	C12N5/06	44000
Undifferentiated Human cells or tissues	C12N5/08	16483
Viruses, e.g. bacteriophages; Compositions thereof; Preparation or purification thereof	C12N7	30747
Enzymes, Proenzymes, compositions thereof	C12N9	+ 100000
Proteinases, from Bacteria	C12N9/52	6896
Mutation or genetic engineering; DNA or RNA concerning genetic engineering, vectors, e.g. plasmids, or their isolation, preparation or purification; Use of hosts thereof	C12N15	+100000
Preparation of hybrid cells by fusion of two or more cells, e.g. protoplast fusion	C12N15/02	19966
For Bacteria	C12N15/03	598
Involving Fungi	C12N15/04	368
Involving Plant cells	C12N15/05	775
Animal cells	C12N15/06	2476
Human cells	C12N15/07	367
Cells resulting from interspecies fusion	C12N15/08	394
Recombinant DNA Technology (15/09), DNA or RNA fragments (15/11), Genes encoding for…	C12N15/09	+100000
Genes encoding for plant proteins	C12N15/29	11844
Genes encoding protozoal proteins	C12N15/30	1893
Genes encoding microbial proteins	C12N15/31	15114
Genes encoding viral proteins	C12N15/33	1496
Proteins from DNA viruses	C12N15/34	4608
Proteins from RNA viruses	C12N15/40	6443
Genes encoding for enzymes or proenzymes	C12N15/52	11534
Recombinant DNA Technology using prokaryotes as hosts	C12N15/75 to 79	
....for Bacillus	C12N15/75	2437
....for Actinomyces; for Streptomyces	C12N15/76	1637
....for Corynebacterium; for Brevibacterium	C12N15/77	983
....for Pseudomonas	C12N15/78	547
... Vectors or expression systems specially adapted for eukaryotic hosts	C12N15/79	3069
Recombinant DNA Technology using eukaryotes as hosts	C12N15/80 to 86	-

Section/Class/*Sub-Class*/Group/Sub-Group	**IPC**	esp@cenet coverage whole database
Recombinant DNA Technology for fungi	C12N15/80	2931
Recombinant DNA Technology for yeasts	C12N15/81	8537
Recombinant DNA technology for plant cells	C12N15/82	37122
plant cells … Viral vectors	C12N15/83	873
plant cells…Ti-plasmids	C12N15/84	1134
Recombinant DNA Technology for Animal cells	C12N15/85	25454
…Viral vectors	C12N15/86	15122
Fermentation or Enzyme using processes to synthesise chemical compounds	***C12P****	***+100000***
Measuring or testing processes involving enzymes or microorganisms	***C12Q****	***+ 100000***
Indexing classifiers for microorganisms for sub-classes C12C to C12Q and C12S	***C12R***	***+100000***
1:00 Micro-organisms	C12R1	+100000
1:01 . Bacteria or actinomycetales	C12R1/01	19207
1:02 ..Acetobacter	C12R1/02	861
1:025 ..Achromobacter	C12R1/025	597
1:03 ..Actinomadura	C12R1/03	875
1:04 ..Actinomyces	C12R1/04	450
1:045 ..Actinoplanes	C12R1/045	1086
1:05 ..Alcaligenes	C12R1/05	1692
1:06 ..Arthrobacter	C12R1/06	1756
1:065 ..Azotobacter	C12R1/065	431
1:07 ..Bacillus	C12R1/07	8232
1:08 ...Bacillus brevis	C12R1/08	244
1:085 ...Bacillus cereus	C12R1/085	344
1:09 ...Bacillus circulans	C12R1/09	268
1:10 ...Bacillus licheniformis	C12R1/10	897
1:11 ...Bacillus megaterium	C12R1/11	351
1:12 ...Bacillus polymyxa	C12R1/12	103
1:125 ...Bacillus subtilis	C12R1/125	3645
1:13 ..Brevibacterium	C12R1/13	2665
1:14 ..Chainia	C12R1/14	23
1:145 ..Clostridium	C12R1/145	23
1:15 ..Corynebacterium	C12R1/15	3952
1:16 ...Corynebacterium diphtheriae	C12R1/16	36
1:165 ...Corynebacterium poinsettiae	C12R1/165	5
1:17 ...Corynebacterium pyogenes	C12R1/17	1
1:18 ..Erwinia	C12R1/18	716
1:185 ..Escherichia	C12R1/185	951
1:19 ...Escherichia coli	C12R1/19	35164
1:20 ..Flavobacterium	C12R1/20	869

Section/Class/*Sub-Class/*Group/Sub-Group	**IPC**	esp@cenet coverage whole database
1:21 ..Haemophilus	C12R 1/21	358
1:22 ..Klebsiella	C12R 1/22	999
1:225 ..Lactobacillus	C12R1/225	2504
1:23 ...Lactobacillus acidophilus	C12R1/23	335
1:24 ...Lactobacillus brevis	C12R1/24	155
1:245 ...Lactobacillus casei	C12R1/245	332
1:25 ...Lactobacillus plantarum	C12R1/25	404
1:26 ..Methylomonas	C12R1/26	163
1:265 ..Micrococcus	C12R1/265	942
1:27 ...Micrococcus flavus	C12R1/27	3
1:28 ...Micrococcus glutamicus	C12R1/28	8
1:285 ...Micrococcus lysodeikticus	C12R1/285	15
1:29 ..Micromonospora	C12R1/29	659
1:30 ...Micromonospor achalcea	C12R1/30	12
1:31 ...Micromonospor apurpurea	C12R1/31	16
1:32 ..Mycobacterium	C12R1/32	1722
1:325 ...Mycobacterium avium	C12R1/325	74
1:33 ...Mycobacterium fortuitum	C12R1/33	90
1:34 ...Mycobacterium smegmatis	C12R1/34	136
1:35 ..Mycoplasma	C12R1/35	263
1:36 ..Neisseria	C12R1/36	727
1:365 ..Nocardia	C12R1/365	1668
1:37 ..Proteus	C12R1/37	587
1:38 ..Pseudomonas	C12R1/38	5927
1:385 ...Pseudomonas aeruginosa	C12R1/385	669
1:39 ...Pseudomonas fluorescens	C12R1/39	853
1:40 ...Pseudomonas putida	C12R1/40	1133
1:41 ..Rhizobium	C12R1/41	481
1:42 ..Salmonella	C12R1/42	1507
1:425 ..Serratia	C12R1/425	887
1:43 ...Serratia marcescens	C12R1/43	227
1:44 ..Staphylococcus	C12R1/44	816
1:445 ...Staphylococcus aureus	C12R1/445	875
1:45 ...Staphylococcus epidermidis	C12R1/45	183
1:46 ..Streptococcus	C12R1/46	2957
1:465 ..Streptomyces	C12R1/465	10297
1:47 ...Streptomyces albus	C12R1/47	120
1:48 ...Streptomyces antibioticus	C12R1/48	27
1:485 ...Streptomyces aureofaciens	C12R1/485	149
1:49 ...Streptomyces aureus	C12R1/49	10
1:50 ...Streptomyces bikiniensis	C12R1/50	7

Section/Class/*Sub-Class*/Group/Sub-Group	**IPC**	esp@cenet coverage whole database
1:51 ...Streptomyces candidus	C12R1/51	12
1:52 ...Streptomyces chartreuses	C12R1/52	9
1:525 ...Streptomyces diastatochromogenes	C12R1/525	6
1:53 ...Streptomyces filipinensis	C12R1/53	5
1:54 ...Streptomyces fradiae	C12R1/54	214
1:545 ...Streptomyces griseus	C12R1/545	195
1:55 ...Streptomyces hygroscopicus	C12R1/55	384
1:56 ...Streptomyces lavendulae	C12R1/56	67
1:565 ...Streptomyces lincolnensis	C12R1/565	5
1:57 ...Streptomyces noursei	C12R1/57	11
1:58 ...Streptomyces olivaceus	C12R1/58	28
1:585 ...Streptomyces platensis	C12R1/585	25
1:59 ...Streptomyces rimosus	C12R1/59	20
1:60 ...Streptomyces sparsogenes	C12R1/60	11
1:61 ...Streptomyces venezuelae	C12R1/61	21
1:62 ..Streptosporangium	C12R1/62	119
1:625 ..Streptoverticillium	C12R1/625	202
1:63 ..Vibrio	C12R1/63	512
1:64 ..Xanthomonas	C12R1/64	1022
1:645 . Fungi	C12R1/645	13689
1:65 ..Absidia	C12R1/65	183
1:66 ..Aspergillus	C12R1/66	2821
1:665 ...Aspergillus awamori	C12R1/665	187
1:67 ...Aspergillus flavus	C12R1/67	142
1:68 ...Aspergillus fumigatus	C12R1/68	136
1:685 ...Aspergillus niger	C12R1/685	1716
1:69 ...Aspergillus oryzae	C12R1/69	1032
1:70 ...Aspergillus ustus	C12R1/70	10
1:71 ...Aspergillus wentii	C12R1/71	3
1:72 ..Candida	C12R1/72	2543
1:725 ...Candida albicans	C12R1/725	295
1:73 ...Candida lipolytica	C12R1/73	201
1:74 ...Candida tropicalis	C12R1/74	273
1:745 ..Cephalosporium	C12R1/745	144
1:75 ...Cephalosporium acremonium	C12R1/75	116
1:76 ...Cephalosporium coerulescens	C12R1/76	0
1:765 ...Cephalosporium crotocinigenum	C12R1/765	2
1:77 ..Fusarium	C12R1/77	939
1:78 ..Hansenula	C12R1/78	922
1:785 ..Mucor	C12R1/785	711
1:79 ..Paecilomyces	C12R1/79	120
1:80 ..Penicillium	C12R1/80	1530
1:81 ...Penicillium brevi	C12R1/81	8

Section/Class/*Sub-Class/*Group/Sub-Group	**IPC**	esp@cenet coverage whole database
1:82 ...Penicillium chrysogenum	C12R1/82	529
1:825 ...Penicillium notatum	C12R1/825	12
1:83 ...Penicillium patulum	C12R1/83	0
1:84 ..Pichia	C12R1/84	2180
1:845 ..Rhizopus	C12R1/845	695
1:85 ..Saccharomyces	C12R1/85	1713
1:86 ...Saccharomyces carlsbergensis	C12R1/86	124
1:865 ...Saccharomyces cerevisiae	C12R1/865	8829
1:87 ...Saccharomyces lactis	C12R1/87	11
1:88 ..Torulopsis	C12R1/88	569
1:885 ..Trichoderma	C12R1/885	1014
1:89 . Algae	C12R1/89	1333
1:90 . Protozoa	C12R1/90	809
1:91 . Cell lines	C12R1/91	42831
1:92 . Viruses	C12R1/92	5046
1:93 ..Animal viruses	C12R1/93	1325
1:94 ..Plant viruses	C12R1/94	13
Processes using enzymes or microorganisms to liberate, separate or purify pre-existing compound or composition. Note that under the following classes enzymes or microorganisms should also be classified under C12S: A21, A23, A61L, A62D, B01D 53, B08B, B09C, C01, C05F, C08, C09B, C09B, C09H, C10G, C13, C14C, C21B, C22B, C23F, C23G, D01C, D01F, D06L, D06M, D06P, D21C, D21H, F24F, F24J, F26B and H01M	***C12S****	***7511***
Extraction of metal compounds from ores or concentrates by wet processes with the aid of microorganisms or enzymes e.g. bacteria or algae	C22B3718*	0

Section/Class/*Sub-Class*/Group/Sub-Group	**IPC**	esp@cenet coverage whole database
Combinatorial Technology	**C40**	**602**
Combinatorial Chemistry; Libraries, e.g. Chemical Libraries, <u>in silico</u> Libraries	***C40B***	**591**
Directed molecular evolution of macromolecules, e.g. RNA, DNA or proteins	C40B10	7
Libraries <u>per se</u>, e.g. arrays, mixtures	C40B40	410
Libraries contained in or displayed by microorganisms, e.g. bacteria or animal cells; Libraries contained in or displayed by vectors, e.g. plasmids; Libraries containing only microorganisms or vectors	C40B40/02	58
Libraries containing only organic compounds	C40B40/04	360
Libraries containing nucleotides or polynucleotides, or derivatives thereof	C40B40/06	34
Libraries containing RNA or DNA which encodes proteins, e.g. gene libraries	C40B40/08	175
Libraries containing peptides or polypeptides, or derivatives thereof	C40B40/10	170
Libraries containing saccharides or polysaccharides, or derivatives thereof	C40B40/12	9
Libraries containing macromolecular compounds and not covered by groups (C40B40/06-C40B40/12)	C40B40/14	4
Methods of creating libraries, e.g. combinatorial synthesis	C40B50	91
Apparatus specially adapted for use in combinatorial chemistry or with libraries	C40B60	23
Tags or labels specially adapted for combinatorial chemistry or libraries, e.g. fluorescent tags or bar codes	C40B70	8
Subject matter not provided for in other groups of this subclass	C40B99	2
Section D: Textiles; Paper	**D**	**+100000**
Bleaching fibres, threads, yarns, fabrics, feathers, or made-up fibrous goods, leather, or fur using enzymes	D06L3/11*	950
Pulp or paper, comprising cellulose or lingocellulose fibres of natural origin only modified by a particular after-treatment chemically or biochemically modified fibres	D21H11/20*	1608
Non-fibrous material added to the pulp, characterised by its function, form or properties; Paper impregnating or coating material, characterised by its function, form or properties in or on the paper, biocidal agents, e.g. fungicidal, bactericidal, insecticidal agents	D21H21/36*	1638
After-treatment of paper not provided for in groups D21H17-D21H23, chemical or biochemical treatment	D21H25/02*	547
Section G: Physics	**G**	**+100000**
Measuring; Testing	G01	**+100000**
Investigating or analysing materials by determining their chemical or physical properties	**G01N**	***+100000***
Investigating or analysing surface structures in atomic ranges using scanning-probe techniques	G01N13/10	7990
Biochemical Electrodes	G01N27/327*	8016

Section/Class/*Sub-Class/*Group/Sub-Group	**IPC**	esp@cenet coverage whole database
Biological material, e.g. blood, urine; Haemocytometers	G01N33/48*	43772
Immunoassay; Biospecific binding assay; Materials thereof	G01N 33/53*	+100000
as above, double or second antibody etc. [deleted in IPC8]	G01N33/54*	4170
as above, relating to type of carrier etc. [deleted in IPC8]	G01N33/55*	19
as above, relating to specific disease i.e. hepatitis, cancer etc. [deleted in IPC8]	G01N33/57*	4
as above, involving proteins, peptides or amino acids etc.	G01N33/68*	57711
as above, involving hormones	G01N33/74*	11585
as above, Human chorionic gonadotropin	G01N33/76*	2891
as above, Thyroid gland hormones	G01N33/78*	1864
as above, involving prostaglandins	G01N33/88*	459
as above, involving lipids, e.g. cholesterol	G01N33/92*	5862
Measuring magnetic properties of articles or specimens of solids or fluids using nuclear magnetic resonance (NMR) applied to biological material, e.g. in vitro testing	G01R33/465*	915
Computing; Calculating; Counting	**G06**	**+100000**
Electrical Digital Data Processing	***G06F***	+ 100000
Computer systems based on biological models	G06N3*	13057
Models for scientific, medical, or mathematical purposes, e.g. full-sized device for demonstration purposes for medicine	G09B23/28*	5542
Digital stores characterized by the use of particular electric or magnetic storage elements; Storage elements thereof using elements simulating biological cells e.g. neuron	G11C11/54*	240
Details of apparatus using scanning-probe techniques (i.e. nanotechnology)	G12B21	4001
Biological shielding	G21C11/02*	1305
Treating liquids, processing by biological processes	G21F9/18*	114
Section H: Electricity (emergent)	**H01**	**+100000**
Apparatus or processes for applying nanostructures, e.g. by molecular beam epitaxy (MBE)	H01F41/30	1331
Biochemical fuel cells, i.e. cells in which microorganisms function as catalysts	H01M8/16*	430

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