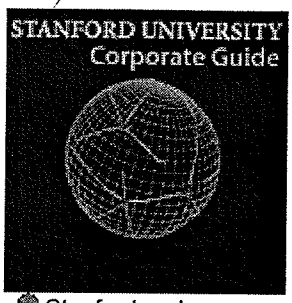

- Stanford and the Private Sector
- Top 10 Stanford Inventions
- SU Press Releases and Online Publications
- Wellspring of Innovation

Top 10 Stanford Inventions

Stanford inventions reach the marketplace via the **Office of Technology Licensing (OTL)**. The OTL promotes the transfer of Stanford technology and paves the road from invention to commercialization. The OTL website offers information for **corporate users**.

- **Top 5 FY 1975 through FY 2002**
- **Top 5 FY 2002**

Stanford's Top 5 Cases: FY 1975 through FY 2002

Recombinant DNA Cloning Technology
Stanford Docket S74-043

Stanford Professor Stanley Cohen's plasmid expertise joined together with University of California's Professor Herbert Boyer's knowledge of restriction enzymes led to the joining of countless genes, using the biotechnology tool now commonly known as recombinant DNA Cloning or Gene Splicing. In addition, the technology became the basis for the biotechnology industry as we know it today.

This is how it works: A gene from a piece of foreign DNA is inserted into a bacterial plasmid. The plasmid is then placed into a living organism which becomes a cell "factory." This factory is now capable of reproducing the desired gene or expressing its protein in unlimited quantities.

On behalf of both Universities, Stanford licensed 467 companies in total. The major products sold under the licensing program include tissue plasminogen activator for heart attacks, erythropoeitin for dialysis patients, insulin for the treatment of diabetes, growth hormone for children with growth deficiencies and interferon for cancer patients. The significant licensees of this technology were Amgen, Eli Lilly, Genentech, Johnson and Johnson, and Schering Plough.

Total Royalties: $255 million

Fluorescent Conjugates for Analysis of Molecules
Stanford Docket S81-026

The marriage of laser-based fluorescence cell sorting with a fluorescent molecule found in algae has led to a whole new area of research and diagnostic applications. The technology developed by Professor Alexander Glazer of the University of California and Dr. Vernon Oi of Stanford is now used in research laboratories throughout the world.

Phycobiliproteins are highly efficient light-gathering protein-fluorophores found in nature. They are intensely colored pigments, which exhibit extremely useful fluorescent properties. Phycobiliproteins conjugated to monoclonal antibodies are used in immunology and diagnostics. The antibody attaches to its specific receptor site on a cell or tissue. Then the cell or tissue can be detected by fluorescence of the label when irradiated with light. Two and three color labeling is possible. Other applications include the fluorescent labeling of DNA probes, and the fluorescent immunoassay of molecules and cells. This technology has been licensed to over 60 companies.

Total Royalties: $38.9 million

Functional Antigen-Binding Proteins
Stanford Docket S84-002

Functional antibody technology was invented in 1984 by Professor Leonard Herzenberg and Dr. Vernon Oi of Stanford, and Professor Sherie Morrison, formerly of Columbia University. Together, they developed a system to produce specific antibodies in a host cell. These antibodies can be used to target specific cells in a human being to treat disease.

Columbia University has taken the lead in licensing this invention. It was first licensed to a major life sciences corporation and then to Centocor, which was subsequently acquired by Johnson & Johnson. The technology has been used to develop therapeutic antibodies, including Remicade for the treatment of Crohn's Diseas and rheumatoid arthritis, and Reopro, an anti-clotting agent.

Total Royalties: $30.2 million

Fiber Optic Amplifier
Stanford Docket S81-142

Stanford has had a long standing research and technology transfer relationship with Litton Industries (subsequently acquired by Northrop Grumman). Through this research, Drs. H. John Shaw and Michel Digonnet and others have patented many inventions related to the amplification of fiber optic signals.

The technology uses lasers to brighten fading beams of light in a fiber network. Fiber amplifiers made optical communications a commercial reality in the 1990s by eliminating the need for inefficient and costly regenerators every few dozen miles. Stanford's patents were licensed to Litton, who has sublicensed them to many companies in the telecommunications industry.

Total Royalties: $23.4 million

FM Sound Synthesis
Stanford Docket S71-017

Yamaha Corporation was the exclusive licensee of this important sound synthesis technology, which became the standard of the industry.

Based on a variation of the frequency modulation (FM) of radio broadcasts, one pure tone (or frequency) is modified by another pure tone, to produce a third tone, much like a painter mixes two colors to produce a third color. After OTL spent four years (1971-1975) trying to interest U.S. companies in the invention, Yamaha Corporation in Japan was granted an exclusive license. Following eight years of development, the Yamaha DX series of music synthesizers entered the market in 1983. In the 1990's, the FM chip became the sound generator installed in millions of personal computers.

Total Royalties: $22.9 million

Stanford's Top Cases for FY 2002

Functional Antigen-Binding Proteins
Stanford Docket S84-002

Functional antibody technology was invented in 1984 by Professor Leonard Herzenberg and Dr. Vernon Oi of Stanford, and Professor Sherie Morrison, formerly of Columbia University. Together, they developed a system to produce specific antibodies in a host cell. These antibodies can be used to target specific cells in a human being to treat disease.

Columbia University has taken the lead in licensing this invention. It is currently licensed to Johnson & Johnson. The technology has been used to develop therapeutic antibodies, including Remicade for the treatment of Crohn's Diseas and rheumatoid arthritis, and Reopro, an anti-clotting agent.

Total Royalties FY02: $16.1 million

Fiber Optic Amplifier
Stanford Docket S81-142

Stanford has had a long standing research and technology transfer relationship with Litton Industries (subsequently acquired by Northrop Grumman). Through this research, Drs. H. John Shaw and Michel Digonnet and others have patented many inventions related to the amplification of fiber optic signals.

The technology uses lasers to brighten fading beams of light in a fiber network. Fiber amplifiers made optical communications a commercial reality in the 1990s by eliminating the need for inefficient and costly regenerators every few dozen miles.

Stanford's patents were licensed to Litton, who has sublicensed them to many companies in the telecommunications industry.

Total Royalties FY02: $10.3 million

Amplification of Eucaryotic Genes
Stanford Docket S82-007 and S82-007A

In 1982 Dr. Gordon Ringold, formerly of Stanford, developed a unique way to increase the production of proteins in non-bacterial host cells. The technology is used to generate multiple copies of a gene of interest by linking it to dihydrofolate reductase (DHFR), which is required for survival of the host cell. A cell with multiple copies of a gene is able to express the protein encoded by that gene more efficiently than a cell with only one copy of the gene.

This technique has been licensed to many biotechnology companies to produce therapeutic proteins. Some of the major products include erythropoeitin for dialysis patients, rituximab for Non-Hodgkin's lymphoma, imiglucerase for Gaucher's disease, and interferon beta-1b for multiple sclerosis.

Total Royalties FY02: $5.3 million

Fluorescent Conjugates for Analysis of Molecules
Stanford Docket S81-026

The marriage of laser-based fluorescence cell sorting with a fluorescent molecule found in algae has led to a whole new area of research and diagnostic applications. The technology developed by Professor Alexander Glazer of the University of California and Dr. Vernon Oi of Stanford is now used in research laboratories throughout the world. Phycobiliproteins are highly efficient light-gathering protein-fluorophores found in nature. They are intensely colored pigments, which exhibit extremely useful fluorescent properties.

Phycobiliproteins conjugated to monoclonal antibodies are used in immunology and diagnostics. The antibody attaches to its specific receptor site on a cell or tissue. Then the cell or tissue can be detected by fluorescence of the label when irradiated with light. Two and three color labeling is possible. Other applications include the fluorescent labeling of DNA probes, and the fluorescent immunoassay of molecules and cells. This technology has been licensed to over 60 companies.

Total Royalties FY02: $4.3 million

A Reception Apparatus for Reducing the Complexity of Multicarrier Demodulators
Stanford Docket S92-019

A Band-Optimized Digital Modulation and Error

Correction Apparatus for High Speed Data Transmission
Stanford Docket S92-018

Method and Apparatus for Reduced Complexity Parametric Estimation of Echoes in Duplex Data Transmission
Stanford Docket S91-040

A Programmable Viterbi Signal Processor for Viterbi Detection
Stanford Docket S90-099

These four patents, licensed as a package, were invented by Professor John Cioffi and his research group. The patents relate to Discrete Multi-Tone (DMT) technology, which enables high-speed data transmissions over telephone lines. DMT technology is used in Asymmetric Digital Subscriber Line (ADSL) standards of ANSI, ITU, and ETSI. ADSL modems can send information at rates 30 to 50 times faster than the 56K analog modems.

In 1992, OTL issued an exclusive license to these four patents to Amati Communications Corporation, which was founded by Cioffi. In 1995, Amati merged with ICOT. In 1998, Amati was acquired by Texas Instruments (TI). Stanford renegotiated the exclusive license with TI to enable them to sublicense all interested parties on a fair and reasonable basis.

Total Royalties FY02: $2.6 million

DNA Microarrays
Stanford Docket S93-097

In 1992, Professor Pat Brown's research group began to develop a method for fabricating DNA microarrays utilizing a robot to spot numerous cDNAs on the surface of easily available slide glass. In 1995, Professor Pat Brown and co-inventor graduate student Dari Shalon published the arraying technique that has led to the widespread use of DNA microarray technology. This method has become very useful for research because scientists can choose which DNA fragments to put on their slides. In 1996, Dr. Brown disclosed the know-how, tools, and designs for the fabrication of DNA microarrays on the internet so that other researchers could make DNA microarrays for use in their own laboratories. In 2002 Dr. Brown shared a Takeda Award for his work in this area.

Meanwhile, Stanford widely marketed the invention, but no company expressed serious interest. In 1995, Dr. Shalon started a company, Synteni, to develop the technology. Eventually, Synteni was sold to Incyte Pharmaceuticals and the license was renegotiated to accommodate the rapidly changing market. Stanford and Incyte are continuing to work together to make the array technology broadly available.

Total Royalties FY02: $1.2 million

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