

Lemelson-MIT Prize 2012

Report on Patent Portfolio of Stephen Quake
For: Lemelson-MIT Program

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IPVision
Patent Interconnection Map

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Access to the *See-the-Forest*TM

Where there are Live Links in this report simply click on the Link and it will take you to the specific document stored at the *See-the-Forest*TM Patent Analytics website.

Important Note About Data. The analyses presented in this Report were based on data as of May 23, 2012 – i.e., the patents listed for a given company represent patents owned of record as shown at the U.S. Patent and Trademark Office databases as of that date. Patents issued to, acquired by or disposed of by such a company after May 23, 2012 will not appear in the list of patents shown in this Report or on *See-the-Forest*TM. However, patents that issue after May 23, 2012 that cite a patent shown in an analysis in this Report will appear in any citation analysis run after May 23, 2012 on the information stored on *See-the-Forest*TM. In such as case there will be an inconsistency between the results presented in this Report (which is a snapshot in time) and the results shown on *See-the-Forest*TM.

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1. THE LEMELSON-MIT PRIZE

"The \$500,000 Lemelson-MIT Prize recognizes individuals who translate their ideas into inventions and innovations that improve the world in which we live.

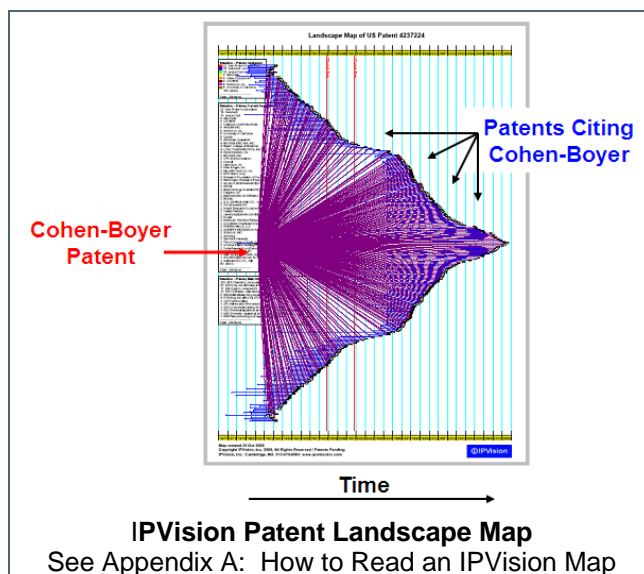
Dubbed the "Oscar for Inventors," the Lemelson-MIT Prize is awarded to outstanding mid-career inventors, who have developed a patented product or process of significant value to society, which has been adopted for practical use, or has a high probability of being adopted. By recognizing and funding younger, mid-career inventors, the prize is designed to spur inventive careers and provide role models for future generations of inventors." Source: [Lemelson-MIT Program Website](#)

2. OBJECTIVE MEASURES OF INNOVATION

One measure of the importance of an invention is the extent to which others in the field cite that invention in research papers. See for example, [Web of Science Citation Indices](#).

Patents are another form of evidence of the value of an innovation and the broadness of the commercial or societal adoption of that invention. In order to obtain a patent the inventor must show that his or her invention is "novel". Relevant prior art known to the inventor must be cited in the patent examination process. A patent can become unenforceable if an applicant knowingly fails to cite relevant prior patent art of which he or she is aware. Accordingly, patent citations or the lack thereof have more specific economic consequences than citations of work in research papers

High Patent Citation is Evidence of Value. Many major innovations that have been patented have been highly cited by other patents. The IPVision Patent Landscape Map shown to the right is of the Cohen-Boyer gene splicing patent that launched the Biotech Industry. Stanley Cohen and Herbert Boyer were [Co-Recipients of the Lemelson-MIT Prize in 1996](#). Stanford University received over \$250m in revenue from the licensing of this patent. This patent U.S. 4,237,224 "Process for producing biologically functional molecular chimeras" had been cited over 270 times as of December 2009.



Caveat: Although high patent citation is strong evidence of the value of an innovation, this evidence must be considered relative to the age of the technology, - i.e., the time it takes for the innovation to be recognized by others. The speed of technological development in a field must also be considered.

3. STEPHEN QUAKE PATENT PORTFOLIO

[Dr. Stephen Quake](#) is Department Co-Chair and Professor of Bioengineering and Applied Physics in the Bioengineering Department of the Schools of Engineering and Medicine at Stanford University. He obtained a BS degree in Physics (1991) and a MS degree in Mathematics (1991) from Stanford University and a Ph.D. in Physics (1994) from the University of Oxford.

Dr. Quake's research includes single molecule biophysics, precision force measurement, micro and nano fabrication with soft materials, integrated microfluidics and large scale biological automation.

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As of May 23, 2012 Dr. Quake had [86 issued U.S. patents](#) and [79 published pending U.S. patent applications](#) (the "Quake Patents"). His top 5 most highly cited patents are:

Top 5 Most Highly Cited Patents of Stephen Quake				
Patent #	Inventors	Title	Citations By (BCs)	Citations To (FCs)
6408878	Unger, Marc A.; Chou, Hou-Pu; Thorsen, Todd A.; Scherer, Axel; Quake, Stephen R.	Microfabricated elastomeric valve and pump systems	20	155
6767706	Quake, Stephen R.; Chou, Hou-Pu	Integrated active flux microfluidic devices and methods	19	127
6540895	Spence, Charles F.; Fu, Anne Y.; Quake, Stephen R.; Arnold, Frances H.	Microfabricated cell sorter for chemical and biological materials	50	117
6221654	Quake, Stephen; Volkmuth, Wayne D.	Method and apparatus for analysis and sorting of polynucleotides based on size	48	101
6002471	Quake, Stephen R.	High resolution scanning raman microscope	3	91

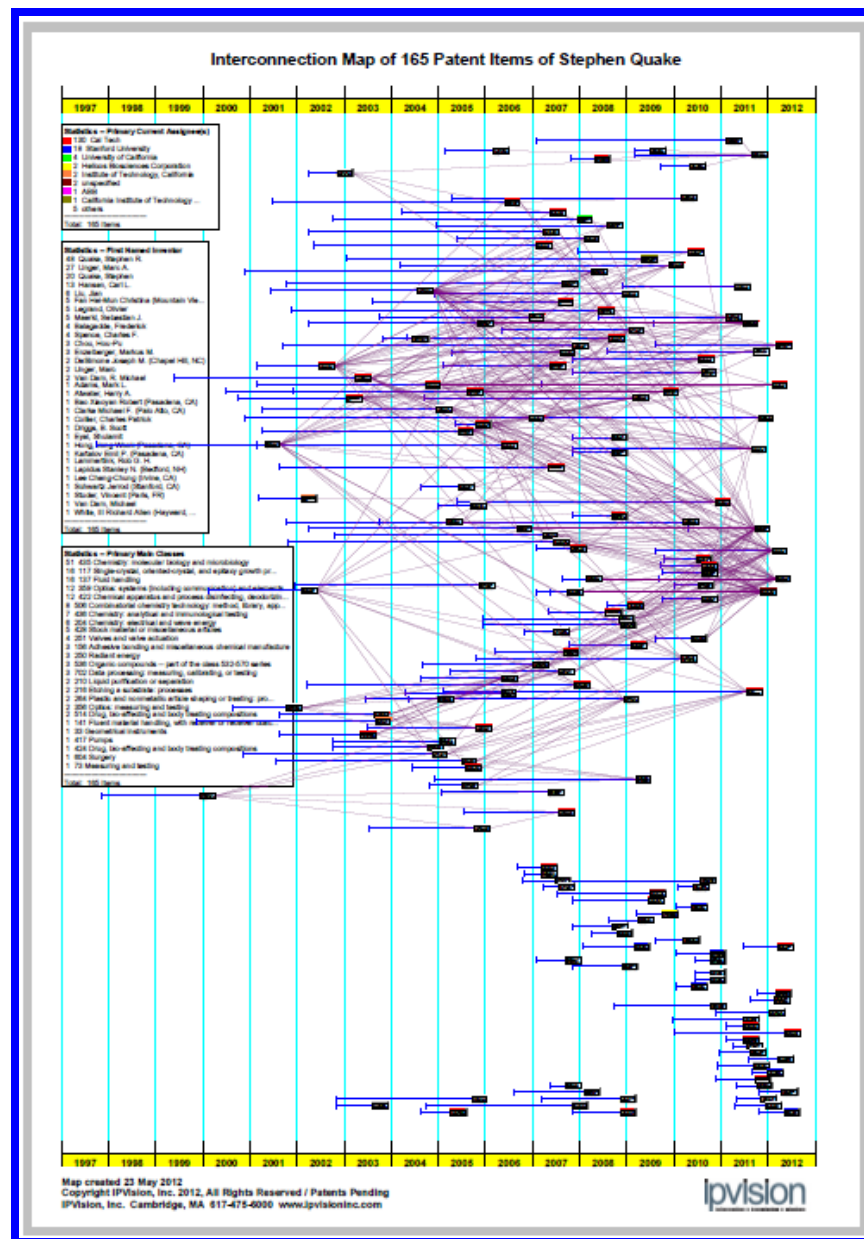
View Patents on See-the-Forest™ ► [Link to List](#)

3.1 **QUAKE PATENT PORTFOLIO MAP**

The following is an IPVision [Patent Interconnection Map™](#) showing the patent citation relationships among the 165 U.S. patent properties (86 issued U.S. patents and 79 published pending U.S. applications) of Dr. Stephen Quake:

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Patent Citation Interconnection Map™ of Dr. Stephen Quake



Patent Citation Interconnection Map™:
This IPVision Patent Citation Interconnection Map™ shows the U.S. patent properties of Dr. Stephen Quake on a timeline from left to right.

Each box on the map is an issued U.S. patent or a published pending U.S patent application. The left edge of each box is aligned with the patent issue date (in the case of issued patents) or the publication date (in the case of published applications). The “tails” to the left of each box shows the filing date. The lines connecting the boxes are the “patent citation references” among the patent properties shown. [How to Read an IPVision Patent Map.](#)

To view an Interactive Map - Click on the Map image or the “Link to Map” text below.

OBSERVATION: The high number of cross citations shown in the Quake Portfolio is usually indicative of high value, with extension patents building on earlier core work.

Note: For information about Reading IPVision Maps, see Appendix A

[View Live IPVision Map™ ▶](#)

[Link to Map](#)

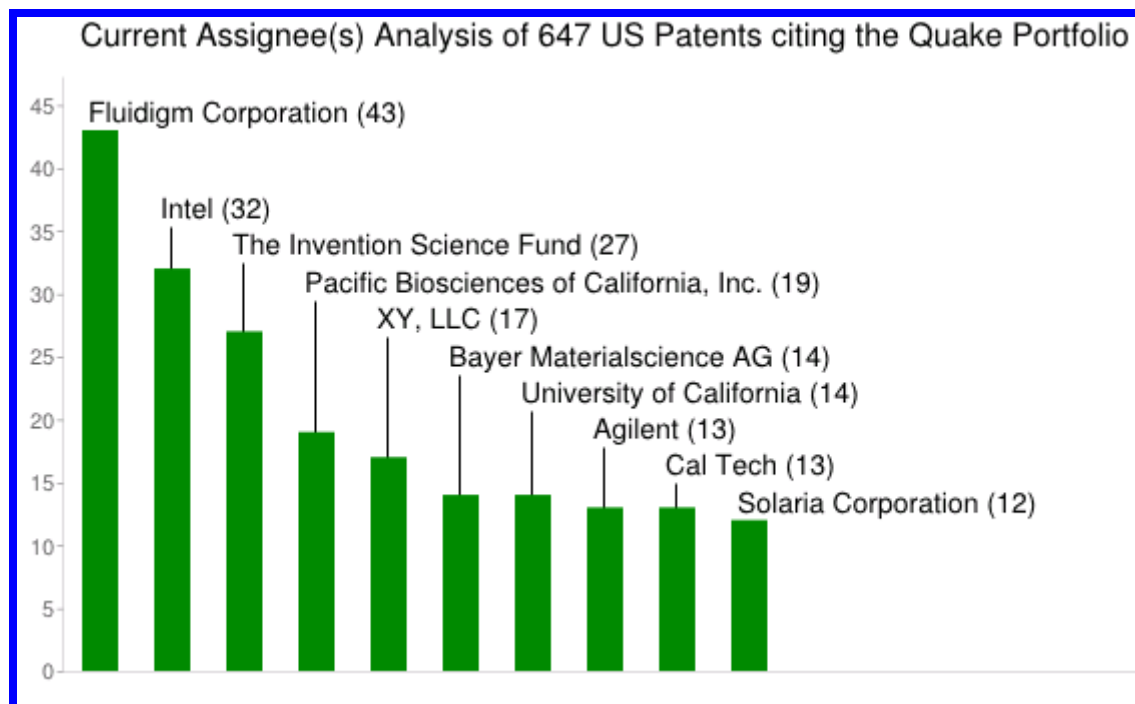
3.2 PATENTS CITING THE QUAKE PATENTS

The Quake Patents are cited by 647 other U.S. patents as prior patent art (“Forward Citation Patents”).

[View “List of Forward Citation Patents” on See-the-Forest™ ▶](#) [Link to List](#)

According to the U.S. Patent and Trademark Office records, the Top 10 Current Assignee/Owners of the Forward Citation Patents are:

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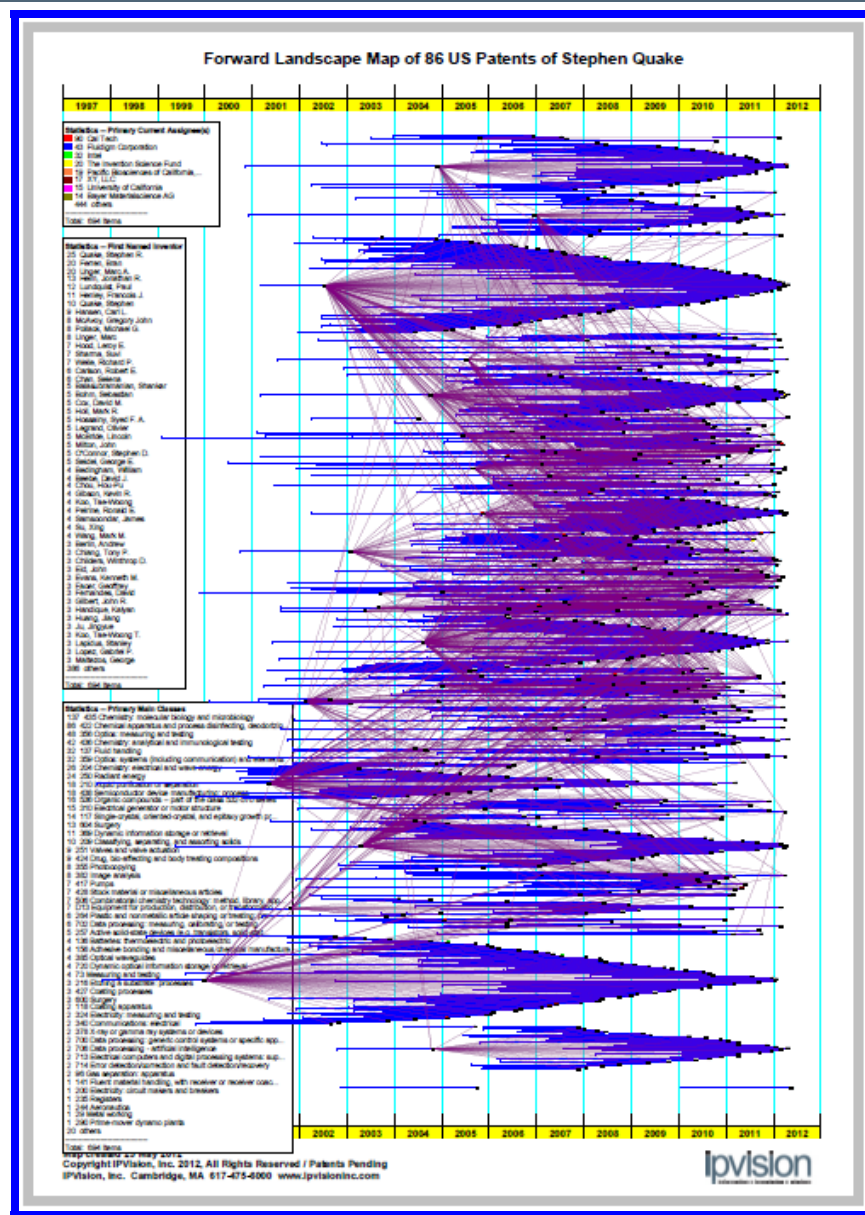
View "Forward Citation Assignee Analysis™" on *See-the-Forest™* ► [Link to Analysis](#)

3.3 QUAKE FORWARD CITATION PATENT LANDSCAPE MAP

The following is an IPVision Forward Citation Patent Landscape Map™ showing the 86 issued U.S. Patents of Dr. Quake and the other U.S. patents that cite the Quake Patents ("Forward Citation Patents" or "FCs") as of the date of this report:

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Forward Citation Patent Landscape Map™ of Quake Patents



Note: For information about Reading IPVision Maps, see Appendix A

[View Live IPVision Map™](#) ▶

[Link to Map](#)

3.4 RELATIVE CITATION OF QUAKE PATENTS

As mentioned above, the Quake Patents are cited as prior art by 647 other (non-Quake) U.S. patents (“Forward Citation Patents”). In order to understand the relative importance from a citation viewpoint of the Quake Patents it is instructive to look at the total number of *citations* by the Forward Citation Patents.

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Cohen-Boyer Example. As noted above, the famous Cohen-Boyer patent from Stanford had been cited by 227 patents as of December 2009. These 227 patents have a total of 3,121 citations of other patents or a mean average of 13.7 citations per Forward Citation Patent. However, if we look only at the first 10 years after the Cohen-Boyer patent was issued and the biotech industry was still very much in development mode, there were 117 Forward Citation Patents for the Cohen-Boyer Patent with a mean average of 3.7 citations each, i.e. the Cohen-Boyer patent accounted for approximately 27% ($=1 / 3.7$) of all patents cited by the Forward Citation Patents, clearly an indication of its relative importance.

Cohen-Boyer Patent: Relative Citation Importance					
Inventor	# Patents	#FC Patents	Average FC/Patent	Total Citations	Mean #Citations
Cohen-Boyer	1	227	227	3,121	13.7
Cohen-Boyer 10 Years	1	117	117	437	3.7

These statistics for the Quake Portfolio are:

Quake Portfolio: Relative Citation Importance					
Inventor	# Issued Patents	#FC Patents	Average FC/Patent	Total Citations	Mean #Citations
Quake	86	647	7.52	63,796	98.6

On these metrics the Quake portfolio appears to be less unique from a patent perspective than the Cohen-Boyer patent – i.e., each patent that cites a Quake patent also cites another 97.6 patents on average.

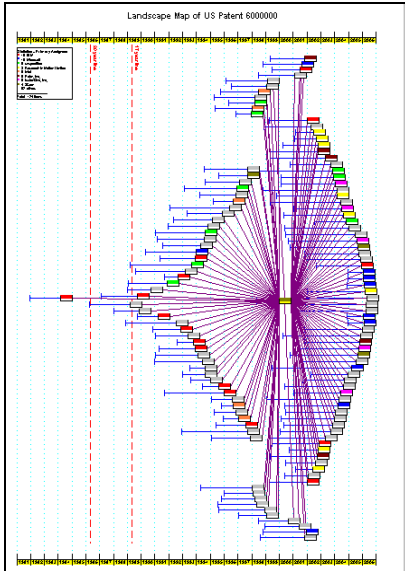
CAVEAT: these statistical comparisons are directional only. Patent citation practices have changed over the years since the Cohen-Boyer patent was issued in December 1980. In addition, the rates of patent citation vary in different technical fields and at different times in the evolution of a technology area.

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APPENDICES AND EXHIBITS

APPENDIX A – HOW TO READ AN IPVISION MAP

An IPVision Map is a visual representation of the relationships between objects. The following is an example of a Landscape Map for a single U.S. Patent:



This Landscape Map is of U.S. Patent 6,000,000 entitled “Extendible method and apparatus for synchronizing multiple files on two different computer systems”. It is the basic patent for the Palm Pilot software.

The horizontal X axis is “time”

Patent 6000000 is in the middle of the “fan”. The lines going backward (to the left) are the patents cited by Patent 6000000 and the lines going forward (to the right) show the patents which cite Patent 6000000.

The details of an IPVision Map are explained in more detail below

