Using Patents to Identify Emerging Trends in Biomedical Engineering

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Siegesmund Engineering Library,
Purdue University

Abstract

Patents are a rich source of information for educating students on emerging fields in biomedical engineering. Since 80% of the information in patents is not published elsewhere, faculty should seriously consider including patent instruction in their courses. Patents may be the first and only place that innovations are detailed. Protecting patent rights may preclude presenting and publishing cutting edge information in journal articles and conference papers. This paper covers U.S. issued patents and published applications as well as world patents and applications. Free databases available on the World Wide Web will be emphasized. Classification systems that are discussed include United States, International, and European. Known inventors and assignees are also discussed. Search examples are shown.

Introduction

Students regularly review journal articles and conference papers in undergraduate education programs for state-of-the-art information. Patents are required to include information that is “new, novel, and non-obvious.” This cutting edge information is usually not published in journal articles and conference papers. Since 80% of the information in patents is not published elsewhere, faculty should seriously consider including patent instruction in their courses. Literature reviews of many topics may be incomplete without using patents. U.S. and world patents are relevant.

The definition for a patent is based on a country’s laws or regulations. The definition provided by the United States Patent and Trademark Office states:

A patent is a property right granted by the Government of the United States of America to an inventor “to exclude others from making, using, offering for sale, or selling the invention throughout the United States or importing the invention into the United States” for a limited time in exchange for public disclosure of the invention when the patent is granted.

An application is filed in the name of the actual inventor. An inventor’s employment contract usually requires that the rights be assigned to the employer. The employer is called the assignee. Many patents are also filed by independent inventors. An inventor is strongly encouraged to seek legal counsel and have a registered patent attorney or agent file the application.
Staff members at the United States Patent and Trademark Office are responsible for the examination and issue of patents. Faculty members are encouraged to consult the detailed information provided by the USPTO for preparing lectures on patents. There are many print and online publications on the Office web site, including frequently asked questions. Two FAQs that are especially helpful include questions on “patents” and those provided by the “General Information Services Division.” New patent users are encouraged to review special pages for Independent Inventors and First Time Visitors.

Michael Lechter, a patent attorney, has joined with many colleagues to provide an excellent survey of patents for engineers and scientists. This book includes in depth information that engineers find very helpful for understanding the patenting process. Changes in U.S. patent law in 1995 and 1999 are not reflected in the book.

U.S. utility and design patents issued after June 8, 1995 are effective for 20 years from date of application. Before June 8, 1995, utility and plant patents are effective for 17 years from date of issue. Maintenance fees are paid on utility patents at 3 ½ years, 7 years, and 13 ½ years. Design patents are effective for 14 years from date of issue. Rights normally end when the term ends. This allows the invention to go into the public domain. In the United States, inventors or their assignees may apply for extensions in some cases, for example, pharmaceuticals that have taken long periods of time for approval by the Food and Drug Administration.

Since 2001, U.S. patent applications have been published 18 months after filing date. This is especially true for applications that are filed outside the United States. Inventors who file only in the U.S. may choose not to have their applications published. Most inventors are permitting their applications to be published.

**World Patents**

The global intellectual property atmosphere greatly influences the scientific and engineering community. As a result, students should be familiar with world patents. One’s patent rights are protected in a country when an inventor files an application, meets the requirements of that country, and is issued a patent. To protect rights outside the United States, one must complete the requirements of that country. A Patent Cooperation Treaty (PCT) application may be filed at the USPTO for patent rights in many countries. The final requirements must also be met in each country. Most patents issued outside the United States are valid for 20 years from application. Most countries publish applications 18 months after filing.

The World Intellectual Property Organization and the European Patent Office are key players in the world patent scene. WIPO is an organization of 179 member countries. Its primary mission is the protection of intellectual property, i.e. patents, trademarks, and copyrights. One sees some of the work of WIPO in a patent document. The standards used for Country Codes, Kind Codes, and INID [International agreed Number for the Identification of (bibliographic) Data] codes make it easier to identify specific information and parts of patent documents. WIPO staff members are responsible for the preliminary search of the PCT application. Patent records from many countries are a part of the European Patent Organization’s esp@cenet database. Patents that share a common priority application number are linked together in one record.
Publishing Considerations Related to Patents

Faculty and students who are writing journal articles, conference papers, and theses should understand how these publications may limit the ability to obtain a patent. Differences among countries should be expected. United States law is based on first-to-invent while other countries are based on first-to-file. The importance of documenting one’s work in a laboratory notebook is highly recommended.

In the United States, a patent must be filed within a year of publication:

In order for an invention to be patentable it must be new as defined in the patent law, which provides that an invention cannot be patented if: “(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for patent,” or “(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country more than one year prior to the application for patent in the United States . . .”

If one wants to file a patent outside the United States, many sources recommend that no publication or presentation should be done before filing. Faculty members are encouraged to consult the university intellectual property office or patent attorney before publication or presentation. In 1995, the U.S. introduced the new provisional patent application. This may help with the publication quandary but it is not a cure-all. A non-provisional application must be filed within a year.

Patents and the Curriculum

The best place to find the emerging trends is the newly published applications or issued patents. An actual search of the patent databases is recommended. Two freely available web sites are U.S. Patent Office web site for Patent Full-Text and Full-Page Image Databases:7 Issued Patents and Patent Applications. The European Patent Office offers its excellent esp@cenet8 database.

Design projects may be an appropriate place to introduce patents. Faculty members in the School of Mechanical Engineering at Purdue University have included a basic introduction to patents and their subject classification in sophomore level design classes for many years. This introduction is done by a skilled librarian who has extensive experience with the topic. Students in Biomedical Engineering may also gain additional knowledge for their design projects.

Assignments Involving Library Materials

Short assignments involving patents may start with newspaper articles, directories, journal articles, and conference papers. Newspaper articles and selected publications may discuss specific new medical devices. Rob Stein9 has written a recent newspaper article titled; “Patients Find Technology Easy to Swallow” in the Washington Post described a new device. He describes the technology as a “M2A disposable diagnostic capsule. Also called the "gut cam," the device is the first of its kind -- a self-contained, miniature, disposable color video system designed to travel painlessly through the digestive system.”
Journal articles and conference papers on patents are not numerous. A survey of several bibliographic databases makes one quickly realize that journal articles and conference papers do not frequently cover patents. Table 1 shows the results of this search:

<table>
<thead>
<tr>
<th>Database</th>
<th>(Coverage)</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>INSPEC (1970-date)</td>
<td>193 records</td>
<td></td>
</tr>
<tr>
<td>COMPENDEX (1983-date)</td>
<td>125 records</td>
<td></td>
</tr>
<tr>
<td>Current Contents (recent year)</td>
<td>100 records</td>
<td></td>
</tr>
</tbody>
</table>

Medline (1966-date) shows 2778 articles were Patents is a subject term. Chemical Abstracts is an excellent for world-wide coverage of chemical patents but may not be that useful for biomedical patents.

Given these very mediocre results, the author advises instructors to introduce free patent databases provided by the United States Patent and Trademark Office and the European Patent Office.

Directories may be helpful. For example the Medical Device Register\textsuperscript{10} contains a product directory and supplier profiles. This directory can be helpful for identifying assignees and products but should not be viewed as a comprehensive directory.

Other opportunities may exist to review medical devices in Food and Drug Administration databases of premarket approvals\textsuperscript{11} and premarket notifications (501K).\textsuperscript{12} The information contained in Recently Approved Devices\textsuperscript{13} links to the New Device Approval. This explains how the product works, when it should be used and not used. After reviewing the related FDA databases and publications, a student should have leads to the inventors, assignees, and product information. Since the patent number is typically not listed in device databases, it is necessary to use inventors, assignees, and product keywords to retrieve patents from patent databases. Drugs listed in the FDA’s Electronic Orange Book\textsuperscript{14} often contain the patent numbers.

**Free Databases or World Wide Web**

Three major free databases are available on the web from the U.S. Patent and Trademark Office and the European Patent Organization. These databases allow limited keyword searching as well as inventor and assignee information. Classification systems are also very good for describing the content of the claims. If one searching for keywords results are incomplete.

United States Patent Grants and Published Applications are available on the Web site of the USPTO. Full-text images of most U.S. publications are available as TIFF images and are printed one page at a time. The web databases contain full-text searching for patents (1976-date) and applications (2001-date). Table 2 shows the opening USPTO search patent screen:
Table 2

**Patent Full-Text and Full-Page Image Databases**

<table>
<thead>
<tr>
<th>Issued Patents</th>
<th>Patent Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>(full-text since 1976, full-page images since 1980)</td>
<td>(published since 15 March 2001)</td>
</tr>
<tr>
<td>Quick Search</td>
<td>Quick Search</td>
</tr>
<tr>
<td>Advanced Search</td>
<td>Advanced Search</td>
</tr>
<tr>
<td>Patent Number Search</td>
<td>Publication Number Search</td>
</tr>
<tr>
<td>Access Full-Page Images Directly!</td>
<td>Help</td>
</tr>
<tr>
<td>Database Notices and Status</td>
<td></td>
</tr>
<tr>
<td>Database Contents</td>
<td></td>
</tr>
</tbody>
</table>

Patent and Trademark Depository Libraries\textsuperscript{15} have access to patents and applications on DVD. A complete patent may be printed very quickly and easily at a PTDL. Libraries also have search software on DVD. Some of which is not available on the web.

The European Patent Office hosts the esp@cenet site that contains patents from many countries. The years covered by each country varies. Keywords from the title and abstracts are available for some records. esp@cenet includes issued patents and published applications. From the opening screen of esp@cenet,\textsuperscript{16} choose *Worldwide - 30 million documents*. Table 3 shows the opening screen:

Table 3

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A typical searcher tends to use keyword searching as the only technique for identifying patents. Keywords often limit retrieval and miss relevant patents. Searching by classification enhances retrieval and locates many relevant patents.

**Classification Systems**

Classification systems are an integral part of patent retrieval. Concepts are often detailed in the classification system. The United States Patent and Trademark Office developed its own U.S. Patent Classification System while the World Patent Organization is responsible for the International Patent Classification. The European Patent Organization has modified the IPC for its use in the European Classification System.

A series of numbers or letters and numbers are used to identify classification systems used with patents. These classification systems typically delineate the content of a patent based on its claims. Table 4 shows examples of patent classifications for endoscopes:

<table>
<thead>
<tr>
<th>System</th>
<th>Terminology</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. Patent Class</td>
<td>Class/Subclass</td>
<td>600/101</td>
</tr>
<tr>
<td>International Class</td>
<td>Section Class Subclass Group Subgroup</td>
<td>A61B1/005</td>
</tr>
<tr>
<td>European Class</td>
<td>Section Class Subclass Group Subgroup</td>
<td>A61B1/005D</td>
</tr>
</tbody>
</table>

1. **U.S. Patent Classification** has search tools that are helpful for determining the classification. Among these are the *Index to the Patent Classification System, Manual of Classification*, and *Classification Definitions*. These are available in print and on the web. The web version links the *Index, Manual of Classification*, and *Definitions*. For endoscopes, the *Index* shows the following:

   *Endoscope*
   
   - Diagnostic specula ....................... 600 / 101
   - Surgical cutter ........................... 606 / 45

   The *Manual of Classification* uses a hierarchical system and shows great detail. It is divided into Classes and Subclasses. Class 600 is subdivided by Main Lines in capital letters. These are further outlined by dots. One dot is subdivided by two dots, etc. Table 5 shows a portion of Class 600:

<table>
<thead>
<tr>
<th>Table 5: Class 600 Surgery (partial)</th>
</tr>
</thead>
<tbody>
<tr>
<td>This Class 600 is considered to be an integral part of Class 128 (see the Class 128 schedule for the position of this Class in schedule hierarchy). This Class retains all pertinent definitions and class lines of Class 128.</td>
</tr>
</tbody>
</table>

   101        ENDOSCOPE
   102        . With chair, table, holder, or other support
   103        . With monitoring of components or view field
   104        . With tool carried on endoscope or auxillary channel therefore
   105        .. Urogenital resectoscope
   106        .. Having tool moving or stopping means
   107        ... Having tool raising platform
   108        .. Laser

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ENDOSCOPE

. With camera or solid state imager
  .. Having signal wires
  .. Stereoscopic
  .. Means for coupling camera or imager
  . With additional scope
  . With guide means for body insertion
  .. Inflatable cuff or balloon
  . With inflatable balloon
  . With means for indicating position, depth or condition of endoscope
  . With control or monitoring of endoscope functions
  . With shield to protect operator (e.g., splatter protection)
  . Having endotrachael intubation means on endoscope
  . With protective sheath
  .. For camera or handle
  .. For auxiliary channel
  .. With means to assist covering or uncovering of sheath
  . With locking or retaining means for sheath
  . With non-optical distal tip attachment
  . With particular shaft cross-section
  . With particular distal tip configuration
  . With particular arrangement of internal elements (e.g., shaft reducing)
  . With particular operating handle design (e.g., for comfort)
  . Universal cord connector device for endoscope functions
  . Sterilizable
  . Having means to protect user, patient, or endoscope from electrical discharge
  . Urological
  . Having separable shaft
  . Having rotatable shaft
  . Having rigid tube structure
  . Having flexible tube structure
  .. Plural layers
  .. Articulated segments
  ... Pivotally connected
  .. Having shape memory retaining material component
  .. With adjustable rigidity
  .. With bend detecting means (e.g., endoscope tracking)
  .. With bending control means
  .... With removable control knob
  ... With braking means
  ... With wire tension control (e.g., slack absorbing)
  ... With deflection recovery
  ... Having temperature sensitive shape memory retaining material
  ... Fluid or electrical control means
  . Having auxiliary channel
  .. Channel seal (e.g., forceps stopcock)
  .. With interior cleaning means
  .. Fluid channel (e.g., suction, irrigation, aspiration)
  ... With window cleaning means
  ... With air or water supply means
  ... With valve construction or valve control means
  . Having imaging and illumination means
  .. Strain relief means on optical element
  .. Ocular (e.g., eyepiece)
  ... With focusing
  ... Angled or offset on endoscope shaft
  ... Plural
  .. Stereoscopic
  .. Focusing
  .. Magnifying
  .. Fog prevention
Definitions are available for classes and subclasses. The definition also gives cross-references to other classes and subclasses.

2. **International Patent Classification** is commonly used in many countries around the world. WIPO outlines the history of the IPC and describes its 7th edition. It consists of eight sections, 120 classes, 628 subclasses and approximately 69,000 groups. Although it is used extensively throughout the world, editions have changed over time and this affects the classification and retrieval of patents in countries that have adopted the IPC. One IPC classification is assigned to each U.S. patent. In other countries, several classifications are assigned. The Catchword Index to the IPC is a starting place to identify the IPC. Here is the classification for:

```
Section:   A
Section Title:  Human Necessities
Class   61
Subclass:  B
Group:   1/00 Main Group
```

Table 6 shows the background on Section/Class A61:
Table 6

| A 61 | MEDICAL OR VETERINARY SCIENCE; HYGIENE |
| A 61 B | DIAGNOSIS; SURGERY; IDENTIFICATION (analysing biological material 901N, e.g. 901N.3345; obtaining records using waves other than optical waves, in general 0609.42900) |

**Note**

This subclass covers instruments, implements, and processes for diagnostic, surgical and personal identification purposes, including obstetrics, instruments for cutting horns, vaccination instruments, fingerprinting, psycho-physical tests.

**Subclass Index**

MEDICINAL METHODS (NON-SURGICAL)  
A61B 1/00, A61B 5/00, A61B 17/00

INSTRUMENTS FOR PSYCHO-PHYSICAL TESTS  
A61B 5/00

MEDICAL INSTRUMENTS  

- For auscultation and diagnostics  
  A61B 5/00 to A61B 10/00
- For medical examination of the interior of cavities or tubes of the body and the eyes  
  A61B 1/00, A61B 9/00
- Aids for examination of the mouth  
  A61B 1/00, A61B 13/00

SURGICAL INSTRUMENTS, DEVICES OR METHODS  
A61B 17/00: A61B 19/00

OTHER INSTRUMENTS, IMPLEMENTS OR ACCESSORIES FOR SURGERY OR DIAGNOSIS  
A61B 19/00

This is a portion of the group for **Diagnosis; Psycho-physical tests** that shows the hierarchical systems of dots. A group with a single dot is a subgroup of 1/00. Those with two dots are a subgroup of those with one dot.

160  
Instruments for performing medical examinations of the interior of cavities or tubes of the body by visual or photographical inspection, e.g. endoscopes (examination of body cavities or body parts using ultrasonic, sonic or infrasonic waves A61B 8/12; instruments, e.g. endoscopes, for taking a cell sample A61B 10/00; endoscopic cutting instruments A61B 17/32; surgical instruments using a laser beam being directed along or through a flexible conduit A61B 18/22; illuminating arrangements therefor (for the eye A61B 3/00) [1]

1/02  
- Having rod-lens arrangements A61B 1/055 (takes precedence) [6]

1/08  
- Articulations [6]

1/01  
- Guiding arrangements therefor [6]

1/012  
- Characterised by internal passages or accessories therefor [6]

1/015  
- Control of fluid supply or evacuation [6]

1/018  
- For receiving instruments [3]

1/04  
- Combined with photographic or television appliances [2]

1/045  
- Control therefor [6]

1/05  
- Characterised by the image sensor, e.g. camera, being in the distal end portion [6]

1/055  
- Having rod-lens arrangements [6]

1/06  
- With illuminating arrangements

1/07  
- Using light-conductive means, e.g. optical fibres [6]

There are no definitions for the IPC. The author assumes that the number following the subgroup title, i.e. [6] identifies the IPC edition that setup the subgroup.

3. **European Classification System**[^3] is an extension of the International Classification System and is under “constant revision.” An index is available but is awkward to use. Some notes are also available.

[^3]: European Classification System is an extension of the International Classification System and is under “constant revision.” An index is available but is awkward to use. Some notes are also available.
The European Classification for A61 B is shown below:

- **A** HUMAN NECESSITIES
- **A61** MEDICAL OR VETERINARY SCIENCE; HYGIENE
- **A61B** DIAGNOSIS; SURGERY; IDENTIFICATION (analyzing biological material G01N, e.g. G01N33/46; obtaining records using waves other than optical waves, in general G03B42/00)

A further breakdown of A61B reveals that the system is more detailed than the IPC:

<table>
<thead>
<tr>
<th>A61B.00</th>
<th>as above</th>
</tr>
</thead>
<tbody>
<tr>
<td>A61B.100E</td>
<td>[N with light conducting means, e.g. fibre optics (A61B.100 to A61B.100 take precedence, light guides per se G02B6/00)]</td>
</tr>
<tr>
<td>A61B.100D</td>
<td>[N comprising a channel for guiding instruments (control of instruments A61B.101B)] [C9907]</td>
</tr>
<tr>
<td>A61B.100F</td>
<td>[N: Coupling devices (medical aspects of connections A61M39/00, coherent light guides formed by bundles of fibres G02B6/06, G02B6/08, G02B6/26; details of coupling devices H01B12/00)]</td>
</tr>
<tr>
<td>A61B.100I</td>
<td>[N with means for preventing contamination, e.g. by sanitary sheath]</td>
</tr>
<tr>
<td>A61B.100N</td>
<td>[N for percutaneous insertion into the body] [C9907]</td>
</tr>
<tr>
<td>A61B.100R</td>
<td>[N with stereoscopic vision] [N9507]</td>
</tr>
<tr>
<td>A61B.100T</td>
<td>[N with focusing features] [N9507]</td>
</tr>
<tr>
<td>A61B.1002</td>
<td>having rod-lens arrangements (A61B.I055 takes precedence) [N9711]</td>
</tr>
<tr>
<td>A61B.1005</td>
<td>Flexible endoscopes [N9711]</td>
</tr>
<tr>
<td>A61B.1005R</td>
<td>[N with controlled bending of insertion part (tip steering of catheters A61M24/01C10; articulated or flexible manipulators B25J10/00)] [N9711] [C9902]</td>
</tr>
<tr>
<td>A61B.1005R2</td>
<td>[N with illuminating arrangements] [N9711]</td>
</tr>
<tr>
<td>A61B.1005R2E</td>
<td>[N: combined with imaging means, e.g. video camera] [N9902]</td>
</tr>
<tr>
<td>A61B.1005R4</td>
<td>[N: Constructional details of control elements, e.g. handles (A61B.I005D takes precedence)] [N9711] [C9902]</td>
</tr>
<tr>
<td>A61B.1005R4D</td>
<td>[N: using distributed actuators, e.g. artificial muscles] [N9902]</td>
</tr>
<tr>
<td>A61B.1005R6</td>
<td>[N: Constructional details of insertion parts, e.g. vertebral elements] [N9902]</td>
</tr>
<tr>
<td>A61B.1005R6B</td>
<td>[N: the insertion parts being asymmetric, e.g. for unilateral bending mechanisms] [N9902]</td>
</tr>
<tr>
<td>A61B.1005D</td>
<td>[N using shape-memory elements] [N9711]</td>
</tr>
<tr>
<td>A61B.1008</td>
<td>Articulations (N: A61B.1005B4 takes precedence) [N9711] [C9902]</td>
</tr>
<tr>
<td>A61B.1001</td>
<td>Guiding arrangements therefore [N9711]</td>
</tr>
<tr>
<td>A61B.1012</td>
<td>characterized by internal passages or accessores therefore [N9711]</td>
</tr>
<tr>
<td>A61B.1015</td>
<td>Control of fluid supply or evacuation [N9711]</td>
</tr>
<tr>
<td>A61B.1018</td>
<td>for receiving instruments [N9711]</td>
</tr>
<tr>
<td>A61B.104</td>
<td>combined with photographic or television appliances [N: camera adapters G03B17/00]</td>
</tr>
<tr>
<td>A61B.104B</td>
<td>[N: using light conducting means, e.g. fibre optics (light guides per se G02B6/00)]</td>
</tr>
<tr>
<td>A61B.104D</td>
<td>[N: using television camera, e.g. CCD camera (A61B.1005 takes precedence)]</td>
</tr>
<tr>
<td>A61B.104D4</td>
<td>[N: with illuminating arrangements providing two or more colours, e.g. by filtering]</td>
</tr>
<tr>
<td>A61B.1045</td>
<td>Control therefore [N9711]</td>
</tr>
<tr>
<td>A61B.105</td>
<td>characterized by the image sensor, e.g. camera, being in the distal end portion (N: A61B.1005B4 takes precedence) [C9902]</td>
</tr>
<tr>
<td>A61B.1055</td>
<td>Having rod-lens arrangements [N9711]</td>
</tr>
<tr>
<td>A61B.106</td>
<td>with illuminating arrangements (N: not otherwise provided for in group A61B.100) [N9711]</td>
</tr>
<tr>
<td>A61B.107</td>
<td>using light-conductive means, e.g. optical fibres</td>
</tr>
</tbody>
</table>

**Searching Techniques**

One should search both the U.S. and esp@cenet Web sites. Often patents are filed in Europe before they are filed in the United States. The reader should check search help on each system. For example, a M2A capsule with a camera that is swallowed and used to identify problems in the digestive system. The technology uses an endoscope.

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One of the inventors is: Iddan Gavriel. The assignee (applicant) is Given Imaging. Since other inventors may be involved, these may be added to the search. There may be a previous assignee.

These situations need to be considered when designing a search:

<table>
<thead>
<tr>
<th>Inventor</th>
<th>Iddan Gavriel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignee</td>
<td>Given Imaging</td>
</tr>
<tr>
<td>IPC</td>
<td>A61B1/05</td>
</tr>
<tr>
<td>EC</td>
<td>A61B1/05</td>
</tr>
<tr>
<td>EC</td>
<td>A61B1/005B2B</td>
</tr>
<tr>
<td>US Class</td>
<td>600/109</td>
</tr>
<tr>
<td>Title</td>
<td>“in vivo” and camera$</td>
</tr>
</tbody>
</table>

U.S. Classification is used on the USPTO Web site. The search system is very flexible for newer patents but uses only classification and patent number before 1976. IPC and EC are both used in esp@cenet. One can not search both classification systems at the same time. Sample searches from both systems will be shown in the conference presentation.

**Conclusion**

Patents are an important source of information for biomedical engineers. Knowledge of intellectual property is necessary to for the development of new medical devices. This paper has introduced faculty and students to the system of United States and world patents. The examples shown give readers basic information about databases, classification systems, and searching techniques. The information provided is a starting point for inclusion of patents in the biomedical curriculum.

Charlotte A. Erdmann has been Assistant Engineering Librarian/Associate Professor of Library Science, Siegesmund Engineering Library, Potter Center, Purdue University, West Lafayette, IN 47907 since 1984. Erdmann specializes in instruction in intellectual property and is head of collection development. In 1998-1999, she was Fellowship Librarian at the United States Patent and Trademark Office. Email address is erdmann@purdue.edu

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Ibid. Guide to IPC.