Small Serial Innovators: The Small Firm Contribution To Technical Change

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Executive Summary

CHI Research is pleased to present to the Office of Advocacy of the Small Business Administration the results of our study of small patenting firms. Our research examined all 1,071 U.S. firms with 15 or more patents between 1996 and 2000. We have found that:

- The small firm share of U.S. patenting is similar to their share of manufacturing employment – 41%
- Small firms produce more highly cited patents than large firms on average. Small firm patents are twice as likely as large firm patents to be among the 1% most cited patents. That is, small firm patents are on average more technically important than large firm patents.
- Small patenting firms produce 13-14 times more patents per employee as large patenting firms.
- The small firms are younger than the large firms, but are not new startups. Persistence distinguishes these patenting small firms from innovative small firms in general. We think of these small firms the "serial innovators," a term suggested by Leigh Buchanan at *Inc* magazine.
- Small firm patenting is very strong in health technologies and gaming, and there are a large number of small firm innovators in parts of information technology.
- Small firm innovation is twice as closely linked to scientific research as large firm innovation on average, and so substantially more high-tech or leading edge.
- Small firm innovation is more extensively linked to outside technology while large firms build more their own technology.
- Small firm innovators are more dependent on local technology.

Small firms are effective innovators. Small firms may well be most important to our economy as agents of change (Audretsch, 1995) signaled by the fact that the small firm contribution to innovation is most intense in new technologies. Small firms often pursue leading-edge technical niches. Any barriers to their participation in new technologies or exclusion from policy development concerning those technologies would be most unfortunate.

Small firm innovation should benefit disproportionately from the Internet and communication technologies that have made it much easier to find technical information and contact experts. This is because small firm innovation is more inter-connected with outside technology than is large firm innovation. The current policy interest at the local level in clusters of innovation should also disproportionately help small firms because for small innovative firms the local technological environment is an important resource.

The small "serial innovators" we have studied are distinguished from other innovative small firms by their innovative success and persistence, and from large patenting firms by their concentration on high quality and leading-edge technical change that builds on a broad array of outside knowledge. We are only just beginning to understand their unique contribution to the competitive environment surrounding technical change that maintains our nation's economic dynamism over the long term.

Introduction

CHI Research is pleased to present to the Office of Advocacy of the Small Business Administration the results of our study of small patenting firms. The contribution made by technical change to long-term economic growth and prosperity is well recognized. The excitement surrounding new technical developments in biotechnology, medical technology, information technology and nanotechnology is palpable. The role of small firms in these new developments is acknowledged. The purpose of this report is to provide quantitative evidence of the significant role that small firms play in today's economy in setting the pace for technical change in this country. In addition the report highlights the potential importance of understanding the small firm role in innovative networks, an area where knowledge is developing rapidly at the moment and which will prove crucial to understanding economic progress in the future.

In this report we look at technical change through the lens of patenting. Patenting reflects invention rather than innovation because strictly speaking, innovation is invention introduced into the marketplace. However, in the case of small firms, we believe that patenting is pretty closely related to innovation. It has to be; the firms are too small to waste time generating patents as an end in themselves. Nevertheless, not every invention is patented and not every inventive small firm is in our study.

Our research examined all 1,071 U.S. firms with 15 or more patents issued between 1996 and 2000. For this project we created a database of information on these firms and their patents. For firms, we principally use information on their number of employees. We also have information on the firm-level SIC and on revenue. On the patents we have information on their technical area, and normalized citation and referencing indicators that allow us to properly assess small firm performance relative to the universe of all U.S. patents.

The report examines a range of characteristics of the patenting of small firms in relation to that of large firms. We begin by describing in detail the methodology by which the database was constructed. This is followed by a comparison of the basic characteristics of patenting firms in comparison with all firms. We then assess the quality and efficiency of small firm invention. This is followed by consideration of how the small patenting firms differ from small innovative firms not included in the study. We finish by examining indicators more related to networks of innovators, and the interrelationships between a firm and the technological environment.

Method

To analyze small firm patenting, patents must be identified with firms. This is not trivial. Most patent documents list an assignee, or an institution that owns the rights to the patent. However, corporate assignees are not firms, but a mixture of firms, establishments, and variant names of firms or establishments. And of course, mergers and acquisitions are constantly changing the status of firms and establishments. In addition there are a range of public sector assignees and patents with no assignee that are owned by individual inventors. In this project, CHI created a thesaurus linking patent assignees and firms for patent assignees with between 15 and 45 patents in the five years ending 2000.

We began by generating a list of assignees with between 15 and 45 patents in the five years ending 2000 that were not foreign firms, universities, government laboratories, or non-profit institutions. We also eliminated from the list assignees that were part of a firm with more than 45 patents in the five years ending 2000. This required using CHI's existing thesaurus linking patent assignees and institutions (domestic or foreign, public or private sector) for institutions with more than 45 patents in the past 5 years. (Referred to as Tech-line and Tech-line companies in what follows.) This eliminated thousands of candidates immediately and made the project feasible. Our list of candidate assignees contained 931 assignees with 15 or more patents.

We then screened the candidate assignees to identify them with a firm. In this step, we researched the status of the assignees to determine whether they were independent firms or part of a larger firm using

FISOnline, Who Own's Whom, CorpTech, Dun & Bradstreet and the internet including 10k filings obtained from Edgar. We eliminated firms that were bankrupt or establishments that were foreign owned. If an assignee proved to be an independent, U.S., for-profit firm or an establishment of a U.S. firm, we included the firm in the study.

CHI's staff was scrupulous in this task. We were well aware of the hazards of firm identification, made clear in Tether's reanalysis of Pavitt's data. Pavitt analyzed 4,378 innovations commercialized in the U.K. since 1945 assembled through a survey. Tether reanalyzed the Pavitt data in the 1990s, confirming the classification of the firms as small or large at the time of the innovation and found that some subsidiaries of large firms had been misclassified as small firms. Reclassification of firms by Tether eliminated the statistical significance in the headline result of the Pavitt study that small firms were becoming more important to innovation (Tether et al., 1997). This does point to the need for very high standards of data compilation where analysis of small firms is concerned.

No amount of attention to detail can overcome the small element of uncertainty imposed on our firm identification by the constant shifts in companies' fortunes. For example, Turbodyne Systems seemed likely to be in chapter 11 in April, but was examined again in July by chance and seemed to be coming back, so we included it in the study. Other firms were bought in recent months. We are unable to continually monitor the status of all firms. CHI is generally up-to-date with big-name mergers and acquisitions, but for the rest, there is no single point in time at which CHI's judgment of all firms' status was true. January-July 2002 was the period during which the company status research was undertaken. The structure of Tech-line companies was taken as it appeared in our thesaurus on June 17th 2002.

Our experience admitting firms to the study provides additional reasons for caution. Often judgment calls were needed to decide whether a firm should be admitted. Here is a sample of some of the most difficult cases and how we decided them:

- PLC Medical Systems – incorporated in Canada but headquartered in Massachusetts and traded on the American Stock Exchange. We called it a US company and put it in.
- Zenith Data Systems – owned by Group Bull, NEC and Packard Bell. Removed, as it is a joint venture.
- Institute for Emerging Architectures – A joint venture between Intel and HP. A shell company that holds patents for licensing. Removed because it is a joint venture and not an innovator itself.
- Pollenex - Parts of the company were sold to two buyers. As is so often the case, there is no public record of where the technology went, so we dropped the company.
- Chronopohl – dropped because the company split and shut down operations related to the patents. There is a publicly available note to the effect that in 1999 they were trying to sell their patents because they were no longer relevant to the firm. They did not announce who bought the patents.

During our research, we recorded information on the primary SIC of the firm, its number of employees and its revenue. Most of this information concerned fiscal year 2001. If a range was given, for example 700-900 employees, we recorded the middle of the range. We found primary SIC's for 85% of the firms: 91% of large firms and 78% of small firms. We found sales information for 91% of the firms: 98% of the large firms and 85% of the small firms.

We have information on employment for 97% of the firms. There are 27 assignees for which we could find no information on number of employees. For 22 of these, we have no independent confirmation that the entity is an employer firm, such as a website or entry in Dun & Bradstreet. These may not be employer firms, for example, they could be a legal entity holding the patents of one or two inventors. They could be bankrupt firms. They could also be subsidiaries or independent firms on whom we could find no information. All firms for which we have no employee numbers are classified as "unknown". We found in the analysis that the patenting characteristics of the unknown firms closely mimic those of the small firms.

Among the smaller patentees, there are a fair number of research companies with 0 sales. Their websites reveal their business focus, which is often pharmaceutical research. These firms exist to develop technology. Their websites often mention funding sources, SBIR for example, but will not mention sales. We only recorded 0 sales in instances where the website explicitly said there were no sales.

The 193,976 patents we will analyze in this study belong to 1,071 firms. In this report the term "patent" refers to type 1, i.e. utility, patents listing a U.S. inventor address that were issued by the U.S. Patent and Trademark Office between 1996 and 2000. These are the independent U.S. firms with 15 or more patents between 1996 and 2000. 485 of these firms were identified in this project; these are the firms with between 15 and 44 patents 1996 to 2000. Most of the small firms have less than 45 patents 1996-2000. The remaining 586 firms were identified using CHI's Tech-line thesaurus; these are the firms with 45 or more patents 1996 to 2000. Table 1 summarizes these numbers.

Table 1 – Number of companies by source

Source	Patents 1996-2000	Large	Small	Unknown	Total
This study	15-44	202	260	23	485
Tech-line	>=45	486	96	4	586
All firms	>=15	688	356	27	1,071

Characteristics of patenting firms

SBA sponsored research has established that small firms find the patent system problematic. The costs of obtaining and maintaining patents can be prohibitive, and small firms are not able to undertake expensive litigation to defend their intellectual property. Nevertheless, we find that one-third of America's most prolific patenting companies are small firms. This can be seen in Table 2, which describes the size characteristics of the set of U.S. companies with 15 or more U.S. patents in the years 1996-2000.[1]

Table 2 – Size of Patenting Firms

Firm characteristics	Number of firms
Patenting 15 or more times 1996-2000	1,071
Unknown number of employees	27
Size known	1,044
100 or fewer employees (% of 1,044)	145 or 14%
500 or fewer employees	356 or 34%
Fortune 500[2]	188 or 18%
Fortune1000	321 or 31%

Even in manufacturing 98% of firms are small firms; so Table 2 suggests that the population of patenting firms differs systematically from the population of all firms. Table 3 illustrates this point as well,

[1] Also, 63% of the firms are public, 75% of the large firms, 44% of the small firms.
[2] Firms with revenue sufficient to be in Fortune 500 or Fortune 1000.

comparing the distribution of patenting firms across major industries with the distribution of all firms across industries.[3] Columns 2 and 3 compare the distributions of US firms and US patenting firms across major SIC industry. From the table we learn that patenting firms are largely manufacturing firms (70%), even though manufacturing firms account for only 6% of US firms.

Assigning firms a primary SIC is a problematic enterprise at best. Sources usually disagreed on the 4-digit primary SIC of private firms. But the same can be true even of publicly traded firms. Maxxam Inc. (ticker MXM) is an integrated aluminum company, a forest products operation, a real estate developer and an operator of a Class 1 thoroughbred and quarter horse racing facility. One source classified it as an aluminum company, another as a real estate operation. We chose "aluminum company" to match the patenting profile.

It is likely that irresolvable problems with firm-level SIC classification mean that the share of manufacturing in patenting is understated at 70%. Manufacturing firms are 82% of firms for which we obtained an SIC, which is probably a more accurate estimation of their importance. Manufacturing enterprises within firms that earn the majority of their revenue from services also cause us problems because the firm will be assigned a service industry SIC, but their patents will originate in their manufacturing operations. Holding companies exemplify this. Finance, Insurance and Real Estate contains the 2-digit SIC: 67-Holding and other investment offices. Most of the patenting companies in this industry group are holding companies whose patents come from manufacturing enterprises they control. Nevertheless, some service firms do patent. Patenting firms in the finance industry include JP Morgan Chase, Citigroup and VISA.

Table 3 – Distribution of firms across major industry groups

			Number of patenting firms			
Industry group	% All firms	% Patenting firms	Small	Large	Unknown	Total
Agriculture, Forestry, And Fishing	2.1%	0.1%		1		1
Mining	0.4%	0.5%		5		5
Construction	12.0%	0.3%	1	2		3
Manufacturing	6.0%	69.9%	210	536	3	749
Transportation, Communications & Utilities	3.9%	1.4%	4	11		15
Wholesale & Retail Trade	27.3%	1.5%	9	7		16
Finance, Insurance, And Real Estate	8.3%	3.2%	6	28		34
Services	40.1%	8.1%	48	38	1	87
Unclassifiable	0.6%	15.1%	78	60	23	161
Total	100%	100%	356	688	27	1071

To get beyond SIC classifications, we examined the descriptions of firms for a sample of 140 firms with less than 45 patents 1996-2000, 53 large firms and 85 small firms.[4] 91% of the large firms were manufacturers, that is produced a product. 68% of the small firms were manufacturers. The remainder of the firms did not seem to produce products. 21% of the small firms (or 18 firms) were research and/or development firms. Seven firms, 2 large and 5 small were software firms. Six firms, 3 large and 3 small,

[3] Distribution of all firms across industries obtained from SBA files, SIC based data for the year 1997.
[4] The sample comprised firms whose names began with A-Biop and M-Prog. Firms for which we could not obtain a description were excluded.

sold services – beyond development or research services. One small firm was a fabless semiconductor manufacturer. We can conclude that large patenting firms are more likely to be manufacturers than small patenting firms. And among the small firms we find a substantial number of R&D, or "development stage" firms.

In this report we will compare the small and large patenting firms and consider how the small patenting firms differ from small firms in general. We will use the 500 employee definition of small firms. For purposes of comparing against the universe of firms, we will assume all the patenting firms are manufacturing firms.

Small firm share of U.S. corporate patents

If asked to guess, most experts would probably say that small firms hold few patents. Small firms find the costs of obtaining and maintaining patents prohibitive, and they also find daunting the prospect of expensive litigation to defend their intellectual property rights. Belief that small firms do not patent seems to be supported by empirical research. Cordes, Hertzfeld and Vonortas surveyed high tech small firms and found that patenting was not the most important means of protecting product or process innovations. Informal means of IPR protection were of primary importance to their respondents (Cordes et al., 1999). Obermayer also reported that small firms relied more on proprietary know-how and trade secrets than on patents (Obermayer, 1981). The thing is, Cohen, Nelson and Walsh found substantially the same result in their survey of manufacturing firms, which over sampled Fortune 500 firms (Cohen et al. 2000). In Cohen et al.'s survey, median firm size was 3,309 employees and median annual sales were $555 million. Table 4 compares the two studies by comparing the rankings of intellectual property protection methods for product innovations. For Cordes et al. the ranking is based on share of respondents reporting that the method was "very important". For Cohen et al. the ranking is based on the mean percentage of product innovations for which the mechanism was considered effective across all technologies. The rankings are identical, which demonstrates that large and small firms hold the same beliefs about the importance of intellectual property protection methods.

Table 4 - Importance of Intellectual Property Protection Methods in Product Innovation

Mechanism	Cordes Small firms	Cohen Large firms
Lead Time	1	1
Secrecy	2	2
Complementary Mfg.	-	3
Complementary Sales/Svc	-	4
Patents	3	5
Other legal	4	6

Small firms do face special circumstances with regard to patents. For example, small firms are less able than large firms to afford the expense of applying for and maintaining patents and are known to be less likely to obtain foreign patent protection (Mogee et al., 1996). Small firms also are less able to pursue costly legal campaigns to enforce their patent rights. Also, in semiconductor related areas, in which firms' technologies overlap and change quickly, patents are often used *en masse* in negotiations to forestall accusations of infringement, keeping production running when injunctions are threatened. Specialized small firms cannot amass a large enough pile of patents to play this game effectively (Cordes et al., 1999). On the other hand, small firms need financing, and venture capitalists need to see patents, along with trademarks or scientific papers, to confirm the substance of the technology developed by the firm. In addition, if a firm wants to license manufacture of its technology to a large firm able to achieve scale economies in production and sales, patents are needed. Therefore, at best we can say that the factors at work in the decision to patent may differ between small and large firms. However, it is not obvious at all that the balance of factors tips in favor of small firms not patenting innovations that large firms would patent.

Patents are distributed in a power law, or highly skewed fashion. The top patenting U.S. firm, IBM, accounts for 6% of the 193,976 patents produced by these 1,071 firms between 1996 and 2000. Table 5 reports the concentration of patenting among the top 1, 10, 100 and 1000 patenting firms in the U.S. The 100 firms with the most patents account for 9% of the firms in the study and 70% of the patents. Fortune 500 firms also account for 70% of the patents, and Fortune 1000 firms for 83%. Large firms account for 94% of the patents and small firms for 6%.

Table 5 – Concentration of patenting

# Firms	Share patents	Share firms
1	6%	0.1%
10	26%	1%
100	70%	9%
1000	99%	93%

That small firms have a 6% share of patenting produced by the top 1000 most patenting firms does not mean that they have a 6% share of U.S. corporate patents. After all, our set of 1,071 firms includes all the large firm patenting powerhouses, but excludes the multitude of small firms with 1, 5 or 10 patents. We must consider who owns the 50% of U.S. patents not included in this study. The answer is foreign firms and their subsidiaries, universities, public sector institutions, individual inventors and small and large U.S. firms patenting less than 15 times between 1996 and 2000. Can we estimate how many patents belong to U.S. corporations and what share of these patents belong to small firms?

We begin by counting the U.S.-invented utility patents issued 1996-2000 and find there were 379,000. We need to estimate how many of these patents are likely owned by U.S. companies. With that number, we can estimate what share are from small firms. We entered into a process of elimination by which we removed from the set of 379k patents whose assignees are known or are unlikely to be U.S. firms. We first set aside the 193,976 patents covered in this study, because we know they are owned by U.S. firms. From the remaining set of patents, we removed patents whose assignees:

- Are included in CHI's Tech-Line database – i.e. foreign firms, universities, government agencies or research institutes with large numbers of patents;
- Are universities or hospitals (found by searching for "univ" and "hosp" and variants in the assignee name).
- Are individual inventors, including unassigned patents.
- List more foreign than U.S. inventors on their patents (including U.S. and foreign invented patents). The assumption is that these are likely foreign companies.

We are left with 69,000 patents that are likely to be owned by U.S. companies. We need to estimate what share of these patents are owned by small companies. To estimate how many of these patents belong to small firms, we will first inspect Figure 1, which displays the number of firms by patenting size categories. To produce this figure, we classified firms according to how many 1996-2000 patents they own: 15-19, 20-24 etc. Only the lower portion of the distribution is shown. In the upper portion, 190 large firms and 3 small firms have more than 150 patents 1996-2000. We can see that as the patenting size decreases, the number of firms increases, and the percentage of firms that are small also increases. This is most dramatic below 45 patents, where we see a striking acceleration in the number of small firms patenting. This is precisely the range of companies for whom data was constructed in this study. For firms with less than 45 patents 1996-2000, small firms account for 49% of patents, large firms 47% and firms of unknown size 4%. Small firms account for only 2% of patents from firms with more than 45 patents 1996-2000.

There are three more size classes below 15. Estimating the share of small firms within them is crucial to estimating the overall share of U.S. corporate patents produced by small firms (the share of firms is equal to the share of patents here). If all those patents belonged to small firms, small firms would account for 31% of U.S. corporate patents.[5] This is clearly unreasonable. There are many Fortune 1000 companies unaccounted for in this data, for example, MacDonalds has one patent 1996-2000. On the other hand, if we estimated that 50% of the remaining patents belonged to small firms because 50% of patents from firms with less than 45 patents belonged to small firms that would also be unreasonable because the small firm share grows substantially as patenting size declines.

We could estimate that 60% of the remaining patents belong to small firms because that is the small firm share in the 15-19 category. That would produce a conservative estimate of 20% of U.S. corporate-owned patents owned by small firms.[6] However, the small firm share grows as size class declines, so it seems more reasonable to estimate that 75% of remaining patents belong to small firms. This would lead to a 24% share of U.S. corporate-owned patents belonging to small firms.[7]

That estimate excludes individual inventor patents from consideration. Individual inventor patents are patents unassigned to any organization, perhaps assigned to an individual. The U.S. patent system favors this type of patenting, trying to keep patenting accessible to individuals in the spirit of Thomas Edison. Since employees of large companies are required to sign over intellectual property to the firm as a condition of emp loyment, such patents do not belong to large firm employees.

To find out if such patents might be associated with small firms, we examined the seven individual assignees with 10 or more U.S. invented patents issued 1996-2000. Of these, five were presidents of small companies - one individual had founded 25 start-ups. One individual is a lawyer and was the assignee on patents that others invented (the other six assignees were both inventor and assignee on their patents). The final individual is the chairman of a large company. This suggests that while not perfect, patents assigned to individuals, and perhaps also unassigned patents, are largely associated with small firms.

There were 76,000 U.S.-invented patents unassigned or assigned to individual inventors 1996-2000. If we include such patents in the small firm total,[8] and use the 75% estimate of share of remaining patents belonging to small firms, we estimate that small firms account for 41% of U.S. corporate patents.[9] CHI believes this is the most reasonable estimate of small firm share of U.S. corporate patenting.

According to Office of Advocacy figures on employment by employment size of firm by NAICS code in 1999, small firms accounted for 41% of manufacturing employment in 1999. As our estimate of the share of small firm patenting was produced before we calculated small firm share of manufacturing employment, we are cheered by the agreement between the two figures. If the true figure for small firm patenting were known, it seems likely that the small firm share of patented technical innovation in this country is somewhere close to the small firm share in employment.

SBA-sponsored research has established that small firms face difficulties in patenting. They find the costs of obtaining and maintaining patents prohibitive, and they also find daunting the prospect of expensive litigation to defend their intellectual property rights. In contrast, large manufacturing firms have teams of

[5] Calculated as follows: (69,000 + 11,624) / (69,000 + 193,976) or (unknown pats + known small firm pats-from this study)/(unknown pats + known US corporate pats-from this study)

[6] Calculated as follows: (0.6 * 69,000 + 11,624) / (69,000 + 193,976) or (60% of unknown pats + known small firm pats-from this study)/(unknown pats + known US corporate pats-from this study)

[7] Calculated as follows: (0.75 * 69,000 + 11,624) / (69,000 + 193,976) or (75% of unknown pats + known small firm pats-from this study)/(unknown pats + known US corporate pats-from this study).

[8] And in the total number of U.S. corporate patents from which they were excluded in the earlier calculation: (0.75 * 69,000 + 11,624 + 76,000) / (69,000 + 193,976 + 76,000) or (75% of unknown pats + known small firm pats-from this study + unassigned & individual)/(unknown pats + known US corporate pats-from this study + unassigned & individual).

[9] Using the 60% estimated small firm share of remaining patents and including individual inventor patents with small firm patents we get 38% of U.S. corporate patents belonging to small firms.

in-house lawyers dedicated to the development and protection of intellectual property. They often provide cash incentives to staff who originate patentable ideas. In recent years, some have even adopted corporate strategies to aggressively build patent portfolios to use in generating licensing revenue. Despite the corporate machines dedicated to patent generation in some large firms and the barriers faced by small firms in patenting, it seems quite likely that small firms and inventors who are self-employed or associated with small firms account for about 40% of U.S. corporate patenting. This is a substantial contribution to technical change in the U.S. on a par with the small firm share of the manufacturing economy. Some of this reflects a continuation of the Edisonian tradition of individual ingenuity, some will be biotech firms spun out of university research, and some will be innovative small firms of long-standing. A variety of small entities innovate, and they maintain the diversity in our country's innovative capacity which is a source of economic strength over the long-term.

Small firm patents are more important

A patent represents a contribution to technical advance of unknown magnitude. The size of a firm's patent portfolio has been found to be closely related to activity levels, that is to the size of R&D budgets. The value of a patent portfolio has been found to be less related to its size than to the importance of the patents it contains. Identifying these high-value patents is necessary because the value of each patent varies enormously; a few patents are extremely valuable and a vast number are almost worthless. That is, the value of patents is distributed in a power law or highly skew fashion. We measure the importance of patents using patent citations.

Patent citations are derived from the references placed on patents to help establish the novelty of the invention. Inventions must be novel to be awarded a patent. To enable the patent office examiner to assess the novelty of the invention, a patent document lists "prior art" in the form of references to previous patents in the same area. Patent citations thus play an important role in patent infringement litigation by delineating the domain of the patent. In counting citations, we reverse the perspective and count how many citations a patent receives from subsequent patents. This is a way of counting how many times a patent becomes prior art in future technological advances. Research has established that highly cited patents represent economically and technically important inventions (Narin, N.D.)

Citation rates vary by technology, therefore it is important to assess each patent's citation count in comparison to others in its technical field. Older patents also have more time to accumulate citations; therefore it is important to compare citation rates independent of the age of the patent. CHI has constructed a citation index that does both. For each patent, the value of the index is calculated by comparing its citation count against the citation counts of patents issued in the same year and in the same technology area. The value of the index is 1 if the patent is cited as often as expected for a patent of that age in that technology area and is greater than 1 for patents cited more often than expected and less than one for patents cited less often than expected. The citation index for small firm patents averages 1.53 while large firm patents average 1.19.[10] Small firms are thus more effective in producing high-value innovations.

This is most strikingly confirmed by examining the patents with the highest citation indices. Small firms account for 6% of the patents issued to the 1,071 most innovative firms. But when these patents are ranked by citation index, we find that small firms account for:

- 8% of the top 10%,
- 9% of the top 5%,
- 14% of the top 1%.

The small firm share of the top 1% most important patents is more than double their share of patents overall. Put slightly differently, 2.3% of small firm patents are found among the most cited 1% of patents

[10] The index is calculated over the entire patent system including foreign firms, individual inventors etc. That patents from the most innovative U.S. firms, large and small, are on average cited more than expected is therefore reasonable.

produced by the 1,071 most innovative firms. Thus, a patent from a small firm is more than twice as likely to be found among the top 1% highest impact patents than is a patent from a large firm. This is an outstanding performance.

In explaining this phenomenon, we might surmise that the internal systems to encourage patenting and the departments of patent lawyers maintained by large firms serve to raise the propensity of large firms to patent. That is, given a trivial innovation, the staff of a large firm are more likely to pursue a patent than are the staff of a small firm, who have better things to do. However, we believe that there is more than this going on. To test this idea, we eliminated from consideration truly trivial patents by removing patents cited less than expected for their year and technology area. That is, we calculated the share that top 1% patents have of patents whose ratio of actual to expected cites was greater than 1. The result is the same, among patents cited at least as often as expected, small firm patents are twice as likely as large firm patents to be found among the top 1% of patents.[11]

Therefore, we would argue that small firm innovators are extremely effective at producing technically important innovations – and technically important innovations are most likely to be commercially important. Small firm innovations are more than twice as likely as large firm innovations to be extremely high impact.

Small firms produce more patents per employee

Are small firms more effective innovators in the sense of producing more inventions per employee than large patenting firms? Large patenting firms have patent departments whose job it is to produce a steady flow of patents. The large firms are producing more of the less important innovations, which should at least be produced at a higher rate than the very highly cited patents small firms concentrate on. Who produces more patents per employee, small or large patenting firms?

First, there are some methodological notes. We excluded from this calculation financial firms (6*** firms in the SIC scheme) because the size of the holding company may well not match the size classification of the innovating company (see below). As in the rest of the study, the number of patents used is the number of U.S. utility patents issued 1996-2000.

We first calculated the number of patents per employee by averaging over the firms. This figure is highly affected by firms with 1 or two employees. It seems likely that the numbers of employees we have for these firms may be incorrect, or may have changed radically in the past few years or perhaps the patents may relate to work conducted by a larger group somewhere else, for example a university. If we exclude from the calculation firms with less than 5 employees, small firms averaged 0.42 patents per employee while the large firms averaged 0.03 patents per employee.[12]

We also calculated the patents per employee figure in aggregate, that is dividing the total number of patents from small firms by the total number of employees in the small firms. Excluding firms with less than 5 employees, we find that small firms produced 0.188 patents per employee and large firms 0.014 patents per employee.[13]

Either way, the small firms are much more innovative per employee than are the large patenting firms, 13-14 times more innovative.

[11] 5.3% of small firm patents and 2.3% of large firm patents with a citation ratio greater than 1 are among the top 1% most cited patents.

[12] If we were to include the 9 firms with less than 5 employees, the small firm figure would rise to 0.75 patents per employee. If we were to exclude firms with less than 10 employees, the small firm figure would decrease to 0.38.

[13] If we include all small firms, the small firm figure rises to 0.191 patents per employee. If we exclude firms with less than 10 employees, the small firm figure falls to 0.186 patents per employee.

How do these firms differ from small firms in general?

Assuming that all the firms in the study are manufacturing firms, what share of U.S. manufacturing firms in 1999 are in this study? The answer is that:

- The 688 large firms comprise 13.66% of the 4,957 large manufacturing firms;
- the 356 small firms comprise 0.11% of the 328,713 small manufacturing firms

This tells us that the 356 small firms with 15 or more patents issued 1996-2000 are highly unusual, more unusual even than the large firms in the study. If every one were a manufacturing firm, the 356 would represent one-tenth of one percent of small manufacturing firms. What besides having 15 patents 96-00 differentiates these firms from other small firms? What does it mean that these firms have 15 patents?

The first way in which these firms differ from other small firms is that they are concentrated in industries in which technical innovation and patent protection are important. The large firms in the study differ from other large firms in precisely the same way. The firms are largely manufacturing companies and almost one-quarter are found in semiconductors, pharmaceuticals, biotechnology and medical devices/equipment – industries that account for about 2% of U.S. manufacturing firms.

- The set of firms includes over 20% of large firms in:
  - semiconductors and related equipment
  - pharmaceutical preparations
  - biological products except diagnostic
  - computer peripheral equipment NEC
- The set also includes over 1% of small firms in:
  - semiconductors and related equipment
  - pharmaceutical preparations
  - biological products except diagnostic
  - electromedical and electrotherapeutic apparatus

There are few firms in the service industries save research and development firms. Stores, accountants, trucking firms etc. are absent because in large measure neither innovation nor patent protection are important to them.

There are a few places where innovation is important but patent protection is less so, and software is the classic example. However, patenting is becoming more important in software, and software firms are well represented here. There are 25 firms in prepackaged software, which is the 6th most frequent primary SIC among the firms. Large patenting software firms include: Adobe, Borland, Microsoft, Sybase and Symantec. There are ten small patenting software firms here - one tenth of one percent of all small software firms in the U.S. in 1997. The small patenting software firms are: 3D System Corp, Echelon, Flashpoint Technology, Masimo, Media Bin, NCT Group, Pavilion Technologies, Scansoft, Scientific Learning, and Xpoint Technologies.

Beyond industry differences, these firms differ because they have invested substantial time and money in innovation. The firms are serious about innovation and so are heavyweight contributors to technical change. Because they devote so much effort to innovation, they are motivated to overcome the hurdles to obtaining, maintaining and litigating patents. They feel they must protect their investment. Again, the patenting small firms are like the patenting large firms in this.

There are many, in fact, a vast number of small firms in innovative, patenting industries absent from this study. Whereas 86.3% of large manufacturing firms are absent, 99.9% of small manufacturing firms are not here. To understand this disparity, we must look at factors particular to small firms. In some ways then

the most interesting question is how do these firms differ from the multitude of small firms with 1, 2 or 3 patents?

To find out we asked Leigh Buchanan of *Inc* magazine who interviewed a number of the firms for Inc's August 2002 innovation issue. She generously shared her insights which are particularly valuable because she brings to the interpretation of the innovation interviews an in-depth understanding of small firms developed through writing for Inc. Leigh's answer lies in the persistence of these firms.

Small firms normally start with a great idea. The firm is founded to exploit the idea, to get it out into the marketplace. It may fail, in which case the firm disappears, or it may work and the entrepreneur may sell out. If the idea works and the firm is not sold, the next idea, or a process to generate more ideas becomes a problem, and often the small firm disappears after the first idea is worked through.[14] The firms in this study are beyond the first idea, or are still sustaining innovation around the first idea. They are successful "serial innovators" in the words of Leigh Buchanan.

Inc found out that firms do not become serial innovators by accident. These firms focus on innovation. They tend to set a goal that a certain percentage of their earnings should come from new products. 3M is famous for doing this, but many of these small firms do the same. The percentage varies; it might be 8%, 15% or 30%. But all the firms emphasize new product development. In addition, the marketing people in these firms are in constant communication with the rest of the firm relaying customer preferences. Every one is attuned to quickly building solutions customers are reported to want. Unusual for small firms, the firms are also very likely to have an R&D group and to have given some thought to how it was set up and managed. A subset of these firms, especially in the pharmaceutical and biotechnology areas, maintain their R&D with support from large firms and are essentially outsourced R&D operations for large firms. Finally, the firms tend to have a core technology rather than a core product. They thus seem to be interested in not just a new thing, but a new and different way of doing something, a new process.

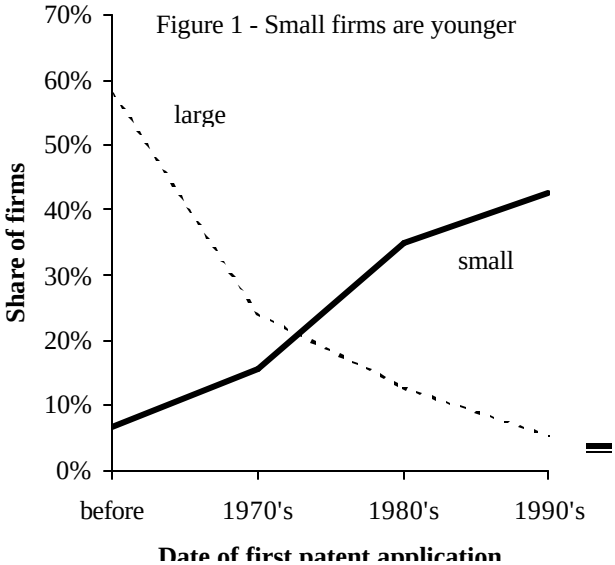
We will see below that a particular technological strength of small firms is in games and toys. That small firm are strong in this technology makes sense within the serial innovator perspective. A lot of small firm establishment is driven by someone's passion. If someone's passion is golf, or snowboarding or toys, establishing an innovative equipment firm is a natural expression of that. In sports, there would be substantial rewards to the serial innovator, who would enjoy a lifestyle in close contact with users of their equipment – i.e. others like themselves passionate about the game or sport - from whom they can glean innovation ideas. Perhaps they attain a central position in the sporting community through their supply of high-end equipment to the elite. Perhaps therefore, the rewards for one's lifestyle of running such a business exceed those to be gained by selling out. This is probably also true because big investor money does not swirl around snowboarding and golf in quite the same fashion as it does around semiconductors and biopharmaceuticals. Therefore in this area entrepreneurs may be more likely to become serial innovators.

Many of the large firms in this study are found in industries where technical innovation and patent protection are important. They are firms that have invested heavily in innovation and seek to protect their investment using patents. The small firms share these characteristics of large patenting firms. But beyond this, the small firms in this study are the serial innovators, small firms who have survived the success of their first idea and moved forward.

The small firms are younger than large firms but are not start-ups

That the small firms in this study are serial innovators makes this study different from many studies of small firms which often focus on entrepreneurship and the founding

Figure 1 - Small firms are younger



[14] At Inc, they see a lot of "serial entrepreneurs" dis appears.

of firms, or on those job-creating small firms that grow quickly into large firms. In the innovation community, new technology based firms are often studied, and so firms less than 4 or 5 years old are investigated. The small firms in this study are that neglected element in the economic world, long-lived small firms.

That the small firms are long-lived, does not mean that that their age distribution mimics that of large firms. We do not have the founding date for each firm, but we do have the first year in which each firm applied for a patent (for patents issued 1970 or later). So we can examine firm age as judged by the year in which the firm, or its predecessors or subsidiaries, made its first patent application. We classified firms according to the decade in which they applied for their first patent. Figure 1 displays the results. We can see that more than one-half (58%) of the large firms applied for their first patent before 1970, compared to 7% of the small firms. On the other hand, 43% of the small firms applied for their first patent after 1989, compared with 5% of the large firms. The large and small firms exhibit opposite age distributions. In comparison to the large firms, youth characterizes these small firms.

There are several sets of opposing forces at work to create these distributions. First brand-new large firms are quite unlikely, except for spin-offs. For example Visteon - an auto-parts supplier spun-off from Ford in 2000 - was "born big" with 53 patents issued 1999-2000. But in general, we see few of these cases, and most new firms are start-ups. However, we do not see brand new start-ups here because they do not meet our criteria for inclusion – 15 patents between 1996 and 2000. Therefore the peak years for these small firms to begin patenting are 1989-1995, years in which 23 small firms on average made their first patent application (compared with 6 large firms per year).

Since we are examining an age distribution of survivors, it is no surprise to find that the number of small firms entrants declines in the years before 1989, stabilizing at 5.6 per year 1973-1982 (compared with 10.2 large firms per year). The number of older, surviving small firms is reduced by growth (older firms are more likely to have grown into large firms), acquisition and failure. The more time that has passed, the more likely is a small firm to succumb to one of these fates. The number of large firms is of course not reduced by growth; merger leaves one large firm whose first patent is the oldest of the two merged companies, and failure is less likely. So the passage of time favors large firm survivors relative to small firm survivors. Although our patenting small firms are not start-ups, they are still young firms in comparison to the set of large firms.

Small firm patenting by technology area

The contribution of small firms to technical change is not even across technologies. To examine this we will use CHI's classification of patents into 30 broad technology areas. This classification is based on the first listed IPC or international patent classification code on each patent. The classification was designed to roughly align with the SIC or NAICS classifications. The 30 technology areas are listed in the first column of Table 6.

Table 6 examines the small firm presence in each technology using two measures. First, the table reports the small firm share of patents in each technology area, and the total number of patents. The second measure, the share of firms that are small by technology area, is more complicated because to obtain it we first had to classify each firm into a technology area based on where most of its patents are found. There were a few firms for which two technology areas were tied, and we counted such firms into both technology areas. Therefore the sum of the number of firms across technology areas exceeds the number of firms in the study.

Overall, we have seen that one-third of the top 1,000 most patenting U.S. firms are small, and small firms have a 6% share of patenting. In biotechnology however, small firms produce one-quarter of the patents in this study and account for 71% of the patenting firms. They are also over represented in the other health related areas - pharmaceuticals, medical equipment and medical electronics. Patenting in chemicals and agriculture is related to the health areas, and so we see a similar though weaker pattern there.

The unclassified patents are another area of small firm strength. Here the story is different. Unclassified patents encompass, amongst other things, patents on gaming – golf, snowboarding, toys, casino gaming etc. 21% of the patents with the words: toy, game, gaming, snowboard or golf in their titles belong to small firms. Mattel is also a strong presence in this category.

In information technology we see another pattern. In health-related technologies small firms produce a higher share of patents than we might expect, and account for a higher share of firms whose patents focus on health technologies. With unclassified patents, small firms account for a higher share of patents than we might expect, although they are about one-third of firms, which is in line with their presence overall. However, in information technologies – areas such as semiconductors and office equipment – the small firm share of patents is lower than 6%, but the share of firms that are small is higher than one-third. In other IT areas, telecommunications and computers, the share of patents is low while the share of firms is about one-third. This suggests that although small firms are relatively more active in these areas, large firms have a higher propensity to patent than in other areas and so overshadow the small firm effort when simple patent counts are examined.[15]

Areas where small firms are weakest include: oil & gas, aerospace, motor vehicles and industrial machinery. In all these areas, small firms have less than half the share of patenting we would expect given their overall presence in the study, and small firms account for less than one-third of firms.

CHI has established that health and information technologies were the fastest growing areas of patenting for U.S. innovators over the past decade (Hicks et al., 2001). The strength of small firm innovators in these burgeoning areas of technology is not an accident. The small firms no doubt made innovation in these technologies more dynamic, and small firms were no doubt attracted into these areas because they offered great technical opportunity. The greater small firm presence in these newer industries is in line with previous research that has established that small firms play an important role in innovation early in the evolution of industries (Audretsch (1995), Freeman & Soete, 1997).

[15] That large IT firms have recently dramatically increased their propensity to patent is reported in Hicks et al., 2001.

Table 6 – Small firm share of patenting by technology

Technology Area	% of patents from small firms	# of patents	% of firms that are small	# of firms
Biotechnology	**25%**	3,886	**71%**	45
Pharmaceuticals	**19%**	6,453	**68%**	59
Medical Equipment	**11%**	8,437	**45%**	88
Unclassified	**11%**	2,511	31%	26
Medical Electronics	**11%**	2,974	**64%**	14
Chemicals	**9%**	15,760	29%	91
Agriculture	**8%**	2,561	28%	18
Glass, Clay And Cement	7%	1,003	50%	2
Wood And Paper	7%	1,961	29%	21
Food And Tobacco	6%	1,453	19%	16
Textiles And Apparel	6%	1,837	19%	16
Power Generation And Distribution	6%	2,045	80%	5
Fabricated Metals	5%	2,313	36%	11
Industrial Process Equipment	5%	5,180	28%	39
Primary Metals	5%	586	22%	9
Electrical Appliances And Comp	5%	10,436	28%	64
Other Transport	5%	1,136	10%	10
Miscellaneous Manufacturing	5%	9,313	16%	73
Heating And Ventilation	5%	1,026	43%	7
Telecommunications	5%	19,099	33%	91
Semiconductors And Electronics	5%	13,893	**44%**	43
Miscellaneous Machinery	4%	6,181	17%	54
Office Equipment And Cameras	4%	9,268	**43%**	37
Measuring And Control Equipment	4%	8,201	26%	39
Plastics, Polymers And Rubber	4%	7,187	21%	28
Industrial Machinery And Tools	3%	8,050	20%	54
Motor Vehicles And Parts	3%	5,774	22%	37
Computers And Peripherals	3%	31,645	30%	101
Aerospace And Parts	2%	1,147	0%	1
Oil And Gas	1%	2,660	6%	17
All technology areas	6%	193,976	33%	1116

Who are the serial innovators?

A simple way to get behind these overall numbers is to examine the top 10 small firms with the most patents in Table 7. Table 7 is an extract from Appendix table 1 which lists the 356 small firms in the study. Appendix table 1 reports the company name, ticker if relevant, rough number of employees, utility patents 1996-2000, the percentage of those patents in the top 10% most cited patents produced by the 1,071 companies and the primary SIC with description. Firms are sorted descending by number of patents. Table 7 confirms the picture of small firm strength in pharmaceuticals and semiconductors, while offering a caution about holding companies.

Table 7 – Top 10 most innovative small firms

Company	Ticker	Employees	Patents 96-00	Share top 10%
Isis Pharmaceuticals Inc	ISIS	430	306	19%
Kohlberg Kravis Roberts & Co		80	223	13%
Research Corporation Technologies		50	163	1%
Candescent Technologies Corp.		350	123	21%
Heartland Industrial Partners LP	HTL	20	119	9%
Tessera Inc.		90	113	29%
Neurogen Corp.	NRGN	190	108	18%
SONICBlue	SBLU	370	105	9%
Alliance Pharmaceutical Corp.	ALLP	180	94	19%
NPS Pharmaceuticals Inc.	NPSP	150	93	8%

There are four pharmaceutical firms at the top of the list: Isis, Alliance, Neurogen and NPS. All are public companies, and all lose phenomenal amounts of money each year. They have a bit of revenue from licensing and selling parts of their technology, but this is more than counterbalanced by tens of millions of dollars in research costs. Each has a core technology around which their research and development is focused. Alliance has perfluorochemical technology; Isis has antisense RNA based technology; NPS has calcium receptor technology, and Neurogen has a technology it calls the Accelerated Intelligent Drug Discovery platform. Each company is pursuing several drug candidates for different diseases based on their core technology. The companies enter into alliances with big pharmaceutical firms both for R&D and for commercialization and marketing purposes. The limited data in the table suggest that there is nothing wrong with the technological acumen of these firms, all except NPS have more than 10% of their patents among the top 10%.

There are also three investment firms on the list: Kohlberg Kravis Roberts (KKR), Research Corporation Technologies and Heartland Industrial Partners. These small firms control technology originated by inventors at large firms or research institutes. Of these KKR is the most famous, a leveraged buyout firm described by Hoovers.com as the barbarians at the gate who now knock politely. They assemble huge funds of private money to take over firms which they then manage to increase their value. Heartland Industrial Partners is also a private equity firm that buys companies to increase their value. Research Corporation Technologies develops technologies from research institutions with an eye to commercialization. KKR and Heartland own controlling interests in companies that own patents, so the patents are consolidated under their names. KKR controls patents from 65 assignee companies or variant names of assignees. However, KKR and Heartland are not public, so the available employment figures for

these firms are not consolidated. Hence, the firms appear small here, but the technology was developed by large firms whose total employment we do not have. Research Corporation owns the patents but does not employ the inventors. So again, the patent and employment figures are unrelated. KKR and Heartland seem to have portfolios whose quality is average, about what you would expect. Research Corporation however may not be accessing a stream of the best quality technology.

The remaining three firms are in information technology: Candescent, Tessera and SONICblue. Candescent has developed thin cathode ray tube technology for flat-panel display. Of course, liquid-crystal technology is in common use in flat-panel displays. Candescent has abandoned plans to manufacture and will focus on licensing its intellectual property. Candescent has big firms as investors, though they lost a development alliance with Sony. Tessera has semiconductor chip-scale packaging technology for demanding applications that finds its way into advanced consumer electronics devices. It earns money licensing its technology and has successfully litigated its patents against big firms. Tessera also offers design and consulting services. This firm may actually make money, and perhaps not unrelated it is also the firm with the highest share of its patents among the top 10%. SONICblue designs and markets electronics. The digital audio player Rio is the leading product. The company has evolved from graphics accelerators, along the way selling some technology and acquiring others, focusing and consolidating. The company has plans for the home networking/multimedia area.

The top 10 serial innovators, those with the most patents, reflect the overall strength of small patenting firms in health technologies and parts of information technology. None of the firms has a primary SIC suggesting it is an R&D firm, yet each seems to sell only their intellectual property or R&D and related services. The financial firms seem like interlopers, though conglomerates today own much technology, and we see here that some of these holding companies do happen to be small private firms.

Small firm innovation is more closely linked to outside technology and to research

Technical innovation has become increasingly challenging. Innovators must move rapidly in the face of increased competition at home and abroad. While moving ever faster, they must also draw on an ever-wider range of knowledge as technology grows more complex and often more closely related to research. How successfully do small firms rise to meet these challenges? We can examine this question using information gleaned from the firms' patents. Patents reference prior art in both the patent and the scientific literature. We can examine these references to devise indicators of how fast a firm is innovating and how closely connected is their technology to research.

CHI calls our indicator of the speed of innovation "technology cycle time" or TCT. It indicates how fast the technology is turning over, defined as the median age in years of the U.S. patent references cited on the front page of the company's patents. Companies with shorter cycle times than their competitors are advancing more quickly from prior technology to current technology. In semiconductors, cycle times are short (3-4 years); in shipbuilding they are long (more than 10 years). The average is 8 years.

We will begin with an index, constructed in the same way as the citation index. The innovation speed index equals one if a patent's median age of referenced patents is equal to the average for the year of patent issue and technology area.[16] Values greater than one indicate faster innovation than expected given the age and technology of the patent. The innovation speed index suggests that small firms are somewhat slower than large firms on average. Large firms average 1.59 on the innovation speed index while small firms average 1.51.[17] This says that large firms are slightly quicker innovators on average, given the age and the technologies of their patents.

[16] Technology area defined by the first IPC code on the patent.

[17] This difference in means is significant at the .0001 level using a one way ANOVA test. The same is true of the differences between small and large firms in science linkage and citation index. With 190,000 patents in the set, even very small differences are significant.

Small firm patents contain longer lists of references to prior patents.[18] We hypothesized that this might make small firm innovation look slower when the median age of references was examined. This occurs because when adding more references, one is more likely to add older references, since there are just more older than newer references available to be cited. So we examined innovation speed using a second metric: the age of the most recently issued patent referenced.

We calculated another index: "innovation speed index-2". Index-2 differs in the following ways. For each citing patent, we identified the most recent referenced patent.[19] We calculated the difference between the year of issue of the patent and the year of issue of its most recent referenced patent. We divided these figures by the average difference for all patents in this study[20] by broad technology area and year.[21] 1.3 million references entered into these calculations.

Innovation speed index-2 is interpreted as follows. A number greater than one means that the patents on average exhibit an older set of references than is the norm for this set of patents in the same broad technology area and year. A number less than one means the opposite, speedier referencing to the prior patent art than we might expect, given the technology area. Since the norms were calculated from this set of patents, large firms determine the norm, so their index value is 1.00. The small firm value is 0.98, indicating that their innovation is slightly faster, when measured using the most recent reference on their patents.

Small firms seem to innovate slightly faster than large firms, as judged by the average age of the newest patent reference. However, the magnitude of the difference was small. Perhaps more important is linked evidence that small firms seem more aware of related technological developments or that their innovative efforts seem more connected with the outside world. As we mentioned above, small firm patents contain longer lists of references to prior patents. Probing this more closely, we find that the share of self-citations is lower for small firms. 10% of small firm references to prior patents are to their own patents in contrast to the 19% share of self-citations among large firm references. This suggests that small firm technology is built more on technology developed outside the firm than is large firm technology.

To examine this more closely, we constructed another normalized index. We calculated the number of self-citing and non-self-citing references to prior patents we might expect on a patent in this set, given its broad technology area and year of issue. We find that small firms self-cite about 80% as much as large firms, confirming the hypothesis that small firms self-cite less in absolute terms probably because they have smaller patent portfolios to cite.[22] However, compared to large firms, small firms cite outside material 1.5 times as much.[23] Thus the technological innovation of small firms does appear to be more extensively connected to developments outside the firm, while the technological innovation of large firms is more extensively connected to prior developments within the firm.

Innovation in small firms is not just more closely linked to outside technology, it also seems more closely linked to the scientific frontier. Increasingly, patents are citing non-patent documents as prior art, and many of these are papers in scientific journals (Narin et al. 1997). CHI's science linkage indicator is based on counts of patent references to scientific papers. Patents that reference many scientific journal articles are different from patents that reference none. For example, a patent on a genetically engineered seed, or on a neural network based process control may reference ten or more scientific articles. In contrast, an improved design for a part of a motor may reference none. High science linkage indicates that a company is building its technology based on advances in science. High-tech companies tend to have higher science

[18] An index of patent reference list length, constructed in the same way as the innovation speed index takes the value of 1.81 for the small firm patents and 1.18 for the large firm patents.
[19] The innovation speed index used the median age of cited references.
[20] The innovation speed index was calculated using the averages for the entire set of U.S. patents.
[21] The innovation speed index used technology areas narrowly defined by IPC codes. Here we used CHI's 30 technology Tech-line classification.
[22] Index values for self-citations to patents produced by the same company: small firms: 0.84, large firms: 1.03.
[23] Index values for citations outside the company: small firms: 1.56, large firms: 0.98.

linkage than their competitors. Science linkage can find the high-tech innovation in traditional areas such as agriculture or textiles.

We find that the science linkage of small firm patents is stronger than that of large firm patents. The lists of references to scientific journal articles on small firm patents are more than twice as long as expected given how much literature large firms reference. We calculated a science linkage index in the following way. The patents issued to the one thousand companies in this study between 1996 and 2000 made 394,173 references to scientific journal articles. We calculated the average number of science references per patent for each of 30 broad technology areas in each year 1996-2000. This we call the "expected value". Then for each patent, we compared its number of science references to the expected value for its year and technology area. We then calculated the average of these actual/expected ratios for large and small firms to obtain our index. We find that the science linkage index for small firms is 2.55 and for large firms is 0.90. Here we see a rather large difference in the behavior of small and large firms.

There are several small firms that stand out with regard to their science linkage and examining them closely perhaps provides insight into some of the factors at work. E. Khashoggi Industries is one such case. About 10 years ago, Khashoggi began a line of patenting in manufacturing and molding from sheets of inorganically filled organic polymer matrix. These patents are classified into technologies that average less than two references to scientific material per patent, areas such as polymers, miscellaneous machinery and miscellaneous manufacturing. The Khashoggi patents carried 20 to 40 references to scientific literature. Mr. Khashoggi has subsequently established a firm called EarthShell (listed on the NASDAQ) which has exclusive licenses to the patents of E. Khashoggi Industries. The firm is engaged in the commercialization of composite material technology for the manufacture of foodservice disposable packaging. This packaging is not just biodegradable but is very environmentally friendly, being a composite of ground limestone and potato starch. Khashoggi Industries itself is a very obscure company that may well be a research firm built around the Edisonian figure of Essam Khashoggi.

It is quite possible that our indicators have identified a small firm niche - pursuing a traditional technology with a research-intensive approach. This is suggested by the observation that the research intensity of small firm innovation exceeds that typical in the large firm approach to the technology. The indicators suggest that many of the serial innovators may take this approach. This is true not just in science intensive areas of technology like biotechnology, but more strikingly also in traditional technologies as illustrated by E. Khashoggi Industries. Khashoggi is not alone. Patenting in metals technology we find Geobiotics who are developing microorganisms to recover metals, so naturally their patents reference far more scientific literature than the standard metals patent. Patenting in telecommunications we find Optex Communications, a firm that worked with NIST money to develop memory devices using electron trapping materials, or materials that can store electrons in a stable electronic state for long periods after they have been excited by incident light. Both firms have far more science-intensive patents than the large firms working in their technology area.

Optex Communications points to a second factor at work, that small firm innovation seems more likely to have received government support. If the government provided research support to a project that resulted in a patent, the patent is supposed to acknowledge the government's interest in the technology. The requirement is not enforced, and there is probably a fair amount of patenting related to government supported work that does not acknowledge government support. Nevertheless, if we assume the factors leading firms to acknowledge government support do not differ systematically between large and small firms, we can use this information to gain some insight into Federal support for small firm innovation. We find that 1.60% of small firm patents acknowledge a government interest compared to 0.57% of large firm patents. Small firms are more than two and a half times as likely as large firms to have received government support for their research and development.[24] This in itself is another indicator suggesting that small firm innovation is more connected with the outside world than is large firm innovation. Also, since the government tends to support research and not tinkering with devices, the greater government support

[24] Note that this is the opposite of what was found by Gellman Research Associates in the 1980's. Thus, the policy impact of that study, the establishment of the SBIR program and other developments seem to have shifted the landscape in favor of small firms over the past few decades.

for small firm innovation aligns with the more research intensive approach taken by small firms to their innovative efforts.

Another factor is made visible looking at the case of Ronald A. Katz Technology Licensing LP. This firm patents in telecommunications. "Telephonic-interface lottery-system" and "Telephonic-interface statistical analysis system" are two of R.A. Katz's favorite patent titles. Of the 15 R.A. Katz patents issued 1996-2000, five list over 60 references to scientific literature, in a technology where the average patent lists less than one. The business model of R.A. Katz Technology Licensing LP is to extract $2 billion in patent licensing revenue from large firms. AT&T, American Express, IBM, Microsoft and Wells Fargo have paid so far. Their strategy involves making the patents so complex that firms settle rather than have to wade through the patents, as they would have to do to litigate. The patents contain hundreds of pages of claims, each slightly different from the others.

An attorney is quoted in Forbes ASAP as saying: "He has literally thousands of claims, and they differ only in trivial respects. Many are broad and vague, and sorting them out takes a lot of time." The 60 references to scientific literature (and over 300 references to other patents, and over 300 references to other non-patent material) on each patent also serve to make each patent more difficult to challenge legally. Any challenger must grapple with the contents of all of the references, and it is very difficult to use any of the referenced material as evidence that the patent should not have been granted because the invention was not novel. The patent office examiner is presumed to have examined all the referenced material and to have judged the invention novel in light of it.

> *Time, particularly when lawyers are involved, means money. When faced with a large number of complicated patents, it's cheaper for companies to pay for a license than to hire expensive attorneys to figure out their merit explains longtime patent system critic Greg Aharonian, publisher of Internet Patent News Service. Companies, he says, end up paying Katz to leave them alone. And perhaps to save money, all four companies that found themselves in court with Katz settled before a final court judgment on the validity of the patents. (Forbes, p. 65)*

The Katz strategy illustrates an important point, namely that all is not doom and gloom for small firms in the legal world surrounding intellectual property. Small technology firms with no expensive production facilities to be shut down by an injunction deprive large firms of a major weapon in patent infringement legal maneuvering. Katz is not the only set of smart engineers, or modern day inheritors of the Edisonian tradition, to attempt this sort of business model. A notorious recent example was Rambus which licenses a computer memory design and has been involved in sometimes bitter patent litigation with several large firms according to Hoovers.com. In 2001, Rambus had $117 million in sales (i.e. licensing revenue), up 62% from the previous year. However, Intel, previously a big backer, is moving away from their technology.

We saw earlier that perhaps 20% of the serial innovators might be considered to be development stage firms, whose business model involves licensing technology. In large measure this is seen as a legitimate form of enterprise. In some cases however, questions are raised – perhaps only in information technologies, or perhaps when the small firm is successful in litigation. Although the development and licensing strategies of these small firms are seen as somewhat illegitimate, they are not unusual except perhaps in being so successful. The Katz case is extreme, but it revealed the possibility of a connection between patent litigation and long reference lists. It may be that small firms relying on licensing for income are more sensitive than large firms to writing stronger patents and so write patent applications with longer reference lists.

The higher rates of science referencing in small firm patents are likely related to two factors: niche high-tech strategies where the firm is trying to commercialize a research-related technology and a desire to build strong patents for use in licensing technology. The higher rates of small firm references to prior patents could reflect both greater small firm reliance on and interaction with external technology and similar legal considerations. These are very important aspects of small firm innovation. A lot of the excitement surrounding small innovative firms these days arises precisely because they are seen as vehicles for entrepreneurial scientists to bring to market research-related ideas. The data indicates that this type of

activity is indeed a specialty of small firms. We have also seen that small firms can use the legal system to their advantage and thus, being a development stage company is possible precisely because patents protect the intellectual property of small firms in a form that can be licensed.

Small firm innovation is more locally connected

One of the ways that technical innovation has become increasingly challenging is that technology has increased in complexity and innovators must draw on a wide range of knowledge, often from outside the firm. We have seen that small firms may excel at this. It has become well known that in leading edge areas, where knowledge is often not codified, there can be advantages to being located near researchers working in the same technology. Thus we see an emphasis today on clusters of innovation which translates into local policy as cities try to attract a critical mass of biotechnology or information technology firms. We might expect small firms, with their reduced resources, to be more dependent on local sources of knowledge to further their innovative work.

We examined this hypothesis by looking at the share of references from small and large firm patents to patents within the same state and the same Metropolitan Statistical Area (MSA). The location of a patent was assessed using the location of the inventors (the home city and state of each inventor is given on a patent). Patents typically list several inventors, and their addresses are often from several MSA's or states. A patent-patent referencing pair was considered to be in-state if any state was found on both the referencing and cited patent. Similarly for MSA's, a patent-patent referencing pair was considered to be "in-MSA" if any MSA was found on both the referencing and cited patent. 1.3 million references entered into these calculations.

We hypothesized that the rates of local referencing would be very different for in-company and outside-company references. This we found to be true. 245,000 of the references were self-citations or in-company references. Overall, 76% of the in-company references were also in-state, while 11% of the outside-company references were in-state. Similarly for MSA's, 68% of the in-company references were also in-MSA, while 6% of the outside-company references were in-MSA.

For both in-company and outside-company references, small firms are more locally connected. However, it is the outside-company references that are of greater interest. 1.1 million of the references were outside references. We find that the innovative efforts of small firms are indeed more strongly connected locally. 15% of small firm references to patents produced by other organizations were in-state compared to 10% of outside-company references from large firms. 9% of small firm references to patents produced by other organizations were in-MSA, or local, compared to 6% of outside-company references from large firms. This may not seem like much, but consider the share of U.S. invented patents in 2001 accounted for by the top 5 MSA's:

- San Jose – 9.6%
- Boston – 5.2%
- San Francisco – 3.8%
- Oakland – 3.7%
- Chicago – 3.7%

Averaged over the whole country, even large firms are citing local technology at a higher rate than would be expected given the share of U.S. patents accounted for by any single MSA. Small firms are even more dependent on the local technological environment than are large firms who presumably have the resources to search the nation, if not the world for expertise and knowledge relevant to their R&D efforts. Thus, regions that seek to foster clusters of innovation to support small firm innovation are doing something important.

Conclusions

Several themes can be drawn out of this research. We have seen that small firms are important innovators. Their share of U.S. patents is likely close to their share of U.S. manufacturing employment. Small firm patents are more technically important on average than large firm patents, and a small firm patent is more likely than a large firm patent to be among the top 1% most cited patents. These small firms also produce more patents per employee than the large patenting firms. That small firms are effective innovators, in some ways better than large firms, has been found before. There is an extensive literature, now several decades old, that examined the question of whether small or large firms were more efficient innovators. This study was not designed to directly address that question – we do not have R&D expenditure figures, nor was the sample of firms chosen to be representative of all small or large firms. However, the

quantitative evidence conclusively establishes that small innovative firms are effective producers of high impact technology.

The small firms we studied are neither as old as the large firms, nor are they start-ups. This type of established small firm is little studied because interest in innovative firms centers on new innovative firms or on large firms that used to be small. Our "serial innovators" concentrate in newer, science intensive technologies such as biotechnology, pharmaceuticals, and semiconductors. This dovetails with the work of Audretsch who established that in industries in which small firms are more innovative, there are more small firm startups. Audretsch attributes high rates of small firm innovation, as might be seen early in an industry's evolution, to the entrepreneurial technological regime in which there is divergence in the expected economic value of a piece of knowledge. In the entrepreneurial regime, this disagreement creates opportunities for small firms and the variety they bring to the pursuit of technical change (Cohen & Klepper, 1991). The more science intensive approach to technical change taken by small firms may represent this variety. Audretsch also argued that "new entrants represent, at least in some cases, not merely smaller replica of the existing incumbent enterprises but also agents of change" (Audretsch, 1995, p. 40). Again, the more science intensive approach to invention, and the more extensive connections to outside technology, and the "development stage" status of many of these firms point to their not being replicas of large firms. The higher citation rates of small firm patents may point to their being agents of change, in that their patents may be more likely to lay the foundations upon which future technology is built.

Finally, we see evidence that small firm innovation may be more networked, more aware of outside technological developments and more dependent on local technology. Small firm patents reference more patent prior art, as well as more scientific prior art. This, combined with the higher internal referencing rate of large firms suggests that small firm innovation is more entwined in outside technical communities. More often than for large firms, these communities are local. At the moment, networks of innovators are considered important, but study of them is really just beginning. They are not easy to study, nor is their importance easily made visible. We can only conjecture at this point that networks of innovation are important in general, that small firms are intensive participants in them, and that pursuing this may be crucial to understanding the economic importance of serial innovators – long-lived small firms who single-mindedly pursue innovation and contribute high-value inventions to America's pool of new technology.

Small firms are effective innovators. Small firms may well be most important to our economy as agents of change (Audretsch, 1995) signaled by the fact that the small firm contribution to innovation is most intense in leading edge technologies and the firms pursue leading-edge technical niches, perhaps in more complex technologies. Any barriers to their participation in new technologies or exclusion from policy development concerning those technologies would be most unfortunate. Small firm innovation should benefit disproportionately from the Internet and communication technologies that have made it much easier to find technical information and contact experts because small firm innovation is more inter-connected with outside innovation than is large firm innovation. The current policy interest at the local level in clusters of innovation should also disproportionately help small firms because for small innovative firms, more than large innovative firms, the local technological environment is an important resource.

The small "serial innovators" we have studied are distinguished from other innovative small firms by their innovative success and persistence, and from large firms by their concentration on high quality and leading-edge technical change that builds on a broad array of outside knowledge. We are only just beginning to understand the unique contribution made by serial innovators to technical change, and their role in maintaining our nation's economic dynamism over the long term.

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Appendix

At the request of the Office of Advocacy, CHI has prepared an analysis of the likely geographic locations of the small firms included in the serial innovators report. This information can be used to assist in the launch of the report. To undertake this analysis in a cost effective manner, CHI did not look up the location of every firm. Rather we used information available in the patent database – the location of inventors.

Patents list the city and state in which each inventor lives. This information was analyzed to produce the six tables in this supplement which are intended to guide SBA in identifying firms in particular states and cities. The state and city in which the most inventors reside was picked as the most likely location of the firm. Metropolitan statistical areas, or MSA's were used to identify cities. To obtain an MSA, we first identified the town listed on the patent with a county and then aggregated the counties into MSA's.

In any particular case, the firm's website should be checked to verify the information. Strange things can happen. For example, eight firms list foreign inventor locations most frequently. One of these is Bio-Technology General Corp., a small firm whose headquarters is in New Jersey, but whose R&D is undertaken in Israel. Such firms were removed from the tables, as were firms that invest in other firms.[1]

The tables are:

1) Count of firms by state

2) Count of firms by city

3) List of states and the firms located there. For each firm the number of U.S. utility patents issued 1996-2000 is provided.

4) List of cities and the firms located there. For each firm the number of U.S. utility patents issued 1996-2000 is provided.

5) List of states and their firms with detail provided on which states were listed on each firm's patents and the number of patents listing an inventor from each state.

6) List of cities and their firms with detail provided on which cities were listed on each firm's patents and the number of patents listing an inventor from each city.

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[1] The firms removed are: Bio-Technology General Corp, Heartland Industrial Partners LP, Kohlberg Kravis Roberts & Co, NCT Group Inc., NPS Pharmaceuticals Inc.

Table 1 – Number of firms by state

State	# firms
California	120
Massachusetts	23
Texas	21
New York	19
Pennsylvania	15
Minnesota	13
Colorado	12
Michigan	12
Ohio	12
Washington	11
New Jersey	11
Illinois	10
Connecticut	7
Georgia	7
Oregon	6
Maryland	5
Florida	5
Wisconsin	5
Foreign	4
Iowa	4
Utah	4
New Hampshire	3
Virginia	3
North Carolina	3
Nebraska	2
Missouri	2
Indiana	2
Nevada	2
Arkansas	1
Rhode Island	1
Delaware	1
South Carolina	1
Kansas	1
Hawaii	1
Alabama	1
Idaho	1
Vermont	1
New Mexico	1

Table 2 – Number of firms by Metropolitan Statistical Area

MSA Name	# firms
San Jose, CA	51
Boston-Worcester-Lawrence-Lowell-Brockton, MA-NH	29
San Diego, CA	21
Minneapolis-St. Paul, MN-WI	13
San Francisco, CA	13
Orange County, CA	11
Detroit, MI	11
Seattle-Bellevue-Everett, WA	11
Philadelphia, PA-NJ	10
Los Angeles-Long Beach, CA	10
Austin-San Marcos, TX	9
Oakland, CA	9
Chicago, IL	8
Atlanta, GA	7
New York, NY	7
Washington, DC-MD-VA-WV	6
New Haven-Bridgeport-Stamford-Waterbury-Danbury, CT	6
Dallas, TX	5
Cleveland-Lorain-Elyria, OH	5
Newark, NJ	5
Boulder-Longmont, CO	5
Nassau-Suffolk, NY	5
Houston, TX	5
Santa Barbara-Santa Maria-Lompoc, CA	4
Salt Lake City-Ogden, UT	4
Portland-Vancouver, OR-WA	4
Pittsburgh, PA	4
Fort Collins-Loveland, CO	3
Dayton-Springfield, OH	3
St. Louis, MO-IL	3
Denver, CO	3
Dutchess County, NY	2
Des Moines, IA	2
Madison, WI	2
Cincinnati, OH-KY-IN	2
Buffalo-Niagara Falls, NY	2
Gainesville, FL	2
Hartford, CT	2
Bergen-Passaic, NJ	2
Baltimore, MD	2
Las Vegas, NV-AZ	2
Melbourne-Titusville-Palm Bay, FL	2
Lincoln, NE	2
Pueblo, CO	2
Middlesex-Somerset-Hunterdon, NJ	2
Monmouth-Ocean, NJ	2
Rochester, NY	2
Toledo, OH	1
Charlotte-Gastonia-Rock Hill, NC-SC	1
Charleston-North Charleston, SC	1
Burlington, VT	1
Sherman-Denison, TX	1
Bryan-College Station, TX	1
Springfield, IL	1
Tampa-St. Petersburg-Clearwater, FL	1
Scranton--Wilkes-Barre--Hazleton, PA	1
Binghamton, NY	1
Vallejo-Fairfield-Napa, CA	1
West Palm Beach-Boca Raton, FL	1
Wilmington-Newark, DE-MD	1
Appleton-Oshkosh-Neenah, WI	1
Ann Arbor, MI	1
Albuquerque, NM	1
Albany-Schenectady-Troy, NY	1
Boise City, ID	1
Newburgh, NY-PA	1
Akron, OH	1
Lexington, KY	1
Memphis, TN-AR-MS	1
Kansas City, MO-KS	1
Janesville-Beloit, WI	1
Indianapolis, IN	1
Greensboro--Winston-Salem--High Point, NC	1
Sacramento, CA	1
Fort Lauderdale, FL	1
San Antonio, TX	1
Eugene-Springfield, OR	1
Orlando, FL	1
Providence-Warwick-	1

MSA Name	# firms
Pawtucket, RI	
Racine, WI	1
Richmond-Petersburg, VA	1
Yolo, CA	1
Columbus, OH	1
Naples, FL	1

Table 3 - Small firms listed by state in which they are most likely located (with # of patents 1996-2000)

Alabama ----------

Atrion Corp	37

Arkansas ----------

Allen Engineering Corp	17

California ----------

3D System Corp	72
Advanced Bionics Corp.	32
Advanced Tissue Sciences Inc	32
Affymax Inc.	67
Agraquest Inc	16
Alliance Pharmaceutical Corp.	94
Alliance Semiconductor Corp.	51
Ampex Corp	36
Amylin Pharmaceuticals Inc	18
Anticancer Inc	18
Aplus Flash Technology Inc	15
Applied Medical Resources Corp	44
Aradigm Corp.	55
Arcade Planet Inc	21
ArrayComm Inc	15
Arthrocare Corp	32
Aura Systems Inc	31
Biosite Inc	25
BioTime Inc	15
Caliper Technologies Corp	50
Candescent Technologies Corp.	123
Capstone Turbine Corp	30
Cardima Inc	27
CardioGenesis Corp.	53
Cell Genesys Inc	29
Centaur Pharmaceuticals Inc	21
Cerus Corp	35
Cohesive Technologies Inc	23
Computer Motion Inc	19
Conductus Inc	15
Corvas International, Inc.	53
Creative Integrated Systems Inc	16
Cygnus Inc	31
Diversa Corp	30
Echelon Corp	24
Embol-X Inc.	40

California ----------

Endotex Interventional Systems Inc	15
Endwave Corp	28
Epimmune Inc	27
Essential Therapeutics Inc	19
Exar Corp.	51
Flashpoint Technology Inc	22
FormFactor Inc	32
Foveon Inc	34
Gemfire Corp	29
Genelabs Technologies Inc	39
Genta Inc	21
Geobiotics Inc	15
Geron Corp	37
Globalstar LP	41
GTCO Corp	17
Health Hero Network Inc	28
ICU Medical Inc	19
Immersion Corp.	62
Immune Response Corp	23
Insmed Inc	32
Integrated Silicon Solution Inc	37
Irvine Biomedical Inc	31
Isis Pharmaceuticals Inc	306
Khashoggi (E.) Industries	68
Large Scale Biology Corp	28
Levelite Technology Inc	18
Lexar Media Inc	21
Ligand Pharmaceuticals Inc.	82
Litel Instruments	22
Lynx Therapeutics Inc.	38
Macrovision Corp	25
Masimo Corp	42
Maxdem Inc	26
Media 100 Inc	29
Membrane Technology & Research Inc	34
Micro Linear Corp.	42
Micro Therapeutics Inc.	38
Microunity Inc	33
Monolithic System Technology Inc	30
Nanogen Inc	21
Neomagic Corp.	38

California

Oak Technology Inc. 44
Onyx Pharmaceuticals Inc 27
Op-D-Op Inc 17
Opti Inc 25
Peregrine Semiconductor Corp 16
Pericom Semiconductor Corp 23
Pharmacyclics Inc 31
Physical Optics Corp. 42
Porter (Pl) Co 17
Privatizer Systems Inc 15
Programmable Microelectronics Corp 30
Prolinx Inc 25
Protein Polymer Technologies Inc 17
Quantum Group Inc 18
Quicklogic Corp. 51
Quidel Corp 37
Rambus Inc. 87
RITA Medical Systems Inc 26
Ronald A Katz Technology Licensing Lp 15
Sangstat Medical Corp 15
Scientific Learning Corp 16
Silicon Genesis Corp. 19
SONICBlue 105
Staar Surgical Co. 46
Stratagene Holding Corp 22
Superconductor Technologies Inc 18
Synaptics Inc 28
Telik Inc 28
Tessera Inc. 113
Texas Biotechnology Corp 20
Transgenomic Inc 20
Tularik Inc. 54
Turbodyne Systems Inc 23
Ultratech Stepper Inc 19
Universal Electronics Inc 19
Viasys Healthcare Inc. 42
Vical Inc 15
VISX Inc 18
Wavien Inc 20
WJ Communications Inc 36
Xoma Ltd. 81
Xpoint Technologies Inc 23
Zircon Corp 23

Colorado

Atrix Laboratories Inc 32
Boulder Scientific Co 15

Colorado

Castle Rock Industries Inc 22
Cortech Inc 28
Displaytech Inc 21
Heska Corp. 67
Laser Technology Inc 28
NaPro Biotherapeutics Inc 20
Picolight Inc 19
Ramtron International Corp. 76
Ribozyme Pharmaceuticals Inc. 73
Symetrix Corp. 80

Connecticut

General Datacomm Industries Inc 44
Li Medical Technologies Inc 15
Neurogen Corp. 108
Pentron Corp 23
Precision Combustion Inc 16
Reflexite Corp 28
Walker Digital LLC 71

Delaware

MSE Inc. 69

Florida

Airnet Communications Corp 31
Arthrex Inc 25
Earth Resources Corp 21
Mainstream Engineering Corp 19
The Panda Project 20

Foreign

Pharmos Corp 19
Research Corporation Technologies 163
Silicon Image Inc 17
Vision-Sciences Inc 26

Georgia

Aer Energy Resources Inc 25
Fiberco Inc 27
Media Bin Inc 16
Petroferm Inc 44
Restorative Care Of America Inc 15
Tensar Corp 32
The Fanning Corp 17

Hawaii

Vivus Inc 17

Idaho

Beacon Light Products Inc 15

Illinois

Illinois

Aksys Ltd 29
Bunn-O-Matic Corp 24
Donlar Biosyntrex Corp 29
Etymotic Research Inc 20
General Kinematics Corp 17
Highland Supply Corp 20
ISCO International Inc 29
M & R Holdings Inc 16
Miner Enterprises Inc 18
Phoenix Closures Inc 20

Indiana

Indiana Mills & Mfg Inc 23
Thermwood Corp 23

Iowa

Lisle Corp 18
Musco Corp 15
Stine Seed Co. 32
Townsend Engineering Co 32

Kansas

Wcm Industries Inc 15

Maryland

Fusion Lighting Inc 35
Genvec Inc 16
Guilford Pharmaceuticals Inc. 55
IGEN Internaional, Inc. 56
Intracel Corp 22

Massachusetts

American Superconductor Corp 55
Autoimmune Inc 29
Biopure Corp 19
Curis Inc 51
Cybex International Inc 21
Dyax Corp 20
ETEX Corp 15
Exergen Corp 18
First Years Inc 15
Foster-Miller Inc 40
Hybridon, Inc. 71
Hyperion Catalysis International Inc 33
Kopin Corp 43
New England Biolabs Inc 43
Nitromed Inc 15
Opta Food Ingredients Inc 17
PLC Medical Systems Inc 17
Roll Systems Inc 26

Massachusetts

Satcon Technology Corp 23
Scansoft Inc 60
Sequenom Inc 17
Transkaryotic Therapies Inc 17
Vista Medical Technologies Inc 18

Michigan

Belanger Inc 17
EJ Brooks Co 33
Fabristeel Products Inc 23
Fisher & Company 21
Lumigen Inc 38
Marketing Displays Inc 21
Midwest Brake Bond Co 17
Nartron Corp 33
Proprietary Technology Inc 29
Tapco Intl Corp 43
Techco Corp 18
Weltronic/Technitron Corp 21

Minnesota

Anchor Wall Systems Inc 16
Angeion Corp. 57
Augustine Medical Inc. 54
Cantel Medical Corp 23
Cardiac Science Inc. 44
Medwave Inc 15
Multi-Tech Systems Inc 34
Nexen Group Inc 18
Optical Sensors Inc 20
Secure Computing Corp 18
St Croix Medical Inc 17
Stratasys Inc 16
Urologix Inc 27

Missouri

Novus International Inc 27
Young Innovations Inc 24

Nebraska

Isco Inc 44
Restoragen Inc 15

Nevada

Rocky Research 15
Valence Technology Inc. 88

New Hampshire

Concerto Software Inc 26
Deka Research & Development Corp 34

New Hampshire

Presstek Inc. 58

New Jersey

Alteon Inc 21
Automotive Technologies Int'l 30
B & G Plastics Inc 22
Base Ten Systems Inc 15
Celgene Corp 44
Enzon, Inc. 54
Immunomedics Inc 45
Kulite Semiconductor Products Inc 23
Opex Corp 16
Osteotech Inc 22
Synaptic Pharmaceutical Corp. 52

New Mexico

Radiant Technologies Inc 15

New York

Anvik Corp 18
Axiohm Transaction Solutions 40
Copytele Inc 19
eMagin Corp. 43
Emisphere Technologies Inc 46
Golden Bridge Technology Inc 27
InterDigital Communications Corp. 83
McGard Inc 17
Molecular Optoelectronics Corp 17
Multisorb Technologies Inc 24
National Molding Corp 36
Nutrition 21 Inc 32
Optex Communications Corp 16
Outrigger Inc 16
Penwest Pharmaceuticals Co 28
Reveo Inc 29
Standard Microsystems Corp 18
TII Network Technologies Inc 27
United Biomedical Inc 21

North Carolina

ABT Inc 15
Digital Optics Corp 26
Pharmagraphics Llc 19

Ohio

Advanced Ceramics Corp 18
Arthrocare Corp 32
Eltech Systems Corp 24
Glasstech Inc 32
Globe Products Inc 38

Ohio

Henny Penny Corp 22
iBiquity Digital Corp 18
Khyber Technologies Corp 16
MTD Products Inc. 58
Ohio Electronic Engravers Inc. 37
Ranpak Corp. 87
Winner Int'L Royalty Corp 19

Oregon

Bend Research Inc 20
Cascade Microtech Inc 16
Digimarc Corp 21
Endovascular Instruments Inc 18
Molecular Probes Inc 32
Warn Industries Inc 21

Pennsylvania

3-Dimensional Pharmaceuticals Inc 15
Accu-Sort Systems Inc 22
Adams Mfg Corp 17
Adolor Corp 19
Arlington Industries Inc. 29
Cell Pathways Inc. 37
Crucible Materials Corp 18
Frank Calandra Inc 21
Genaera Corp 27
Geo Specialty Chemicals Inc 23
Infectech Inc 27
Kensey Nash Corp 35
NeoStrata Inc 72
Tippins Inc 20
Trion Industries Inc 18

Rhode Island

Stem Cells Inc 31

South Carolina

Sawgrass Systems Inc 15

Texas

@Track Communications Inc 28
Active Power Inc 19
BAG Corp 25
Ball Semiconductor Inc. 21
Bionumerik Pharmaceuticals Inc. 47
Enchira Biotechnology Corp 20
Learn2Com Inc 17
Lynntech Inc. 33
Manhattan Scientifics Inc 18
Microfab Technologies Inc 17

Texas ----------

Pavilion Technologies Inc 16
Sachem Inc 16
SI Diamond Technology Inc 27
Sigmatel Inc 15
Silicon Laboratories Inc 15
Spinal Concepts Inc 18
Staktek Corp 36
Tanox Inc 23
Vari-Lite International Inc 21
Welker Engineering Co 16
Zonagen Inc 17

Utah ----------

Megadyne Medical Products Inc 17
Myriad Genetics Inc 27
Sarcos Inc 57
Specialized Health Products Inc 22

Vermont ----------

Burton Corp 30

Virginia ----------

American Research Corp Of Virginia 18
Face International Corp 25
Medical Solutions Inc 15

Washington ----------

Cell Therapeutics Inc 58
Coinstar Inc 15
Corixa Corp. 36
ICOS Corp 77
Light Sciences Lp 21
Medisystems Technology Corp 22
Metawave Communications Corp 25
Neorx Corp 51
Prolinx Inc 25
Schweitzer Engineering Laboratories Inc 21
TriPath Imaging Inc 79

Wisconsin ----------

Armament Systems & Procedures Inc 28
Beere Precision Medical Instruments Inc 15
Bone Care Int' L Inc 24
Ssi Technologies Inc 28
Third Wave Technologies Inc 15

Table 4 - Small firms listed by city in which they are most likely located (with # of patents 1996-2000)

Akron, OH	**MSA0080**
Khyber Technologies Corp	16
Albany-Schenectady-Troy, NY	**MSA0160**
Molecular Optoelectronics Corp	17
Albuquerque, NM	**MSA0200**
Radiant Technologies Inc	15
Ann Arbor, MI	**MSA0440**
Lumigen Inc	38
Appleton-Oshkosh-Neenah, WI	**MSA0460**
Armament Systems & Procedures Inc	28
Atlanta, GA	**MSA0520**
Aer Energy Resources Inc	25
Fiberco Inc	27
Media Bin Inc	16
Petroferm Inc	44
Restorative Care Of America Inc	15
Tensar Corp	32
The Fanning Corp	17
Austin-San Marcos, TX	**MSA0640**
Active Power Inc	19
Manhattan Scientifics Inc	18
Pavilion Technologies Inc	16
Sachem Inc	16
SI Diamond Technology Inc	27
Sigmatel Inc	15
Silicon Laboratories Inc	15
Spinal Concepts Inc	18
Staktek Corp	36
Baltimore, MD	**MSA0720**
Guilford Pharmaceuticals Inc.	55
Pharmos Corp	19
Bergen-Passaic, NJ	**MSA0875**
Kulite Semiconductor Products Inc	23
Bergen-Passaic, NJ	**MSA0875**
Synaptic Pharmaceutical Corp.	52
Binghamton, NY	**MSA0960**
Axiohm Transaction Solutions	40
Boise City, ID	**MSA1080**
Beacon Light Products Inc	15
Boston-Worcester-Lawrence-Lowell-Brockton, MA-NH	**MSA1123**
American Superconductor Corp	55
Autoimmune Inc	29
Biopure Corp	19
Concerto Software Inc	26
Curis Inc	51
Cybex International Inc	21
Deka Research & Development Corp	34
Dyax Corp	20
ETEX Corp	15
Exergen Corp	18
First Years Inc	15
Foster-Miller Inc	40
Hybridon, Inc.	71
Hyperion Catalysis International Inc	33
Kopin Corp	43
Media 100 Inc	29
New England Biolabs Inc	43
Nitromed Inc	15
Opta Food Ingredients Inc	17
PLC Medical Systems Inc	17
Presstek Inc.	58
Roll Systems Inc	26
Satcon Technology Corp	23
Scansoft Inc	60
Sequenom Inc	17
Transkaryotic Therapies Inc	17
Viasys Healthcare Inc.	42
Vision-Sciences Inc	26
Vista Medical Technologies Inc	18
Boulder-Longmont, CO	**MSA1125**

Boulder-Longmont, CO MSA1125

- Displaytech Inc 21
- Musco Corp 15
- NaPro Biotherapeutics Inc 20
- Picolight Inc 19
- Ribozyme Pharmaceuticals Inc. 73

Bryan-College Station, TX MSA1260

- Lynntech Inc. 33

Buffalo-Niagara Falls, NY MSA1280

- McGard Inc 17
- Multisorb Technologies Inc 24

Burlington, VT MSA1303

- Burton Corp 30

Charleston-North Charleston, SC MSA1440

- Sawgrass Systems Inc 15

Charlotte-Gastonia-Rock Hill, NC-SC MSA1520

- Digital Optics Corp 26

Chicago, IL MSA1600

- Aksys Ltd 29
- Donlar Biosyntrex Corp 29
- Etymotic Research Inc 20
- General Kinematics Corp 17
- ISCO International Inc 29
- M & R Holdings Inc 16
- Miner Enterprises Inc 18
- Phoenix Closures Inc 20

Cincinnati, OH-KY-IN MSA1640

- iBiquity Digital Corp 18
- Lisle Corp 18

Cleveland-Lorain-Elyria, OH MSA1680

- Advanced Ceramics Corp 18
- Eltech Systems Corp 24
- Lisle Corp 18
- MTD Products Inc. 58
- Ranpak Corp. 87

Columbus, OH MSA1840

- Arthrocare Corp 32

Dallas, TX MSA1920

- @Track Communications Inc 28
- Ball Semiconductor Inc. 21
- Microfab Technologies Inc 17
- Spinal Concepts Inc 18
- Vari-Lite International Inc 21

Dayton-Springfield, OH MSA2000

- Globe Products Inc 38
- Henny Penny Corp 22
- Ohio Electronic Engravers Inc. 37

Denver, CO MSA2080

- Castle Rock Industries Inc 22
- Cortech Inc 28
- Laser Technology Inc 28

Des Moines, IA MSA2120

- Stine Seed Co. 32
- Townsend Engineering Co 32

Detroit, MI MSA2160

- Belanger Inc 17
- EJ Brooks Co 33
- Fabristeel Products Inc 23
- Fisher & Company 21
- Marketing Displays Inc 21
- Midwest Brake Bond Co 17
- Nartron Corp 33
- Proprietary Technology Inc 29
- Tapco Intl Corp 43
- Techco Corp 18
- Weltronic/Technitron Corp 21

Dutchess County, NY MSA2281

- eMagin Corp. 43
- Penwest Pharmaceuticals Co 28

Eugene-Springfield, OR MSA2400

- Molecular Probes Inc 32

Fort Collins-Loveland, CO MSA2670

Fort Collins-Loveland, CO — MSA2670

Atrix Laboratories Inc	32
Boulder Scientific Co	15
Heska Corp.	67

Fort Lauderdale, FL — MSA2680

Winner Int'L Royalty Corp	19

Gainesville, FL — MSA2900

American Research Corp Of Virginia	18
Pharmos Corp	19

Greensboro--Winston-Salem--High Point, NC — MSA3120

Pharmagraphics Llc	19

Hartford, CT — MSA3283

Bend Research Inc	20
Reflexite Corp	28

Houston, TX — MSA3360

Enchira Biotechnology Corp	20
Learn2Com Inc	17
Tanox Inc	23
Welker Engineering Co	16
Zonagen Inc	17

Indianapolis, IN — MSA3480

Indiana Mills & Mfg Inc	23

Janesville-Beloit, WI — MSA3620

Ssi Technologies Inc	28

Kansas City, MO-KS — MSA3760

Wcm Industries Inc	15

Las Vegas, NV-AZ — MSA4120

Rocky Research	15
Valence Technology Inc.	88

Lexington, KY — MSA4280

ABT Inc	15

Lincoln, NE — MSA4360

Isco Inc	44

Lincoln, NE — MSA4360

Restoragen Inc	15

Los Angeles-Long Beach, CA — MSA4480

3D System Corp	72
Advanced Bionics Corp.	32
Aura Systems Inc	31
Bend Research Inc	20
Capstone Turbine Corp	30
Maxdem Inc	26
Physical Optics Corp.	42
Porter (Pl) Co	17
Ronald A Katz Technology Licensing Lp	15
Wavien Inc	20

Madison, WI — MSA4720

Bone Care Int'L Inc	24
Third Wave Technologies Inc	15

Melbourne-Titusville-Palm Bay, FL — MSA4900

Airnet Communications Corp	31
Mainstream Engineering Corp	19

Memphis, TN-AR-MS — MSA4920

Allen Engineering Corp	17

Middlesex-Somerset-Hunterdon, NJ — MSA5015

Celgene Corp	44
Enzon, Inc.	54

Minneapolis-St. Paul, MN-WI — MSA5120

Anchor Wall Systems Inc	16
Angeion Corp.	57
Augustine Medical Inc.	54
Cantel Medical Corp	23
Cardiac Science Inc.	44
Medwave Inc	15
Multi-Tech Systems Inc	34
Nexen Group Inc	18
Optical Sensors Inc	20
Secure Computing Corp	18
St Croix Medical Inc	17
Stratasys Inc	16
Urologix Inc	27

Monmouth-Ocean, NJ — MSA5190

Base Ten Systems Inc	15
Osteotech Inc	22

Naples, FL — MSA5345

Arthrex Inc	25

Nassau-Suffolk, NY — MSA5380

Copytele Inc	19
InterDigital Communications Corp.	83
National Molding Corp	36
Standard Microsystems Corp	18
TII Network Technologies Inc	27

New Haven-Bridgeport-Stamford-Waterbury-Danbury, CT — MSA5483

General Datacomm Industries Inc	44
Li Medical Technologies Inc	15
Neurogen Corp.	108
Pentron Corp	23
Precision Combustion Inc	16
Walker Digital LLC	71

New York, NY — MSA5600

Anvik Corp	18
Emisphere Technologies Inc	46
Golden Bridge Technology Inc	27
Nutrition 21 Inc	32
Outrigger Inc	16
Reveo Inc	29
United Biomedical Inc	21

Newark, NJ — MSA5640

Alteon Inc	21
Automotive Technologies Int' l	30
B & G Plastics Inc	22
Immunomedics Inc	45
Trion Industries Inc	18

Newburgh, NY-PA — MSA5660

Infectech Inc	27

Oakland, CA — MSA5775

Aradigm Corp.	55
Arcade Planet Inc	21
BioTime Inc	15

Oakland, CA — MSA5775

Cerus Corp	35
FormFactor Inc	32
Immersion Corp.	62
Onyx Pharmaceuticals Inc	27
Silicon Genesis Corp.	19
Xoma Ltd.	81

Orange County, CA — MSA5945

Applied Medical Resources Corp	44
Creative Integrated Systems Inc	16
GTCO Corp	17
ICU Medical Inc	19
Irvine Biomedical Inc	31
Masimo Corp	42
Maxdem Inc	26
Micro Therapeutics Inc.	38
Privatizer Systems Inc	15
Staar Surgical Co.	46
Universal Electronics Inc	19

Orlando, FL — MSA5960

Earth Resources Corp	21

Philadelphia, PA-NJ — MSA6160

3-Dimensional Pharmaceuticals Inc	15
Accu-Sort Systems Inc	22
Adolor Corp	19
Cell Pathways Inc.	37
Genaera Corp	27
Geo Specialty Chemicals Inc	23
Kensey Nash Corp	35
NeoStrata Inc	72
Opex Corp	16
Schweitzer Engineering Laboratories Inc	21

Pittsburgh, PA — MSA6280

Adams Mfg Corp	17
Crucible Materials Corp	18
Frank Calandra Inc	21
Tippins Inc	20

Portland-Vancouver, OR-WA — MSA6440

Cascade Microtech Inc	16
Digimarc Corp	21

Portland-Vancouver, OR-WA — MSA6440

Endovascular Instruments Inc	18
Warn Industries Inc	21

Providence-Warwick-Pawtucket, RI — MSA6483

Stem Cells Inc	31

Pueblo, CO — MSA6560

Ramtron International Corp.	76
Symetrix Corp.	80

Racine, WI — MSA6600

Beere Precision Medical Instruments Inc	15

Richmond-Petersburg, VA — MSA6760

Lisle Corp	18

Rochester, NY — MSA6840

Optex Communications Corp	16
Research Corporation Technologies	163

Sacramento, CA — MSA6920

Op-D-Op Inc	17

Salt Lake City-Ogden, UT — MSA7160

Megadyne Medical Products Inc	17
Myriad Genetics Inc	27
Sarcos Inc	57
Specialized Health Products Inc	22

San Antonio, TX — MSA7240

Bionumerik Pharmaceuticals Inc.	47

San Diego, CA — MSA7320

Advanced Tissue Sciences Inc	32
Alliance Pharmaceutical Corp.	94
Amylin Pharmaceuticals Inc	18
Anticancer Inc	18
Biosite Inc	25
Corvas International, Inc.	53
Diversa Corp	30
Epimmune Inc	27
Genta Inc	21
Immune Response Corp	23

San Diego, CA — MSA7320

Isis Pharmaceuticals Inc	306
Ligand Pharmaceuticals Inc.	82
Litel Instruments	22
Nanogen Inc	21
Peregrine Semiconductor Corp	16
Protein Polymer Technologies Inc	17
Quantum Group Inc	18
Quidel Corp	37
Stratagene Holding Corp	22
Texas Biotechnology Corp	20
Vical Inc	15

San Francisco, CA — MSA7360

Caliper Technologies Corp	50
Cell Genesys Inc	29
Cygnus Inc	31
Embol-X Inc.	40
Foveon Inc	34
Gemfire Corp	29
Geobiotics Inc	15
Geron Corp	37
Lynx Therapeutics Inc.	38
RITA Medical Systems Inc	26
Scientific Learning Corp	16
Telik Inc	28
Tularik Inc.	54

San Jose, CA — MSA7400

Affymax Inc.	67
Alliance Semiconductor Corp.	51
Ampex Corp	36
Aplus Flash Technology Inc	15
ArrayComm Inc	15
Arthrocare Corp	32
Candescent Technologies Corp.	123
Cardima Inc	27
CardioGenesis Corp.	53
Centaur Pharmaceuticals Inc	21
Cohesive Technologies Inc	23
Conductus Inc	15
Echelon Corp	24
Endotex Interventional Systems Inc	15
Endwave Corp	28
Essential Therapeutics Inc	19
Exar Corp.	51

San Jose, CA **MSA7400**

Flashpoint Technology Inc 22
Genelabs Technologies Inc 39
Globalstar LP 41
Health Hero Network Inc 28
Insmed Inc 32
Integrated Silicon Solution Inc 37
Levelite Technology Inc 18
Lexar Media Inc 21
Macrovision Corp 25
Membrane Technology & Research Inc 34
Micro Linear Corp. 42
Microunity Inc 33
Monolithic System Technology Inc 30
Neomagic Corp. 38
Oak Technology Inc. 44
Opti Inc 25
Pericom Semiconductor Corp 23
Pharmacyclics Inc 31
Programmable Microelectronics Corp 30
Quicklogic Corp. 51
Rambus Inc. 87
Sangstat Medical Corp 15
Silicon Genesis Corp. 19
Silicon Image Inc 17
SONICBlue 105
Synaptics Inc 28
Tessera Inc. 113
Transgenomic Inc 20
Ultratech Stepper Inc 19
VISX Inc 18
Vivus Inc 17
WJ Communications Inc 36
Xpoint Technologies Inc 23
Zircon Corp 23

Santa Barbara-Santa Maria-Lompoc, CA **MSA7480**

Computer Motion Inc 19
Khashoggi (E.) Industries 68
Superconductor Technologies Inc 18
Turbodyne Systems Inc 23

Scranton--Wilkes-Barre--Hazleton, PA **MSA7560**

Arlington Industries Inc. 29

Seattle-Bellevue-Everett, WA **MSA7600**

Cell Therapeutics Inc 58
Coinstar Inc 15
Corixa Corp. 36
ICOS Corp 77
Light Sciences Lp 21
Medisystems Technology Corp 22
Metawave Communications Corp 25
Neorx Corp 51
Prolinx Inc 25
Thermwood Corp 23
TriPath Imaging Inc 79

Sherman-Denison, TX **MSA7640**

BAG Corp 25

Springfield, IL **MSA7880**

Bunn-O-Matic Corp 24

St. Louis, MO-IL **MSA7040**

Highland Supply Corp 20
Novus International Inc 27
Young Innovations Inc 24

Tampa-St. Petersburg-Clearwater, FL **MSA8280**

Atrion Corp 37

Toledo, OH **MSA8400**

Glasstech Inc 32

Vallejo-Fairfield-Napa, CA **MSA8720**

Large Scale Biology Corp 28

Washington, DC-MD-VA-WV **MSA8840**

Face International Corp 25
Fusion Lighting Inc 35
Genvec Inc 16
IGEN Internaional, Inc. 56
Intracel Corp 22
Medical Solutions Inc 15

West Palm Beach-Boca Raton, FL **MSA8960**

The Panda Project 20

Wilmington-Newark, DE-MD	**MSA9160**
MSE Inc.	69
Yolo, CA	**MSA9270**
Agraquest Inc	16

Table 5 - Small firms listed by state with detail on the number of patents listing an inventor address in a state

Alabama ----------

Atrion Corp *37 patents 96-00*
- Alabama 26
- Florida 9
- Texas 4
- New Jersey 3
- Virginia 2

Arkansas ----------

Allen Engineering Corp *17 patents 96-00*
- Arkansas 17
- Tennessee 6

California ----------

3D System Corp *72 patents 96-00*
- California 59
- Texas 8
- Ohio 5
- Foreign 4
- Rhode Island 3
- Massachusetts 2
- Oregon 1

Advanced Bionics Corp. *32 patents 96-00*
- California 18
- Foreign 10
- Colorado 10
- Arizona 1

Advanced Tissue Sciences Inc *32 patents 96-00*
- California 24
- Vermont 8
- Georgia 3

Affymax Inc. *67 patents 96-00*
- California 67
- North Carolina 2
- Ohio 2
- Michigan 1
- New Jersey 1
- Pennsylvania 1

Agraquest Inc *16 patents 96-00*
- California 16
- Foreign 5

Alliance Pharmaceutical Corp. *94 patents 96-00*
- California 70
- Foreign 19
- Michigan 9
- New Jersey 5
- Pennsylvania 4
- Washington 2

California ----------

- New York 2
- Alabama 1
- District of Columbia 1
- Vermont 1

Alliance Semiconductor Corp. *51 patents 96-00*
- California 51

Ampex Corp *36 patents 96-00*
- California 35
- Texas 1
- New Mexico 1

Amylin Pharmaceuticals Inc *18 patents 96-00*
- California 17
- Foreign 3
- North Carolina 1
- Pennsylvania 1

Anticancer Inc *18 patents 96-00*
- California 18
- Ohio 4

Aplus Flash Technology Inc *15 patents 96-00*
- California 15
- Foreign 11

Applied Medical Resources Cor *44 patents 96-00*
- California 41
- Massachusetts 3
- Missouri 3
- Virginia 1

Aradigm Corp. *55 patents 96-00*
- California 50
- Massachusetts 4
- Foreign 2
- Washington 1

Arcade Planet Inc *21 patents 96-00*
- California 21
- Arizona 6
- Illinois 1

ArrayComm Inc *15 patents 96-00*
- California 15
- Foreign 4
- New York 3

Arthrocare Corp *32 patents 96-00*
- California 32
- Ohio 32

Aura Systems Inc *31 patents 96-00*
- California 23
- Illinois 4
- Oregon 4

California ----------

Virginia 2
Foreign 1

Biosite Inc *25 patents 96-00*
California 25

BioTime Inc *15 patents 96-00*
California 15

Caliper Technologies Corp *50 patents 96-00*
California 50

Candescent Technologies Corp. *123 patents 96-00*
California 123
Oregon 9
Maryland 6
Massachusetts 4
Connecticut 3
South Carolina 1

Capstone Turbine Corp *30 patents 96-00*
California 30
Arizona 1

Cardima Inc *27 patents 96-00*
California 27
North Carolina 10
Massachusetts 3

CardioGenesis Corp. *53 patents 96-00*
California 53
Wisconsin 3
Indiana 2
New Jersey 2
New York 2
Kentucky 1

Cell Genesys Inc *29 patents 96-00*
California 28
New York 7
Massachusetts 3
Foreign 2
Connecticut 2
North Carolina 2
Maryland 1
Missouri 1
Pennsylvania 1
Michigan 1
Virginia 1

Centaur Pharmaceuticals Inc *21 patents 96-00*
California 21
Maryland 2
Pennsylvania 1
Oklahoma 1

Cerus Corp *35 patents 96-00*
California 35
Foreign 2
Kentucky 2

Cohesive Technologies Inc *23 patents 96-00*
California 14

California ----------

Massachusetts 6
Colorado 2
New Mexico 1
Texas 1

Computer Motion Inc *19 patents 96-00*
California 18
Foreign 1

Conductus Inc *15 patents 96-00*
California 14
Foreign 1
North Carolina 1
Texas 1

Corvas International, Inc. *53 patents 96-00*
California 52
Foreign 16
Colorado 5
New Hampshire 3
Massachusetts 3

Creative Integrated Systems Inc *16 patents 96-00*
California 16
Foreign 4

Cygnus Inc *31 patents 96-00*
California 31
Washington 2
Massachusetts 1
Foreign 1
North Carolina 1
New Jersey 1
New York 1
Delaware 1
Michigan 1

Diversa Corp *30 patents 96-00*
California 19
Pennsylvania 8
New Jersey 6
Foreign 1
Delaware 1

Echelon Corp *24 patents 96-00*
California 24
Foreign 2

Embol-X Inc. *40 patents 96-00*
California 40
New York 11
Massachusetts 6
New Hampshire 6

Endotex Interventional Systems *15 patents 96-00*
California 14
Pennsylvania 2
South Carolina 1

Endwave Corp *28 patents 96-00*
California 28
Oregon 1

California ----------

Mississippi 1

Epimmune Inc 27 patents 96-00
California 27
Foreign 4
Massachusetts 4
New York 1

Essential Therapeutics Inc 19 patents 96-00
California 19
New Jersey 7

Exar Corp. 51 patents 96-00
California 50
Maryland 1

Flashpoint Technology Inc 22 patents 96-00
California 22
North Carolina 1

FormFactor Inc 32 patents 96-00
California 29
New York 4
Texas 2
New Hampshire 1

Foveon Inc 34 patents 96-00
California 34

Gemfire Corp 29 patents 96-00
California 29

Genelabs Technologies Inc 39 patents 96-00
California 35
Massachusetts 8
Oregon 5
Georgia 5
Foreign 5
Texas 2

Genta Inc 21 patents 96-00
California 19
Maryland 1
Foreign 1
Washington 1

Geobiotics Inc 15 patents 96-00
California 15

Geron Corp 37 patents 96-00
California 35
Foreign 5
Texas 4
Colorado 2
Washington 1

Globalstar LP 41 patents 96-00
California 41
Foreign 1

GTCO Corp 17 patents 96-00
California 9
Arizona 6
Maryland 2

Health Hero Network Inc 28 patents 96-00

California ----------

California 28
New Jersey 3

ICU Medical Inc 19 patents 96-00
California 19
Florida 2

Immersion Corp. 62 patents 96-00
California 57
New York 2
Michigan 2
Massachusetts 2
Maryland 1

Immune Response Corp 23 patents 96-00
California 18
Connecticut 3
Colorado 2
Pennsylvania 2
Vermont 1

Insmed Inc 32 patents 96-00
California 30
Virginia 2
Maryland 1
Alabama 1

Integrated Silicon Solution Inc 37 patents 96-00
California 37

Irvine Biomedical Inc 31 patents 96-00
California 31
Foreign 1

Isis Pharmaceuticals Inc 306 patents 96-00
California 301
Foreign 21
Maryland 10
Colorado 7
Texas 7
Massachusetts 6
Pennsylvania 2
Virginia 2
Illinois 1
Arizona 1
Alabama 1
Connecticut 1
New Jersey 1
North Carolina 1
Ohio 1
Washington 1

Khashoggi (E.) Industries 68 patents 96-00
California 66
Illinois 4
Virginia 1
Minnesota 1
Foreign 1

Large Scale Biology Corp 28 patents 96-00
California 25

California ----------

	Florida	4	
	District of Columbia	3	
	Virginia	3	
	Maryland	3	
Levelite Technology Inc		*18*	*patents 96-00*
	California	18	
Lexar Media Inc		*21*	*patents 96-00*
	California	21	
Ligand Pharmaceuticals Inc.		*82*	*patents 96-00*
	California	72	
	Foreign	9	
	Massachusetts	7	
	Colorado	3	
	Michigan	3	
	Wisconsin	3	
	Connecticut	3	
	New Hampshire	3	
	Florida	2	
	Pennsylvania	2	
	Texas	2	
	Oregon	2	
Litel Instruments		*22*	*patents 96-00*
	California	22	
Lynx Therapeutics Inc.		*38*	*patents 96-00*
	California	23	
	Foreign	20	
	Missouri	1	
Macrovision Corp		*25*	*patents 96-00*
	California	25	
	Foreign	1	
	Washington	1	
Masimo Corp		*42*	*patents 96-00*
	California	40	
	Colorado	7	
Maxdem Inc		*26*	*patents 96-00*
	California	26	
Media 100 Inc		*29*	*patents 96-00*
	California	14	
	Massachusetts	12	
	Pennsylvania	3	
	Foreign	2	
	Ohio	1	
	New Hampshire	1	
	Iowa	1	
Membrane Technology & Resea		*34*	*patents 96-00*
	California	34	
	Foreign	3	
	Oregon	1	
Micro Linear Corp.		*42*	*patents 96-00*
	California	42	
	Foreign	1	
	Florida	1	

California ----------

Micro Therapeutics Inc.		*38*	*patents 96-00*
	California	34	
	Florida	14	
	Minnesota	4	
	Ohio	3	
	Texas	1	
Microunity Inc		*33*	*patents 96-00*
	California	33	
Monolithic System Technology I		*30*	*patents 96-00*
	California	30	
Nanogen Inc		*21*	*patents 96-00*
	California	21	
Neomagic Corp.		*38*	*patents 96-00*
	California	35	
	Foreign	3	
Oak Technology Inc.		*44*	*patents 96-00*
	California	20	
	Massachusetts	12	
	New Hampshire	6	
	Florida	5	
	Texas	4	
Onyx Pharmaceuticals Inc		*27*	*patents 96-00*
	California	23	
	Foreign	6	
	Colorado	1	
Op-D-Op Inc		*17*	*patents 96-00*
	California	17	
Opti Inc		*25*	*patents 96-00*
	California	25	
Peregrine Semiconductor Corp		*16*	*patents 96-00*
	California	16	
	New Jersey	1	
Pericom Semiconductor Corp		*23*	*patents 96-00*
	California	23	
Pharmacyclics Inc		*31*	*patents 96-00*
	California	31	
	Texas	23	
	Foreign	4	
	Indiana	2	
	Virginia	1	
	Ohio	1	
Physical Optics Corp.		*42*	*patents 96-00*
	California	42	
Porter (Pl) Co		*17*	*patents 96-00*
	California	11	
	Indiana	6	
	Michigan	1	
Privatizer Systems Inc		*15*	*patents 96-00*
	California	12	
	Utah	8	
	Illinois	3	
	Ohio	3	

California ----------

Connecticut 3

Programmable Microelectronics *30 patents 96-00*
California 30
Foreign 1

Prolinx Inc *25 patents 96-00*
Washington 15
California 15

Protein Polymer Technologies I *17 patents 96-00*
California 17
Montana 3

Quantum Group Inc *18 patents 96-00*
California 16
Massachusetts 2
New York 1
Pennsylvania 1

Quicklogic Corp. *51 patents 96-00*
California 51
Washington 4

Quidel Corp *37 patents 96-00*
California 29
Oregon 7
Foreign 3
Massachusetts 1

Rambus Inc. *87 patents 96-00*
California 87
Oregon 1
Foreign 1

RITA Medical Systems Inc *26 patents 96-00*
California 26
Florida 1

Ronald A Katz Technology Lice *15 patents 96-00*
California 15

Sangstat Medical Corp *15 patents 96-00*
California 13
North Carolina 3
Foreign 2

Scientific Learning Corp *16 patents 96-00*
California 16
Pennsylvania 4
Illinois 1
Foreign 1

Silicon Genesis Corp. *19 patents 96-00*
California 15
Foreign 3
Massachusetts 3

SONICBlue *105 patents 96-00*
California 85
Texas 11
Washington 5
Oregon 4
Foreign 2
Arizona 1

California ----------

Ohio 1

Staar Surgical Co. *46 patents 96-00*
California 40
Foreign 6

Stratagene Holding Corp *22 patents 96-00*
California 22
Massachusetts 2
Georgia 1
Wyoming 1
Texas 1
New York 1

Superconductor Technologies In *18 patents 96-00*
California 18

Synaptics Inc *28 patents 96-00*
California 27
Foreign 1

Telik Inc *28 patents 96-00*
California 28
New York 4
Colorado 1
Massachusetts 1

Tessera Inc. *113 patents 96-00*
California 99
New York 18
Texas 9
Florida 2
Foreign 2
Minnesota 1
New Jersey 1
Rhode Island 1
Pennsylvania 1

Texas Biotechnology Corp *20 patents 96-00*
California 13
Texas 9
New York 2
Pennsylvania 1

Transgenomic Inc *20 patents 96-00*
California 13
Nebraska 9
Iowa 3
Foreign 1

Tularik Inc. *54 patents 96-00*
California 54
New York 1

Turbodyne Systems Inc *23 patents 96-00*
California 21
Texas 2
Foreign 2

Ultratech Stepper Inc *19 patents 96-00*
California 15
New Hampshire 3
Connecticut 1

California ----------

Michigan 1
Massachusetts 1

Universal Electronics Inc *19 patents 96-00*
California 18
Foreign 2

Viasys Healthcare Inc. *42 patents 96-00*
California 17
Massachusetts 16
Foreign 3
Illinois 3
New Hampshire 3
Colorado 2
Hawaii 2
Wisconsin 1
Kentucky 1

Vical Inc *15 patents 96-00*
California 15
Wisconsin 4
Illinois 2
Texas 1
Pennsylvania 1
Michigan 1
Oregon 1

VISX Inc *18 patents 96-00*
California 15
New York 2
New Jersey 1

Wavien Inc *20 patents 96-00*
California 20
Massachusetts 2

WJ Communications Inc *36 patents 96-00*
California 29
Maryland 6
Foreign 1
Illinois 1
Virginia 1

Xoma Ltd. *81 patents 96-00*
California 79
Virginia 5
Washington 4
Foreign 2
Texas 1

Xpoint Technologies Inc *23 patents 96-00*
California 22
Florida 1

Zircon Corp *23 patents 96-00*
California 22
Tennessee 1

Colorado ----------

Atrix Laboratories Inc *32 patents 96-00*
Colorado 24

Colorado ----------

Alabama 8
Texas 7
California 3
Foreign 1
Florida 1
New Jersey 1

Boulder Scientific Co *15 patents 96-00*
Colorado 15

Castle Rock Industries Inc *22 patents 96-00*
Colorado 16
North Carolina 12
Arizona 3
California 1
Ohio 1

Cortech Inc *28 patents 96-00*
Colorado 28
California 9
Pennsylvania 1
Oregon 1
Massachusetts 1
Arizona 1

Displaytech Inc *21 patents 96-00*
Colorado 17
Arizona 5
Foreign 2
New York 1
Washington 1
California 1
Wisconsin 1

Heska Corp. *67 patents 96-00*
Colorado 62
Foreign 5
Wisconsin 3
Massachusetts 3
Utah 1
Georgia 1
California 1

Laser Technology Inc *28 patents 96-00*
Colorado 27
California 1
Foreign 1
Florida 1

NaPro Biotherapeutics Inc *20 patents 96-00*
Colorado 14
Pennsylvania 8
New York 4
Foreign 4
Massachusetts 2

Picolight Inc *19 patents 96-00*
Colorado 19
Texas 4

Ramtron International Corp. *76 patents 96-00*

Colorado

Colorado	74
Foreign	7
California	3
Massachusetts	1
Mississippi	1

Ribozyme Pharmaceuticals Inc. — *73 patents 96-00*

Colorado	66
Ohio	5
Massachusetts	5
Foreign	4
Michigan	3
California	3
Alabama	2

Symetrix Corp. — *80 patents 96-00*

Colorado	78
Foreign	34
California	2
Arizona	1
Pennsylvania	1

Connecticut

General Datacomm Industries I — *44 patents 96-00*

Connecticut	28
Foreign	12
Massachusetts	2
New York	1
California	1
Texas	1
North Carolina	1

Li Medical Technologies Inc — *15 patents 96-00*

Connecticut	15
Ohio	1

Neurogen Corp. — *108 patents 96-00*

Connecticut	106
Foreign	4
California	3
Virginia	1
Texas	1
New Jersey	1
Maryland	1

Pentron Corp — *23 patents 96-00*

Connecticut	13
New Jersey	10

Precision Combustion Inc — *16 patents 96-00*

Connecticut	16
New Jersey	4
Maryland	1
New York	1

Reflexite Corp — *28 patents 96-00*

Connecticut	26
New York	3
Foreign	1

Connecticut

Walker Digital LLC — *71 patents 96-00*

Connecticut	71
Illinois	8
Minnesota	7
New Hampshire	1
New York	1

Delaware

MSE Inc. — *69 patents 96-00*

Delaware	58
Maryland	17
Pennsylvania	8
Montana	6
New Jersey	1
Arkansas	1
Foreign	1
Ohio	1

Florida

Airnet Communications Corp — *31 patents 96-00*

Florida	29
Arizona	1
California	1
New York	1

Arthrex Inc — *25 patents 96-00*

Florida	17
Texas	7
Foreign	6
Delaware	4
California	2
Tennessee	1
New Hampshire	1

Earth Resources Corp — *21 patents 96-00*

Florida	21
Georgia	2
Alabama	2
Texas	1

Mainstream Engineering Corp — *19 patents 96-00*

Florida	19
Maryland	1

The Panda Project — *20 patents 96-00*

Florida	20
California	6
Wyoming	1

Foreign

Pharmos Corp — *19 patents 96-00*

Foreign	18
Maryland	2
Florida	2
Massachusetts	1

Research Corporation Technolo — *163 patents 96-00*

Foreign	25

Foreign

Massachusetts	19
New York	19
California	16
Illinois	16
Texas	13
Oklahoma	11
Pennsylvania	10
Colorado	7
Maryland	6
New Jersey	6
Louisiana	6
Kentucky	6
Iowa	6
Indiana	6
Arizona	4
Virginia	4
Tennessee	4
Florida	4
Delaware	4
Alabama	4
Wisconsin	3
Minnesota	3
Michigan	3
Oregon	3
West Virginia	2
Rhode Island	2
Wyoming	1
Washington	1
Utah	1
South Carolina	1
Connecticut	1
Missouri	1

Silicon Image Inc — *17 patents 96-00*

Foreign	14
California	12

Vision-Sciences Inc — *26 patents 96-00*

Foreign	15
Massachusetts	9
New Jersey	2
Michigan	1
Mississippi	1
California	1
New Hampshire	1

Georgia

Aer Energy Resources Inc — *25 patents 96-00*

Georgia	25
Oregon	3
Ohio	1
Florida	1
Foreign	1
California	1

Georgia

Fiberco Inc — *27 patents 96-00*

Georgia	27
Delaware	3
Pennsylvania	3

Media Bin Inc — *16 patents 96-00*

Georgia	16
California	1

Petroferm Inc — *44 patents 96-00*

Georgia	40
New York	5
Florida	4
New Jersey	3
Foreign	1
Connecticut	1

Restorative Care Of America In — *15 patents 96-00*

Georgia	8
Florida	7
Texas	2

Tensar Corp — *32 patents 96-00*

Georgia	18
Illinois	6
South Carolina	5
North Carolina	4
Florida	2
Tennessee	2
Alabama	1
Minnesota	1
Oregon	1
Pennsylvania	1
West Virginia	1
Ohio	1

The Fanning Corp — *17 patents 96-00*

Georgia	17

Hawaii

Vivus Inc — *17 patents 96-00*

Hawaii	16
California	11
New Jersey	4
Colorado	2
Maryland	1

Idaho

Beacon Light Products Inc — *15 patents 96-00*

Idaho	15
Ohio	1

Illinois

Aksys Ltd — *29 patents 96-00*

Illinois	29
Massachusetts	3
Wyoming	1
Virginia	1

Illinois

Bunn-O-Matic Corp — *24 patents 96-00*
- Illinois 24

Donlar Biosyntrex Corp — *29 patents 96-00*
- Illinois 28
- South Carolina 2
- Minnesota 1
- Tennessee 1
- Texas 1
- Michigan 1

Etymotic Research Inc — *20 patents 96-00*
- Illinois 18
- California 7
- New Jersey 2
- Foreign 2
- Oregon 1
- New Hampshire 1

General Kinematics Corp — *17 patents 96-00*
- Illinois 17

Highland Supply Corp — *20 patents 96-00*
- Illinois 20
- Missouri 6

ISCO International Inc — *29 patents 96-00*
- Illinois 22
- Foreign 4
- California 4
- Colorado 2
- New Jersey 1
- Utah 1

M & R Holdings Inc — *16 patents 96-00*
- Illinois 16
- California 2

Miner Enterprises Inc — *18 patents 96-00*
- Illinois 13
- New York 3
- Wisconsin 2
- Indiana 1

Phoenix Closures Inc — *20 patents 96-00*
- Illinois 20

Indiana

Indiana Mills & Mfg Inc — *23 patents 96-00*
- Indiana 23
- Foreign 1

Thermwood Corp — *23 patents 96-00*
- Indiana 23
- Washington 1

Iowa

Lisle Corp — *18 patents 96-00*
- Iowa 17
- Kansas 2
- Ohio 2
- Foreign 1

Iowa

- Virginia 1

Musco Corp — *15 patents 96-00*
- Iowa 15
- Colorado 1

Stine Seed Co. — *32 patents 96-00*
- Iowa 32

Townsend Engineering Co — *32 patents 96-00*
- Iowa 29
- Foreign 13
- Florida 1
- North Carolina 1
- Wisconsin 1

Kansas

Wcm Industries Inc — *15 patents 96-00*
- Kansas 9
- Colorado 6

Maryland

Fusion Lighting Inc — *35 patents 96-00*
- Maryland 30
- Texas 3
- Massachusetts 3
- Illinois 1
- New York 1
- Virginia 1
- Foreign 1
- Pennsylvania 1

Genvec Inc — *16 patents 96-00*
- Maryland 16
- New York 3
- Virginia 2

Guilford Pharmaceuticals Inc. — *55 patents 96-00*
- Maryland 55
- Alabama 2
- Missouri 1

IGEN Internaional, Inc. — *56 patents 96-00*
- Maryland 47
- Virginia 16
- Massachusetts 7
- New Hampshire 5
- Foreign 5
- New Jersey 4
- Texas 3
- Nebraska 3
- Delaware 2
- California 2

Intracel Corp — *22 patents 96-00*
- Maryland 20
- Foreign 4
- Massachusetts 3
- Pennsylvania 3
- Washington 3

Maryland

West Virginia	2
Nebraska	1
Wisconsin	1

Massachusetts

American Superconductor Corp — 55 patents 96-00

Massachusetts	46
New Hampshire	9
Ohio	6
Foreign	4
Wisconsin	4
New York	3
Rhode Island	2
Washington	1

Autoimmune Inc — 29 patents 96-00

Massachusetts	29
Foreign	2
California	1
Maryland	1

Biopure Corp — 19 patents 96-00

Massachusetts	17
New Hampshire	4
South Carolina	4
Rhode Island	2
Texas	2

Curis Inc — 51 patents 96-00

Massachusetts	49
New Hampshire	15
California	6
Foreign	6
Pennsylvania	2
Maryland	1
Missouri	1

Cybex International Inc — 21 patents 96-00

Massachusetts	11
Pennsylvania	8
Colorado	6
California	2
Maine	2
Rhode Island	1
New York	1
Wisconsin	1

Dyax Corp — 20 patents 96-00

Massachusetts	11
Virginia	10
Maryland	10
California	1
Wisconsin	1

ETEX Corp — 15 patents 96-00

Massachusetts	15
Foreign	8
Rhode Island	2

Massachusetts

Exergen Corp — 18 patents 96-00

Massachusetts	18

First Years Inc — 15 patents 96-00

Massachusetts	14
Foreign	1
Rhode Island	1

Foster-Miller Inc — 40 patents 96-00

Massachusetts	39
Virginia	2
New Hampshire	2
Connecticut	1
Michigan	1
Foreign	1

Hybridon, Inc. — 71 patents 96-00

Massachusetts	70
Foreign	8
Alabama	1
Louisiana	1
Georgia	1
Rhode Island	1

Hyperion Catalysis Internationa — 33 patents 96-00

Massachusetts	29
Pennsylvania	10
New York	8
Foreign	5
Ohio	2
Maryland	1
California	1

Kopin Corp — 43 patents 96-00

Massachusetts	39
California	16
New York	1

New England Biolabs Inc — 43 patents 96-00

Massachusetts	43
New York	3
Pennsylvania	2
Foreign	1
Georgia	1
Illinois	1
New Hampshire	1
Arizona	1
Virginia	1

Nitromed Inc — 15 patents 96-00

Massachusetts	14
Foreign	5
Connecticut	1
California	1
Florida	1
Wisconsin	1

Opta Food Ingredients Inc — 17 patents 96-00

Massachusetts	17
Iowa	2

Massachusetts

PLC Medical Systems Inc — *17 patents 96-00*

Massachusetts	16
New Jersey	1
Foreign	1

Roll Systems Inc — *26 patents 96-00*

Massachusetts	20
Maine	7
New Hampshire	4
Connecticut	3

Satcon Technology Corp — *23 patents 96-00*

Massachusetts	16
New York	5
Ohio	2
Colorado	2
Foreign	2
New Hampshire	2
Maryland	1
California	1
Michigan	1
Pennsylvania	1

Scansoft Inc — *60 patents 96-00*

Massachusetts	41
Connecticut	7
Foreign	7
California	6
Minnesota	1
New York	1
Washington	1

Sequenom Inc — *17 patents 96-00*

Massachusetts	14
Foreign	8
California	2
Pennsylvania	1

Transkaryotic Therapies Inc — *17 patents 96-00*

Massachusetts	17

Vista Medical Technologies Inc — *18 patents 96-00*

Massachusetts	15
California	4

Michigan

Belanger Inc — *17 patents 96-00*

Michigan	17

EJ Brooks Co — *33 patents 96-00*

Michigan	18
New Jersey	10
Indiana	5
Colorado	2
Ohio	1
Nebraska	1

Fabristeel Products Inc — *23 patents 96-00*

Michigan	14
Foreign	13

Michigan

Ohio	1

Fisher & Company — *21 patents 96-00*

Michigan	21
New York	1

Lumigen Inc — *38 patents 96-00*

Michigan	38

Marketing Displays Inc — *21 patents 96-00*

Michigan	20
Foreign	2

Midwest Brake Bond Co — *17 patents 96-00*

Michigan	17

Nartron Corp — *33 patents 96-00*

Michigan	33
Wisconsin	2
Indiana	1

Proprietary Technology Inc — *29 patents 96-00*

Michigan	28
South Carolina	1

Tapco Intl Corp — *43 patents 96-00*

Michigan	39
Texas	3
Foreign	2

Techco Corp — *18 patents 96-00*

Michigan	18

Weltronic/Technitron Corp — *21 patents 96-00*

Michigan	10
Foreign	7
Ohio	3
Indiana	1
New Hampshire	1

Minnesota

Anchor Wall Systems Inc — *16 patents 96-00*

Minnesota	9
Wisconsin	7
Georgia	2

Angeion Corp. — *57 patents 96-00*

Minnesota	55
California	2
Massachusetts	2

Augustine Medical Inc. — *54 patents 96-00*

Minnesota	54
Florida	1

Cantel Medical Corp — *23 patents 96-00*

Minnesota	22
Foreign	2
Utah	1
Colorado	1

Cardiac Science Inc. — *44 patents 96-00*

Minnesota	43
California	2
Massachusetts	1

Minnesota

Medwave Inc — *15 patents 96-00*
- Minnesota 15

Multi-Tech Systems Inc — *34 patents 96-00*
- Minnesota 32
- California 12
- Foreign 2

Nexen Group Inc — *18 patents 96-00*
- Minnesota 17
- South Dakota 2
- Foreign 1
- Wisconsin 1

Optical Sensors Inc — *20 patents 96-00*
- Minnesota 18
- Washington 3
- California 3
- New Jersey 3
- Massachusetts 2
- South Dakota 1

Secure Computing Corp — *18 patents 96-00*
- Minnesota 16
- New Mexico 1
- Pennsylvania 1
- Foreign 1

St Croix Medical Inc — *17 patents 96-00*
- Minnesota 17

Stratasys Inc — *16 patents 96-00*
- Minnesota 10
- New York 7
- Arizona 2
- New Jersey 1

Urologix Inc — *27 patents 96-00*
- Minnesota 26
- Wyoming 5
- Washington 3
- Arizona 1

Missouri

Novus International Inc — *27 patents 96-00*
- Missouri 22
- Texas 3
- Georgia 3
- Foreign 2
- Michigan 2
- Wisconsin 1

Young Innovations Inc — *24 patents 96-00*
- Missouri 19
- California 4
- Minnesota 1
- Idaho 1

Nebraska

Isco Inc — *44 patents 96-00*
- Nebraska 39

Nebraska

- Oregon 6
- Pennsylvania 4
- Texas 4
- Massachusetts 2
- Maryland 1
- Oklahoma 1
- Foreign 1
- California 1

Restoragen Inc — *15 patents 96-00*
- Nebraska 15
- Florida 5
- Connecticut 4
- Massachusetts 2

Nevada

Rocky Research — *15 patents 96-00*
- Nevada 12
- Illinois 2
- Foreign 2
- Wisconsin 2
- Nebraska 1
- Arkansas 1

Valence Technology Inc. — *88 patents 96-00*
- Nevada 61
- California 25
- Foreign 9
- Maryland 4
- Massachusetts 4
- Georgia 2
- Washington 2
- New York 2
- Idaho 1
- West Virginia 1

New Hampshire

Concerto Software Inc — *26 patents 96-00*
- New Hampshire 14
- Massachusetts 12
- Texas 7
- California 6
- Missouri 6

Deka Research & Development — *34 patents 96-00*
- New Hampshire 34
- Massachusetts 9
- Maine 4
- California 3
- Oregon 1
- Rhode Island 1

Presstek Inc. — *58 patents 96-00*
- New Hampshire 44
- Massachusetts 23
- Florida 4
- Arizona 4

New Hampshire

New York	2
Foreign	1
Washington	1

New Jersey

Alteon Inc — *21 patents 96-00*

New Jersey	21
New York	15
Massachusetts	7
Connecticut	2

Automotive Technologies Int'l — *30 patents 96-00*

New Jersey	30
Missouri	16
California	10
Michigan	4
New York	2

B & G Plastics Inc — *22 patents 96-00*

New Jersey	22

Base Ten Systems Inc — *15 patents 96-00*

New Jersey	14
New York	8
Pennsylvania	6

Celgene Corp — *44 patents 96-00*

New Jersey	29
California	15
Foreign	1
Pennsylvania	1
Vermont	1
Delaware	1

Enzon, Inc. — *54 patents 96-00*

New Jersey	48
Maryland	8
California	5
Pennsylvania	5
Georgia	3
Foreign	2
Florida	1
New York	1

Immunomedics Inc — *45 patents 96-00*

New Jersey	45
Foreign	1

Kulite Semiconductor Products — *23 patents 96-00*

New Jersey	23
New York	8

Opex Corp — *16 patents 96-00*

New Jersey	15
Pennsylvania	4
Foreign	1
Delaware	1
California	1

Osteotech Inc — *22 patents 96-00*

New Jersey	15

New Jersey

Foreign	6
Pennsylvania	2
Georgia	1

Synaptic Pharmaceutical Corp. — *52 patents 96-00*

New Jersey	52
New York	25
California	5
Pennsylvania	3
Delaware	2
Illinois	1
Connecticut	1

New Mexico

Radiant Technologies Inc — *15 patents 96-00*

New Mexico	14
Virginia	1

New York

Anvik Corp — *18 patents 96-00*

New York	17
New Jersey	7
Connecticut	4

Axiohm Transaction Solutions — *40 patents 96-00*

New York	31
California	4
Foreign	3
Wyoming	3
Colorado	2
Kentucky	1
Minnesota	1

Copytele Inc — *19 patents 96-00*

New York	15
Pennsylvania	10
New Jersey	2

eMagin Corp. — *43 patents 96-00*

New York	27
North Carolina	9
Washington	9
California	2

Emisphere Technologies Inc — *46 patents 96-00*

New York	46
Connecticut	32
New Jersey	5

Golden Bridge Technology Inc — *27 patents 96-00*

New York	22
New Jersey	15
Massachusetts	5
Foreign	1

InterDigital Communications C — *83 patents 96-00*

New York	57
New Jersey	12
Pennsylvania	12
California	10

New York

Foreign	5	
Virginia	3	
West Virginia	2	
Washington	2	
Massachusetts	1	
McGard Inc	*17*	*patents 96-00*
New York	17	
Molecular Optoelectronics Corp	*17*	*patents 96-00*
New York	16	
Foreign	1	
Multisorb Technologies Inc	*24*	*patents 96-00*
New York	24	
Michigan	2	
National Molding Corp	*36*	*patents 96-00*
New York	35	
California	4	
Illinois	1	
Nutrition 21 Inc	*32*	*patents 96-00*
New York	19	
California	10	
Connecticut	8	
Foreign	2	
Virginia	1	
New Jersey	1	
Optex Communications Corp	*16*	*patents 96-00*
New York	15	
Maryland	2	
New Jersey	1	
Outrigger Inc	*16*	*patents 96-00*
New York	16	
Connecticut	1	
Penwest Pharmaceuticals Co	*28*	*patents 96-00*
New York	28	
Foreign	13	
Connecticut	2	
Iowa	1	
Reveo Inc	*29*	*patents 96-00*
New York	29	
Connecticut	1	
Pennsylvania	1	
Maine	1	
Standard Microsystems Corp	*18*	*patents 96-00*
New York	12	
California	5	
Texas	2	
Vermont	1	
Massachusetts	1	
TII Network Technologies Inc	*27*	*patents 96-00*
New York	24	
Florida	1	
Arizona	1	
New Jersey	1	

New York

United Biomedical Inc	*21*	*patents 96-00*
New York	17	
Foreign	6	
New Jersey	1	

North Carolina

ABT Inc	*15*	*patents 96-00*
North Carolina	12	
Foreign	2	
Kentucky	1	
Digital Optics Corp	*26*	*patents 96-00*
North Carolina	26	
Pennsylvania	2	
New Jersey	1	
Pharmagraphics Llc	*19*	*patents 96-00*
North Carolina	19	
Illinois	14	

Ohio

Advanced Ceramics Corp	*18*	*patents 96-00*
Ohio	16	
Foreign	2	
Arthrocare Corp	*32*	*patents 96-00*
California	32	
Ohio	32	
Eltech Systems Corp	*24*	*patents 96-00*
Ohio	24	
Texas	2	
Foreign	1	
Massachusetts	1	
Glasstech Inc	*32*	*patents 96-00*
Ohio	32	
Michigan	8	
Globe Products Inc	*38*	*patents 96-00*
Ohio	37	
Washington	1	
Henny Penny Corp	*22*	*patents 96-00*
Ohio	21	
Indiana	2	
iBiquity Digital Corp	*18*	*patents 96-00*
Ohio	9	
Illinois	6	
Maryland	3	
Khyber Technologies Corp	*16*	*patents 96-00*
Ohio	16	
MTD Products Inc.	*58*	*patents 96-00*
Ohio	57	
Wisconsin	1	
Ohio Electronic Engravers Inc.	*37*	*patents 96-00*
Ohio	37	
Florida	3	
Ranpak Corp.	*87*	*patents 96-00*
Ohio	78	

Ohio

Washington	8
Foreign	4
Texas	3
District of Columbia	1
Pennsylvania	1

Winner Int'L Royalty Corp — *19 patents 96-00*

Ohio	10
Florida	8
Pennsylvania	2
Foreign	1

Oregon

Bend Research Inc — *20 patents 96-00*

Oregon	20
Connecticut	1
California	1

Cascade Microtech Inc — *16 patents 96-00*

Oregon	16
Washington	4

Digimarc Corp — *21 patents 96-00*

Oregon	17
Massachusetts	4
Washington	4

Endovascular Instruments Inc — *18 patents 96-00*

Oregon	17
Washington	1

Molecular Probes Inc — *32 patents 96-00*

Oregon	32
California	3
Minnesota	1
Foreign	1
North Carolina	1
Alaska	1

Warn Industries Inc — *21 patents 96-00*

Oregon	18
Washington	5
Michigan	4
California	1
Kentucky	1

Pennsylvania

3-Dimensional Pharmaceuticals — *15 patents 96-00*

Pennsylvania	14
New Jersey	12
Illinois	2

Accu-Sort Systems Inc — *22 patents 96-00*

Pennsylvania	22
New Jersey	6

Adams Mfg Corp — *17 patents 96-00*

Pennsylvania	17
Ohio	1

Adolor Corp — *19 patents 96-00*

Pennsylvania	18
New Jersey	7
Minnesota	2
California	1

Pennsylvania

Arlington Industries Inc. — *29 patents 96-00*

Pennsylvania	29
Florida	6

Cell Pathways Inc. — *37 patents 96-00*

Pennsylvania	34
Arizona	14
California	13
Colorado	7
Ohio	3
Foreign	2
Alabama	1

Crucible Materials Corp — *18 patents 96-00*

Pennsylvania	17
New York	3

Frank Calandra Inc — *21 patents 96-00*

Pennsylvania	20
Missouri	7
West Virginia	7
New York	1
Foreign	1
Minnesota	1
Kentucky	1

Genaera Corp — *27 patents 96-00*

Pennsylvania	27
New Jersey	8
Illinois	4
New York	3
Kentucky	2
Delaware	1

Geo Specialty Chemicals Inc — *23 patents 96-00*

Pennsylvania	13
South Carolina	8
North Carolina	7
Georgia	3
New Jersey	2
Foreign	2
Delaware	1

Infectech Inc — *27 patents 96-00*

Pennsylvania	26
New York	1

Kensey Nash Corp — *35 patents 96-00*

Pennsylvania	26
Minnesota	8
California	2
Colorado	1
Foreign	1

NeoStrata Inc — *72 patents 96-00*

Pennsylvania	71
New Jersey	1

Pennsylvania

Tippins Inc — *20 patents 96-00*
- Pennsylvania 20
- Ohio 1

Trion Industries Inc — *18 patents 96-00*
- Pennsylvania 15
- New Jersey 14
- Foreign 1

Rhode Island

Stem Cells Inc — *31 patents 96-00*
- Rhode Island 30
- Massachusetts 18
- Foreign 13
- Pennsylvania 7
- Oregon 2
- Alabama 1
- Arizona 1
- Illinois 1
- Wisconsin 1

South Carolina

Sawgrass Systems Inc — *15 patents 96-00*
- South Carolina 15

Texas

@Track Communications Inc — *28 patents 96-00*
- Texas 28
- Wisconsin 1

Active Power Inc — *19 patents 96-00*
- Texas 19

BAG Corp — *25 patents 96-00*
- Texas 25

Ball Semiconductor Inc. — *21 patents 96-00*
- Texas 19
- Foreign 9

Bionumerik Pharmaceuticals In — *47 patents 96-00*
- Texas 47

Enchira Biotechnology Corp — *20 patents 96-00*
- Texas 18
- North Dakota 2
- Washington 2
- New Hampshire 1
- Foreign 1
- Pennsylvania 1
- Massachusetts 1

Learn2Com Inc — *17 patents 96-00*
- Texas 16
- Colorado 1

Lynntech Inc. — *33 patents 96-00*
- Texas 33
- California 3

Manhattan Scientifics Inc — *18 patents 96-00*
- Texas 18

Texas

- Utah 1
- Washington 1
- Colorado 1

Microfab Technologies Inc — *17 patents 96-00*
- Texas 17

Pavilion Technologies Inc — *16 patents 96-00*
- Texas 16

Sachem Inc — *16 patents 96-00*
- Texas 15
- Oklahoma 2
- Missouri 1
- Illinois 1

SI Diamond Technology Inc — *27 patents 96-00*
- Texas 26
- Michigan 6
- Oregon 3
- Colorado 3
- Foreign 1

Sigmatel Inc — *15 patents 96-00*
- Texas 15

Silicon Laboratories Inc — *15 patents 96-00*
- Texas 15

Spinal Concepts Inc — *18 patents 96-00*
- Texas 11
- New Jersey 6
- Foreign 1

Staktek Corp — *36 patents 96-00*
- Texas 36

Tanox Inc — *23 patents 96-00*
- Texas 19
- Foreign 4
- New Jersey 4
- California 1

Vari-Lite International Inc — *21 patents 96-00*
- Texas 21

Welker Engineering Co — *16 patents 96-00*
- Texas 15
- Alabama 1

Zonagen Inc — *17 patents 96-00*
- Texas 10
- Nebraska 6
- Connecticut 1
- Massachusetts 1

Utah

Megadyne Medical Products Inc — *17 patents 96-00*
- Utah 15
- Colorado 3
- Oklahoma 1

Myriad Genetics Inc — *27 patents 96-00*
- Utah 27
- Foreign 5

Utah

North Carolina	4	
Pennsylvania	3	
Sarcos Inc	*57*	*patents 96-00*
Utah	57	
Specialized Health Products Inc	*22*	*patents 96-00*
Utah	22	

Vermont

Burton Corp	*30*	*patents 96-00*
Vermont	25	
Foreign	5	
Oregon	1	

Virginia

American Research Corp Of Vir	*18*	*patents 96-00*
Virginia	18	
Florida	10	
North Carolina	2	
Face International Corp	*25*	*patents 96-00*
Virginia	25	
California	1	
Medical Solutions Inc	*15*	*patents 96-00*
Virginia	15	
Maryland	11	

Washington

Cell Therapeutics Inc	*58*	*patents 96-00*
Washington	58	
Pennsylvania	2	
Colorado	1	
Coinstar Inc	*15*	*patents 96-00*
Washington	14	
California	4	
Indiana	1	
Corixa Corp.	*36*	*patents 96-00*
Washington	18	
California	11	
Florida	4	
Michigan	4	
Montana	3	
Foreign	2	
Nebraska	1	
New York	1	
Tennessee	1	
ICOS Corp	*77*	*patents 96-00*
Washington	65	
Foreign	11	
California	11	
Massachusetts	6	
Tennessee	3	
Oregon	3	
Pennsylvania	2	
Utah	1	

Washington

New York	1	
Light Sciences Lp	*21*	*patents 96-00*
Washington	21	
Arizona	12	
New Mexico	1	
Medisystems Technology Corp	*22*	*patents 96-00*
Washington	21	
Illinois	8	
California	1	
Metawave Communications Cor	*25*	*patents 96-00*
Washington	24	
California	1	
Neorx Corp	*51*	*patents 96-00*
Washington	44	
Foreign	11	
Alabama	2	
Michigan	1	
Missouri	1	
Prolinx Inc	*25*	*patents 96-00*
Washington	15	
California	15	
Schweitzer Engineering Laborat	*21*	*patents 96-00*
Washington	20	
Idaho	8	
Pennsylvania	1	
TriPath Imaging Inc	*79*	*patents 96-00*
Washington	58	
New York	8	
Massachusetts	6	
Foreign	5	
Colorado	4	
North Carolina	3	
California	3	
Illinois	3	

Wisconsin

Armament Systems & Procedure	*28*	*patents 96-00*
Wisconsin	28	
Texas	1	
Beere Precision Medical Instru	*15*	*patents 96-00*
Wisconsin	15	
Bone Care Int'L Inc	*24*	*patents 96-00*
Wisconsin	23	
Illinois	8	
Foreign	4	
Iowa	3	
Kentucky	3	
Ssi Technologies Inc	*28*	*patents 96-00*
Wisconsin	21	
Michigan	5	
Illinois	3	
Oklahoma	3	

Wisconsin ----------

California 1

Third Wave Technologies Inc *15 patents 96-00*

Wisconsin 15

California 1

Table 6 - Small firms listed by city with detail on the number of patents listing an inventor address in a city

Akron, OH

Khyber Technologies Corp — *16 patents 96-00*
- Akron, OH — 16
- Canton-Massillon, OH — 3

Albany-Schenectady-Troy, NY

Molecular Optoelectronics Co — *17 patents 96-00*
- Albany-Schenectady-Troy, NY — 16

Albuquerque, NM

Radiant Technologies Inc — *15 patents 96-00*
- Albuquerque, NM — 14
- Richmond-Petersburg, VA — 1

Ann Arbor, MI

Lumigen Inc — *38 patents 96-00*
- Ann Arbor, MI — 24
- Detroit, MI — 22

Appleton-Oshkosh-Neenah, WI

Armament Systems & Procedu — *28 patents 96-00*
- Appleton-Oshkosh-Neenah, WI — 28
- Dallas, TX — 1

Atlanta, GA

Aer Energy Resources Inc — *25 patents 96-00*
- Atlanta, GA — 25
- Los Angeles-Long Beach, CA — 1
- Cleveland-Lorain-Elyria, OH — 1

Fiberco Inc — *27 patents 96-00*
- Atlanta, GA — 22
- Wilmington-Newark, DE-MD — 3
- Philadelphia, PA-NJ — 3

Media Bin Inc — *16 patents 96-00*
- Atlanta, GA — 16
- San Jose, CA — 1

Petroferm Inc — *44 patents 96-00*
- Atlanta, GA — 40
- Jacksonville, FL — 4
- Nassau-Suffolk, NY — 4
- Middlesex-Somerset-Hunterdon, NJ — 2
- Bergen-Passaic, NJ — 1
- Glens Falls, NY — 1
- New Haven-Bridgeport-Stamford-Waterbury-Da — 1

Restorative Care Of America I — *15 patents 96-00*
- Atlanta, GA — 8
- Tampa-St. Petersburg-Clearwater, FL — 7
- Fort Worth-Arlington, TX — 2

Tensar Corp — *32 patents 96-00*
- Atlanta, GA — 18
- Chicago, IL — 6

Atlanta, GA

- Greenville-Spartanburg-Anderson, SC — 5
- Greensboro--Winston-Salem--High Point, NC — 4
- Johnson City-Kingsport-Bristol, TN-VA — 2
- Orlando, FL — 2
- Mobile, AL — 1
- Cincinnati, OH-KY-IN — 1
- Salem, OR — 1
- Minneapolis-St. Paul, MN-WI — 1

The Fanning Corp — *17 patents 96-00*
- Atlanta, GA — 17

Austin-San Marcos, TX

Active Power Inc — *19 patents 96-00*
- Austin-San Marcos, TX — 19

Manhattan Scientifics Inc — *18 patents 96-00*
- Austin-San Marcos, TX — 18
- Spokane, WA — 1
- Pueblo, CO — 1

Pavilion Technologies Inc — *16 patents 96-00*
- Austin-San Marcos, TX — 16

Sachem Inc — *16 patents 96-00*
- Austin-San Marcos, TX — 15
- Chicago, IL — 1
- St. Louis, MO-IL — 1

SI Diamond Technology Inc — *27 patents 96-00*
- Austin-San Marcos, TX — 18
- Houston, TX — 10
- San Antonio, TX — 8
- Detroit, MI — 6
- Boulder-Longmont, CO — 3
- Portland-Vancouver, OR-WA — 3

Sigmatel Inc — *15 patents 96-00*
- Austin-San Marcos, TX — 15
- Dallas, TX — 2

Silicon Laboratories Inc — *15 patents 96-00*
- Austin-San Marcos, TX — 15

Spinal Concepts Inc — *18 patents 96-00*
- Dallas, TX — 7
- Austin-San Marcos, TX — 7
- Middlesex-Somerset-Hunterdon, NJ — 6
- Newark, NJ — 5
- Bergen-Passaic, NJ — 5

Staktek Corp — *36 patents 96-00*
- Austin-San Marcos, TX — 35

Baltimore, MD

Guilford Pharmaceuticals Inc. — *55 patents 96-00*
- Baltimore, MD — 55

Baltimore, MD

- Birmingham, AL 2
- St. Louis, MO-IL 1

Pharmos Corp *19 patents 96-00*

- Gainesville, FL 2
- Baltimore, MD 2
- Boston-Worcester-Lawrence-Lowell-Brockton, 1

Bergen-Passaic, NJ

Kulite Semiconductor Product *23 patents 96-00*

- Bergen-Passaic, NJ 23
- New York, NY 8
- Middlesex-Somerset-Hunterdon, NJ 1
- Jersey City, NJ 1

Synaptic Pharmaceutical Corp *52 patents 96-00*

- Bergen-Passaic, NJ 50
- New York, NY 25
- Newark, NJ 10
- Trenton, NJ 8
- Middlesex-Somerset-Hunterdon, NJ 7
- Oakland, CA 5
- Philadelphia, PA-NJ 3
- Wilmington-Newark, DE-MD 2
- New Haven-Bridgeport-Stamford-Waterbury-Da 1
- Chicago, IL 1

Binghamton, NY

Axiohm Transaction Solutions *40 patents 96-00*

- Binghamton, NY 4
- Albany-Schenectady-Troy, NY 2
- San Diego, CA 2
- Los Angeles-Long Beach, CA 2
- Denver, CO 2
- Syracuse, NY 1
- Minneapolis-St. Paul, MN-WI 1
- Lexington, KY 1

Boise City, ID

Beacon Light Products Inc *15 patents 96-00*

- Boise City, ID 15
- Columbus, OH 1

Boston-Worcester-Lawrence-Lowell-Brockt

American Superconductor Cor *55 patents 96-00*

- Boston-Worcester-Lawrence-Lowell-Brockton, 49
- Madison, WI 4
- Cleveland-Lorain-Elyria, OH 3
- Albany-Schenectady-Troy, NY 3
- Columbus, OH 2
- Providence-Warwick-Pawtucket, RI 2
- Cincinnati, OH-KY-IN 1

Autoimmune Inc *29 patents 96-00*

- Boston-Worcester-Lawrence-Lowell-Brockton, 29
- Washington, DC-MD-VA-WV 1
- San Jose, CA 1

Biopure Corp *19 patents 96-00*

Boston-Worcester-Lawrence-Lowell-Brockt

- Boston-Worcester-Lawrence-Lowell-Brockton, 17
- Columbia, SC 4
- Lubbock, TX 2
- Providence-Warwick-Pawtucket, RI 2

Concerto Software Inc *26 patents 96-00*

- Boston-Worcester-Lawrence-Lowell-Brockton, 19
- Dallas, TX 7
- St. Louis, MO-IL 6
- Fort Worth-Arlington, TX 6
- San Jose, CA 6

Curis Inc *51 patents 96-00*

- Boston-Worcester-Lawrence-Lowell-Brockton, 49
- San Francisco, CA 5
- Oakland, CA 3
- Philadelphia, PA-NJ 2
- Washington, DC-MD-VA-WV 1
- San Diego, CA 1
- St. Louis, MO-IL 1
- San Jose, CA 1

Cybex International Inc *21 patents 96-00*

- Boston-Worcester-Lawrence-Lowell-Brockton, 11
- Sharon, PA 8
- Pueblo, CO 6
- Portland, ME 2
- Orange County, CA 2
- Providence-Warwick-Pawtucket, RI 1
- Nassau-Suffolk, NY 1
- Madison, WI 1

Deka Research & Developmen *34 patents 96-00*

- Boston-Worcester-Lawrence-Lowell-Brockton, 34
- Portland, ME 4
- San Jose, CA 2
- Portland-Vancouver, OR-WA 1
- San Francisco, CA 1
- Providence-Warwick-Pawtucket, RI 1

Dyax Corp *20 patents 96-00*

- Boston-Worcester-Lawrence-Lowell-Brockton, 11
- Washington, DC-MD-VA-WV 10
- Richmond-Petersburg, VA 7
- Charlottesville, VA 2
- San Francisco, CA 1
- Madison, WI 1

ETEX Corp *15 patents 96-00*

- Boston-Worcester-Lawrence-Lowell-Brockton, 15
- Barnstable-Yarmouth, MA 2
- Providence-Warwick-Pawtucket, RI 2

Exergen Corp *18 patents 96-00*

- Boston-Worcester-Lawrence-Lowell-Brockton, 18

First Years Inc *15 patents 96-00*

- Boston-Worcester-Lawrence-Lowell-Brockton, 14
- Providence-Warwick-Pawtucket, RI 1

Foster-Miller Inc *40 patents 96-00*

Boston-Worcester-Lawrence-Lowell-Brockt

- Boston-Worcester-Lawrence-Lowell-Brockton, 38
- Detroit, MI 1
- Hartford, CT 1
- Washington, DC-MD-VA-WV 1

Hybridon, Inc. *71 patents 96-00*

- Boston-Worcester-Lawrence-Lowell-Brockton, 70
- Birmingham, AL 1
- Providence-Warwick-Pawtucket, RI 1
- Atlanta, GA 1
- New Orleans, LA 1

Hyperion Catalysis Internatio *33 patents 96-00*

- Boston-Worcester-Lawrence-Lowell-Brockton, 28
- Philadelphia, PA-NJ 10
- New York, NY 3
- Akron, OH 2
- Washington, DC-MD-VA-WV 1
- Oakland, CA 1
- Springfield, MA 1

Kopin Corp *43 patents 96-00*

- Boston-Worcester-Lawrence-Lowell-Brockton, 39
- San Jose, CA 6
- Rochester, NY 1

Media 100 Inc *29 patents 96-00*

- Boston-Worcester-Lawrence-Lowell-Brockton, 12
- San Jose, CA 11
- Santa Cruz-Watsonville, CA 4
- Oakland, CA 4
- San Francisco, CA 3
- Reading, PA 3
- Toledo, OH 1
- Davenport-Moline-Rock Island, IA-IL 1

New England Biolabs Inc *43 patents 96-00*

- Boston-Worcester-Lawrence-Lowell-Brockton, 43
- New York, NY 3
- Philadelphia, PA-NJ 2
- Washington, DC-MD-VA-WV 1
- Atlanta, GA 1
- Champaign-Urbana, IL 1

Nitromed Inc *15 patents 96-00*

- Boston-Worcester-Lawrence-Lowell-Brockton, 14
- San Diego, CA 1
- Madison, WI 1

Opta Food Ingredients Inc *17 patents 96-00*

- Boston-Worcester-Lawrence-Lowell-Brockton, 17
- Sioux City, IA-NE 2

PLC Medical Systems Inc *17 patents 96-00*

- Boston-Worcester-Lawrence-Lowell-Brockton, 16
- Philadelphia, PA-NJ 1

Presstek Inc. *58 patents 96-00*

- Boston-Worcester-Lawrence-Lowell-Brockton, 50
- Tucson, AZ 3
- Melbourne-Titusville-Palm Bay, FL 2

Boston-Worcester-Lawrence-Lowell-Brockt

- New York, NY 2
- Orlando, FL 2
- Seattle-Bellevue-Everett, WA 1

Roll Systems Inc *26 patents 96-00*

- Boston-Worcester-Lawrence-Lowell-Brockton, 20
- Hartford, CT 3

Satcon Technology Corp *23 patents 96-00*

- Boston-Worcester-Lawrence-Lowell-Brockton, 16
- New York, NY 5
- Colorado Springs, CO 2
- Cleveland-Lorain-Elyria, OH 2
- Santa Barbara-Santa Maria-Lompoc, CA 1
- Pittsburgh, PA 1
- Ann Arbor, MI 1
- Washington, DC-MD-VA-WV 1

Scansoft Inc *60 patents 96-00*

- Boston-Worcester-Lawrence-Lowell-Brockton, 41
- New Haven-Bridgeport-Stamford-Waterbury-Da 6
- San Jose, CA 5
- Oakland, CA 3
- San Francisco, CA 2
- Springfield, MA 1
- Seattle-Bellevue-Everett, WA 1
- New London-Norwich, CT 1
- Rochester, NY 1

Sequenom Inc *17 patents 96-00*

- Boston-Worcester-Lawrence-Lowell-Brockton, 14
- San Diego, CA 2
- Johnstown, PA 1

Transkaryotic Therapies Inc *17 patents 96-00*

- Boston-Worcester-Lawrence-Lowell-Brockton, 17

Viasys Healthcare Inc. *42 patents 96-00*

- Boston-Worcester-Lawrence-Lowell-Brockton, 16
- Orange County, CA 14
- Riverside-San Bernardino, CA 10
- Springfield, MA 3
- Los Angeles-Long Beach, CA 3
- Chicago, IL 3
- Denver, CO 2
- Madison, WI 1
- Boulder-Longmont, CO 1
- Lexington, KY 1
- Honolulu, HI 1

Vision-Sciences Inc *26 patents 96-00*

- Boston-Worcester-Lawrence-Lowell-Brockton, 9
- Bergen-Passaic, NJ 2
- Oakland, CA 1
- Detroit, MI 1

Vista Medical Technologies In *18 patents 96-00*

- Boston-Worcester-Lawrence-Lowell-Brockton, 15
- San Diego, CA 2
- Los Angeles-Long Beach, CA 2

Boston-Worcester-Lawrence-Lowell-Brockt

Springfield, MA 1

Boulder-Longmont, CO

Displaytech Inc *21 patents 96-00*

Boulder-Longmont, CO 17
Tucson, AZ 5
Pueblo, CO 3
Denver, CO 2
Seattle-Bellevue-Everett, WA 1
New York, NY 1
Los Angeles-Long Beach, CA 1
Madison, WI 1

Musco Corp *15 patents 96-00*

Boulder-Longmont, CO 1

NaPro Biotherapeutics Inc *20 patents 96-00*

Boulder-Longmont, CO 14
Philadelphia, PA-NJ 7
Greeley, CO 4
Denver, CO 4
New York, NY 2
Nassau-Suffolk, NY 2
Boston-Worcester-Lawrence-Lowell-Brockton, 1

Picolight Inc *19 patents 96-00*

Boulder-Longmont, CO 19
Lubbock, TX 3
Austin-San Marcos, TX 1

Ribozyme Pharmaceuticals Inc *73 patents 96-00*

Boulder-Longmont, CO 66
Cleveland-Lorain-Elyria, OH 5
Boston-Worcester-Lawrence-Lowell-Brockton, 5
Ann Arbor, MI 3
Oakland, CA 2
Fort Collins-Loveland, CO 2
Birmingham, AL 2
Denver, CO 1
San Diego, CA 1

Bryan-College Station, TX

Lynntech Inc. *33 patents 96-00*

Bryan-College Station, TX 32
Houston, TX 12
San Jose, CA 3
Austin-San Marcos, TX 3

Buffalo-Niagara Falls, NY

McGard Inc *17 patents 96-00*

Buffalo-Niagara Falls, NY 16

Multisorb Technologies Inc *24 patents 96-00*

Buffalo-Niagara Falls, NY 24
Jamestown, NY 3
Grand Rapids-Muskegon-Holland, MI 2

Burlington, VT

Burton Corp *30 patents 96-00*

Burlington, VT 22

Burlington, VT

Portland-Vancouver, OR-WA 1

Charleston-North Charleston, SC

Sawgrass Systems Inc *15 patents 96-00*

Charleston-North Charleston, SC 15

Charlotte-Gastonia-Rock Hill, NC-SC

Digital Optics Corp *26 patents 96-00*

Charlotte-Gastonia-Rock Hill, NC-SC 26
Harrisburg-Lebanon-Carlisle, PA 2
York, PA 1
Newark, NJ 1

Chicago, IL

Aksys Ltd *29 patents 96-00*

Chicago, IL 29
Boston-Worcester-Lawrence-Lowell-Brockton, 3

Donlar Biosyntrex Corp *29 patents 96-00*

Chicago, IL 28
Greenville-Spartanburg-Anderson, SC 2
Houston, TX 1
Rochester, MN 1
Knoxville, TN 1
Lansing-East Lansing, MI 1

Etymotic Research Inc *20 patents 96-00*

Chicago, IL 18
San Jose, CA 5
San Diego, CA 2
Newark, NJ 2
San Francisco, CA 1
Boston-Worcester-Lawrence-Lowell-Brockton, 1

General Kinematics Corp *17 patents 96-00*

Chicago, IL 16

ISCO International Inc *29 patents 96-00*

Chicago, IL 18
Boulder-Longmont, CO 2
Los Angeles-Long Beach, CA 2
San Jose, CA 2
Denver, CO 2
Middlesex-Somerset-Hunterdon, NJ 1
Newark, NJ 1
Salt Lake City-Ogden, UT 1

M & R Holdings Inc *16 patents 96-00*

Chicago, IL 16
San Diego, CA 2

Miner Enterprises Inc *18 patents 96-00*

Chicago, IL 13
Buffalo-Niagara Falls, NY 3
Racine, WI 2
Milwaukee-Waukesha, WI 2
Kenosha, WI 2
Gary, IN 1

Phoenix Closures Inc *20 patents 96-00*

Chicago, IL 19
Kankakee, IL 1

Cincinnati, OH-KY-IN

iBiquity Digital Corp — *18 patents 96-00*
- Cincinnati, OH-KY-IN 9
- Champaign-Urbana, IL 6
- Baltimore, MD 3
- Hamilton-Middletown, OH 1

Lisle Corp — *18 patents 96-00*
- Richmond-Petersburg, VA 1
- Cleveland-Lorain-Elyria, OH 1
- Cincinnati, OH-KY-IN 1

Cleveland-Lorain-Elyria, OH

Advanced Ceramics Corp — *18 patents 96-00*
- Cleveland-Lorain-Elyria, OH 16
- Akron, OH 1

Eltech Systems Corp — *24 patents 96-00*
- Cleveland-Lorain-Elyria, OH 24
- Houston, TX 2
- Boston-Worcester-Lawrence-Lowell-Brockton, 1

Lisle Corp — *18 patents 96-00*
- Richmond-Petersburg, VA 1
- Cincinnati, OH-KY-IN 1
- Cleveland-Lorain-Elyria, OH 1

MTD Products Inc. — *58 patents 96-00*
- Cleveland-Lorain-Elyria, OH 54
- Youngstown-Warren, OH 2
- Mansfield, OH 2
- Akron, OH 2
- Racine, WI 1

Ranpak Corp. — *87 patents 96-00*
- Cleveland-Lorain-Elyria, OH 70
- Columbus, OH 10
- Seattle-Bellevue-Everett, WA 8
- Dallas, TX 3
- Washington, DC-MD-VA-WV 1
- Pittsburgh, PA 1

Columbus, OH

Arthrocare Corp — *32 patents 96-00*
- San Jose, CA 32
- Columbus, OH 32
- Oakland, CA 6
- San Francisco, CA 2
- San Diego, CA 2

Dallas, TX

@Track Communications Inc — *28 patents 96-00*
- Dallas, TX 28
- Fort Worth-Arlington, TX 15
- Madison, WI 1

Ball Semiconductor Inc. — *21 patents 96-00*
- Dallas, TX 17

Microfab Technologies Inc — *17 patents 96-00*
- Dallas, TX 17

Spinal Concepts Inc — *18 patents 96-00*
- Austin-San Marcos, TX 7

Dallas, TX

- Dallas, TX 7
- Middlesex-Somerset-Hunterdon, NJ 6
- Newark, NJ 5
- Bergen-Passaic, NJ 5

Vari-Lite International Inc — *21 patents 96-00*
- Dallas, TX 21
- Fort Worth-Arlington, TX 4
- Austin-San Marcos, TX 1

Dayton-Springfield, OH

Globe Products Inc — *38 patents 96-00*
- Dayton-Springfield, OH 33
- Cincinnati, OH-KY-IN 11
- Seattle-Bellevue-Everett, WA 1

Henny Penny Corp — *22 patents 96-00*
- Dayton-Springfield, OH 14
- Hamilton-Middletown, OH 1

Ohio Electronic Engravers Inc — *37 patents 96-00*
- Dayton-Springfield, OH 37
- Cincinnati, OH-KY-IN 9
- Fort Lauderdale, FL 3

Denver, CO

Castle Rock Industries Inc — *22 patents 96-00*
- Denver, CO 15
- Fort Collins-Loveland, CO 2
- Orange County, CA 1

Cortech Inc — *28 patents 96-00*
- Denver, CO 28
- San Diego, CA 9
- Boulder-Longmont, CO 7
- San Francisco, CA 1
- Boston-Worcester-Lawrence-Lowell-Brockton, 1
- Pittsburgh, PA 1
- Tucson, AZ 1

Laser Technology Inc — *28 patents 96-00*
- Denver, CO 27
- San Francisco, CA 1
- Fort Walton Beach, FL 1

Des Moines, IA

Stine Seed Co. — *32 patents 96-00*
- Des Moines, IA 32

Townsend Engineering Co — *32 patents 96-00*
- Des Moines, IA 29
- Madison, WI 1
- Fort Myers-Cape Coral, FL 1

Detroit, MI

Belanger Inc — *17 patents 96-00*
- Detroit, MI 17
- Flint, MI 1

EJ Brooks Co — *33 patents 96-00*
- Detroit, MI 17
- Ann Arbor, MI 13

Detroit, MI

- Newark, NJ 10
- Bergen-Passaic, NJ 5
- Fort Wayne, IN 4
- Middlesex-Somerset-Hunterdon, NJ 2
- Canton-Massillon, OH 1
- Columbus, OH 1
- Omaha, NE-IA 1

Fabristeel Products Inc — *23 patents 96-00*
- Detroit, MI 12
- Ann Arbor, MI 2
- Cleveland-Lorain-Elyria, OH 1

Fisher & Company — *21 patents 96-00*
- Detroit, MI 15
- New York, NY 1

Marketing Displays Inc — *21 patents 96-00*
- Detroit, MI 19

Midwest Brake Bond Co — *17 patents 96-00*
- Detroit, MI 17

Nartron Corp — *33 patents 96-00*
- Detroit, MI 4
- Ann Arbor, MI 2
- Racine, WI 2
- Grand Rapids-Muskegon-Holland, MI 1

Proprietary Technology Inc — *29 patents 96-00*
- Detroit, MI 27

Tapco Intl Corp — *43 patents 96-00*
- Detroit, MI 39
- Ann Arbor, MI 3
- Houston, TX 3

Techco Corp — *18 patents 96-00*
- Detroit, MI 18

Weltronic/Technitron Corp — *21 patents 96-00*
- Detroit, MI 10
- Toledo, OH 3
- Boston-Worcester-Lawrence-Lowell-Brockton, 1
- Lafayette, IN 1

Dutchess County, NY

eMagin Corp. — *43 patents 96-00*
- Dutchess County, NY 24
- Albany-Schenectady-Troy, NY 18
- Raleigh-Durham-Chapel Hill, NC 9
- Seattle-Bellevue-Everett, WA 8
- Portland-Vancouver, OR-WA 5
- Oakland, CA 1

Penwest Pharmaceuticals Co — *28 patents 96-00*
- Dutchess County, NY 28
- Cedar Rapids, IA 1
- New York, NY 1

Eugene-Springfield, OR

Molecular Probes Inc — *32 patents 96-00*
- Eugene-Springfield, OR 31
- Corvallis, OR 4

Eugene-Springfield, OR

- San Francisco, CA 1
- Sacramento, CA 1
- Duluth-Superior, MN-WI 1
- Raleigh-Durham-Chapel Hill, NC 1
- Vallejo-Fairfield-Napa, CA 1
- Minneapolis-St. Paul, MN-WI 1

Fort Collins-Loveland, CO

Atrix Laboratories Inc — *32 patents 96-00*
- Fort Collins-Loveland, CO 24
- Birmingham, AL 8
- Houston, TX 7
- San Jose, CA 3
- San Francisco, CA 3
- Tampa-St. Petersburg-Clearwater, FL 1
- Denver, CO 1
- Bergen-Passaic, NJ 1

Boulder Scientific Co — *15 patents 96-00*
- Fort Collins-Loveland, CO 8
- Boulder-Longmont, CO 5
- Greeley, CO 4

Heska Corp. — *67 patents 96-00*
- Fort Collins-Loveland, CO 62
- Greeley, CO 17
- Boston-Worcester-Lawrence-Lowell-Brockton, 3
- Milwaukee-Waukesha, WI 2
- Boulder-Longmont, CO 2
- Denver, CO 1
- Atlanta, GA 1
- San Jose, CA 1
- San Francisco, CA 1
- Sacramento, CA 1
- Madison, WI 1

Fort Lauderdale, FL

Winner Int'L Royalty Corp — *19 patents 96-00*
- Fort Lauderdale, FL 8
- Cleveland-Lorain-Elyria, OH 6
- Akron, OH 5
- Youngstown-Warren, OH 2
- Sharon, PA 2

Gainesville, FL

American Research Corp Of V — *18 patents 96-00*
- Gainesville, FL 10
- Tampa-St. Petersburg-Clearwater, FL 4
- Raleigh-Durham-Chapel Hill, NC 2

Pharmos Corp — *19 patents 96-00*
- Gainesville, FL 2
- Baltimore, MD 2
- Boston-Worcester-Lawrence-Lowell-Brockton, 1

Greensboro--Winston-Salem--High Point, N

Pharmagraphics Llc — *19 patents 96-00*
- Greensboro--Winston-Salem--High Point, NC 19

Greensboro--Winston-Salem--High Point, N

Chicago, IL 14

Hartford, CT

Bend Research Inc *20 patents 96-00*

Hartford, CT 1

Los Angeles-Long Beach, CA 1

Reflexite Corp *28 patents 96-00*

Hartford, CT 22

New Haven-Bridgeport-Stamford-Waterbury-Da 6

New York, NY 1

Rochester, NY 1

Houston, TX

Enchira Biotechnology Corp *20 patents 96-00*

Houston, TX 18

Grand Forks, ND-MN 2

Boston-Worcester-Lawrence-Lowell-Brockton, 2

Seattle-Bellevue-Everett, WA 2

Philadelphia, PA-NJ 1

Learn2Com Inc *17 patents 96-00*

Houston, TX 16

Denver, CO 1

Tanox Inc *23 patents 96-00*

Houston, TX 19

Middlesex-Somerset-Hunterdon, NJ 4

San Diego, CA 1

Welker Engineering Co *16 patents 96-00*

Houston, TX 12

Birmingham, AL 1

Zonagen Inc *17 patents 96-00*

Houston, TX 10

Lincoln, NE 6

New Haven-Bridgeport-Stamford-Waterbury-Da 1

Indianapolis, IN

Indiana Mills & Mfg Inc *23 patents 96-00*

Indianapolis, IN 23

Kokomo, IN 1

Janesville-Beloit, WI

Ssi Technologies Inc *28 patents 96-00*

Janesville-Beloit, WI 17

Madison, WI 7

Detroit, MI 5

Chicago, IL 3

Oklahoma City, OK 3

San Jose, CA 1

Ann Arbor, MI 1

Kansas City, MO-KS

Wcm Industries Inc *15 patents 96-00*

Kansas City, MO-KS 9

Pueblo, CO 6

Denver, CO 1

Las Vegas, NV-AZ

Rocky Research *15 patents 96-00*

Las Vegas, NV-AZ

Las Vegas, NV-AZ 12

Rockford, IL 2

Little Rock-North Little Rock, AR 1

Valence Technology Inc. *88 patents 96-00*

Las Vegas, NV-AZ 61

San Jose, CA 21

Boston-Worcester-Lawrence-Lowell-Brockton, 4

Baltimore, MD 4

Vallejo-Fairfield-Napa, CA 3

Seattle-Bellevue-Everett, WA 2

Rochester, NY 2

Atlanta, GA 2

Washington, DC-MD-VA-WV 1

Boise City, ID 1

Lexington, KY

ABT Inc *15 patents 96-00*

Lexington, KY 1

Lincoln, NE

Isco Inc *44 patents 96-00*

Lincoln, NE 37

Houston, TX 4

Pittsburgh, PA 4

Brazoria, TX 2

Boston-Worcester-Lawrence-Lowell-Brockton, 2

Omaha, NE-IA 2

Oklahoma City, OK 1

Portland-Vancouver, OR-WA 1

Oakland, CA 1

Restoragen Inc *15 patents 96-00*

Lincoln, NE 15

Gainesville, FL 3

Boston-Worcester-Lawrence-Lowell-Brockton, 2

Omaha, NE-IA 1

Los Angeles-Long Beach, CA

3D System Corp *72 patents 96-00*

Los Angeles-Long Beach, CA 56

San Jose, CA 18

Ventura, CA 14

Austin-San Marcos, TX 8

Akron, OH 5

Cleveland-Lorain-Elyria, OH 5

Providence-Warwick-Pawtucket, RI 3

Houston, TX 2

Boston-Worcester-Lawrence-Lowell-Brockton, 2

Riverside-San Bernardino, CA 1

Orange County, CA 1

Portland-Vancouver, OR-WA 1

Sacramento, CA 1

Santa Cruz-Watsonville, CA 1

Advanced Bionics Corp. *32 patents 96-00*

Los Angeles-Long Beach, CA 13

Denver, CO 10

Los Angeles-Long Beach, CA

- San Jose, CA 4
- Yolo, CA 2
- Ventura, CA 2
- Phoenix-Mesa, AZ 1
- Orange County, CA 1

Aura Systems Inc — *31 patents 96-00*

- Los Angeles-Long Beach, CA 20
- Orange County, CA 8
- Portland-Vancouver, OR-WA 4
- St. Louis, MO-IL 4
- Ventura, CA 2

Bend Research Inc — *20 patents 96-00*

- Hartford, CT 1
- Los Angeles-Long Beach, CA 1

Capstone Turbine Corp — *30 patents 96-00*

- Los Angeles-Long Beach, CA 26
- Ventura, CA 6
- Orange County, CA 4
- San Diego, CA 3
- Phoenix-Mesa, AZ 1

Maxdem Inc — *26 patents 96-00*

- Los Angeles-Long Beach, CA 26
- Orange County, CA 26

Physical Optics Corp. — *42 patents 96-00*

- Los Angeles-Long Beach, CA 41
- Orange County, CA 14
- Santa Rosa, CA 3
- San Diego, CA 1
- Bakersfield, CA 1
- Ventura, CA 1
- Yolo, CA 1

Porter (Pl) Co — *17 patents 96-00*

- Los Angeles-Long Beach, CA 8
- Indianapolis, IN 6
- Ventura, CA 2
- Yolo, CA 1
- Detroit, MI 1

Ronald A Katz Technology Lic — *15 patents 96-00*

- Los Angeles-Long Beach, CA 15

Wavien Inc — *20 patents 96-00*

- Los Angeles-Long Beach, CA 16
- Ventura, CA 6
- Orange County, CA 2
- Santa Rosa, CA 1
- Santa Cruz-Watsonville, CA 1
- Oakland, CA 1
- Boston-Worcester-Lawrence-Lowell-Brockton, 1
- San Jose, CA 1

Madison, WI

Bone Care Int'L Inc — *24 patents 96-00*

- Madison, WI 23
- Chicago, IL 8

Madison, WI

- Lexington, KY 3

Third Wave Technologies Inc — *15 patents 96-00*

- Madison, WI 15
- Los Angeles-Long Beach, CA 1

Melbourne-Titusville-Palm Bay, FL

Airnet Communications Corp — *31 patents 96-00*

- Melbourne-Titusville-Palm Bay, FL 24
- New York, NY 1
- San Jose, CA 1
- Phoenix-Mesa, AZ 1

Mainstream Engineering Corp — *19 patents 96-00*

- Melbourne-Titusville-Palm Bay, FL 18
- Daytona Beach, FL 1
- Baltimore, MD 1

Memphis, TN-AR-MS

Allen Engineering Corp — *17 patents 96-00*

- Memphis, TN-AR-MS 6

Middlesex-Somerset-Hunterdon, NJ

Celgene Corp — *44 patents 96-00*

- Middlesex-Somerset-Hunterdon, NJ 28
- San Diego, CA 15
- Newark, NJ 15
- Jersey City, NJ 2
- Philadelphia, PA-NJ 1
- Trenton, NJ 1
- Burlington, VT 1
- Wilmington-Newark, DE-MD 1

Enzon, Inc. — *54 patents 96-00*

- Middlesex-Somerset-Hunterdon, NJ 46
- Monmouth-Ocean, NJ 14
- Trenton, NJ 13
- Washington, DC-MD-VA-WV 8
- Philadelphia, PA-NJ 5
- Oakland, CA 3
- Atlanta, GA 3
- Newark, NJ 3
- Nassau-Suffolk, NY 1

Minneapolis-St. Paul, MN-WI

Anchor Wall Systems Inc — *16 patents 96-00*

- Minneapolis-St. Paul, MN-WI 12
- Atlanta, GA 2

Angeion Corp. — *57 patents 96-00*

- Minneapolis-St. Paul, MN-WI 55
- Duluth-Superior, MN-WI 6
- Ventura, CA 2
- Boston-Worcester-Lawrence-Lowell-Brockton, 2
- St. Cloud, MN 1

Augustine Medical Inc. — *54 patents 96-00*

- Minneapolis-St. Paul, MN-WI 53
- Daytona Beach, FL 1

Cantel Medical Corp — *23 patents 96-00*

Minneapolis-St. Paul, MN-WI

- Minneapolis-St. Paul, MN-WI 22
- Denver, CO 1
- Duluth-Superior, MN-WI 1
- Salt Lake City-Ogden, UT 1

Cardiac Science Inc. *44 patents 96-00*

- Minneapolis-St. Paul, MN-WI 43
- Los Angeles-Long Beach, CA 2
- Boston-Worcester-Lawrence-Lowell-Brockton, 1

Medwave Inc *15 patents 96-00*

- Minneapolis-St. Paul, MN-WI 15

Multi-Tech Systems Inc *34 patents 96-00*

- Minneapolis-St. Paul, MN-WI 31
- San Jose, CA 12

Nexen Group Inc *18 patents 96-00*

- Minneapolis-St. Paul, MN-WI 17

Optical Sensors Inc *20 patents 96-00*

- Minneapolis-St. Paul, MN-WI 18
- Middlesex-Somerset-Hunterdon, NJ 3
- Seattle-Bellevue-Everett, WA 3
- San Francisco, CA 2
- Oakland, CA 2
- Boston-Worcester-Lawrence-Lowell-Brockton, 2
- Rapid City, SD 1
- Orange County, CA 1

Secure Computing Corp *18 patents 96-00*

- Minneapolis-St. Paul, MN-WI 16
- Philadelphia, PA-NJ 1
- Albuquerque, NM 1

St Croix Medical Inc *17 patents 96-00*

- Minneapolis-St. Paul, MN-WI 17

Stratasys Inc *16 patents 96-00*

- Minneapolis-St. Paul, MN-WI 10
- New York, NY 7
- Tucson, AZ 2
- Monmouth-Ocean, NJ 1
- Dutchess County, NY 1
- Middlesex-Somerset-Hunterdon, NJ 1
- Trenton, NJ 1

Urologix Inc *27 patents 96-00*

- Minneapolis-St. Paul, MN-WI 25
- Duluth-Superior, MN-WI 11
- St. Cloud, MN 3
- Seattle-Bellevue-Everett, WA 3
- Phoenix-Mesa, AZ 1

Monmouth-Ocean, NJ

Base Ten Systems Inc *15 patents 96-00*

- Monmouth-Ocean, NJ 10
- Philadelphia, PA-NJ 8
- New York, NY 8
- Trenton, NJ 4
- Newark, NJ 2

Osteotech Inc *22 patents 96-00*

Monmouth-Ocean, NJ

- Monmouth-Ocean, NJ 15
- Philadelphia, PA-NJ 5
- Atlanta, GA 1

Naples, FL

Arthrex Inc *25 patents 96-00*

- Naples, FL 17
- San Antonio, TX 5
- Wilmington-Newark, DE-MD 4
- Houston, TX 2
- San Francisco, CA 2
- Jackson, TN 1
- Boston-Worcester-Lawrence-Lowell-Brockton, 1

Nassau-Suffolk, NY

Copytele Inc *19 patents 96-00*

- Nassau-Suffolk, NY 15
- Allentown-Bethlehem-Easton, PA 10
- New York, NY 2
- Monmouth-Ocean, NJ 2

InterDigital Communications *83 patents 96-00*

- Nassau-Suffolk, NY 57
- Philadelphia, PA-NJ 13
- San Diego, CA 10
- New York, NY 6
- Monmouth-Ocean, NJ 3
- Washington, DC-MD-VA-WV 3
- Scranton--Wilkes-Barre--Hazleton, PA 2
- Portland-Vancouver, OR-WA 2
- Newark, NJ 2
- Barnstable-Yarmouth, MA 1
- Jersey City, NJ 1

National Molding Corp *36 patents 96-00*

- Nassau-Suffolk, NY 35
- Riverside-San Bernardino, CA 3
- Chicago, IL 1
- Santa Rosa, CA 1

Standard Microsystems Corp *18 patents 96-00*

- Nassau-Suffolk, NY 10
- Orange County, CA 5
- New York, NY 4
- Austin-San Marcos, TX 2
- San Diego, CA 2
- Boston-Worcester-Lawrence-Lowell-Brockton, 1

TII Network Technologies Inc *27 patents 96-00*

- Nassau-Suffolk, NY 24
- Orlando, FL 1
- Phoenix-Mesa, AZ 1

New Haven-Bridgeport-Stamford-Waterbur

General Datacomm Industries *44 patents 96-00*

- New Haven-Bridgeport-Stamford-Waterbury-Da 24
- Hartford, CT 4
- New York, NY 1
- Raleigh-Durham-Chapel Hill, NC 1

New Haven-Bridgeport-Stamford-Waterbur

Dallas, TX 1
Orange County, CA 1
Boston-Worcester-Lawrence-Lowell-Brockton, 1

Li Medical Technologies Inc *15 patents 96-00*
New Haven-Bridgeport-Stamford-Waterbury-Da 15
Cincinnati, OH-KY-IN 1

Neurogen Corp. *108 patents 96-00*
New Haven-Bridgeport-Stamford-Waterbury-Da 96
Hartford, CT 69
Los Angeles-Long Beach, CA 3
New London-Norwich, CT 1
Washington, DC-MD-VA-WV 1
Bergen-Passaic, NJ 1
Austin-San Marcos, TX 1

Pentron Corp *23 patents 96-00*
New Haven-Bridgeport-Stamford-Waterbury-Da 13
Middlesex-Somerset-Hunterdon, NJ 7
Newark, NJ 7
Philadelphia, PA-NJ 6
Monmouth-Ocean, NJ 6
Hartford, CT 1

Precision Combustion Inc *16 patents 96-00*
New Haven-Bridgeport-Stamford-Waterbury-Da 13
Monmouth-Ocean, NJ 4
Washington, DC-MD-VA-WV 1

Walker Digital LLC *71 patents 96-00*
New Haven-Bridgeport-Stamford-Waterbury-Da 71
Chicago, IL 8
Minneapolis-St. Paul, MN-WI 7
Boston-Worcester-Lawrence-Lowell-Brockton, 1
New York, NY 1

New York, NY

Anvik Corp *18 patents 96-00*
New York, NY 16
Bergen-Passaic, NJ 6
New Haven-Bridgeport-Stamford-Waterbury-Da 4
Middlesex-Somerset-Hunterdon, NJ 2

Emisphere Technologies Inc *46 patents 96-00*
New York, NY 46
New Haven-Bridgeport-Stamford-Waterbury-Da 32
Monmouth-Ocean, NJ 5

Golden Bridge Technology Inc *27 patents 96-00*
New York, NY 18
Middlesex-Somerset-Hunterdon, NJ 12
Nassau-Suffolk, NY 9
Barnstable-Yarmouth, MA 5
Monmouth-Ocean, NJ 5

Nutrition 21 Inc *32 patents 96-00*
New York, NY 19
San Diego, CA 10
New Haven-Bridgeport-Stamford-Waterbury-Da 8
Richmond-Petersburg, VA 1

New York, NY

Newark, NJ 1

Outrigger Inc *16 patents 96-00*
New York, NY 16
New Haven-Bridgeport-Stamford-Waterbury-Da 1

Reveo Inc *29 patents 96-00*
New York, NY 29
Philadelphia, PA-NJ 1

United Biomedical Inc *21 patents 96-00*
New York, NY 15
Nassau-Suffolk, NY 5
Bergen-Passaic, NJ 1

Newark, NJ

Alteon Inc *21 patents 96-00*
Newark, NJ 17
New York, NY 15
Bergen-Passaic, NJ 10
Nassau-Suffolk, NY 8
Boston-Worcester-Lawrence-Lowell-Brockton, 7
Trenton, NJ 5
New Haven-Bridgeport-Stamford-Waterbury-Da 2

Automotive Technologies Int'l *30 patents 96-00*
Newark, NJ 30
Los Angeles-Long Beach, CA 7
Detroit, MI 4
San Diego, CA 3
New York, NY 2
Riverside-San Bernardino, CA 1

B & G Plastics Inc *22 patents 96-00*
Newark, NJ 22
Middlesex-Somerset-Hunterdon, NJ 4

Immunomedics Inc *45 patents 96-00*
Newark, NJ 42
Monmouth-Ocean, NJ 23
Middlesex-Somerset-Hunterdon, NJ 3
Bergen-Passaic, NJ 3

Trion Industries Inc *18 patents 96-00*
Newark, NJ 14
Scranton--Wilkes-Barre--Hazleton, PA 13

Newburgh, NY-PA

Infectech Inc *27 patents 96-00*
Newburgh, NY-PA 26
Sharon, PA 18
New York, NY 1

Oakland, CA

Aradigm Corp. *55 patents 96-00*
Oakland, CA 50
San Francisco, CA 13
San Jose, CA 5
Boston-Worcester-Lawrence-Lowell-Brockton, 4
Modesto, CA 1
Seattle-Bellevue-Everett, WA 1

Arcade Planet Inc *21 patents 96-00*

Oakland, CA

Oakland, CA 21
San Jose, CA 13
San Francisco, CA 10
Phoenix-Mesa, AZ 6
Stockton-Lodi, CA 3
Los Angeles-Long Beach, CA 2
Chicago, IL 1

BioTime Inc *15 patents 96-00*
Oakland, CA 15

Cerus Corp *35 patents 96-00*
Oakland, CA 35
San Francisco, CA 8
San Jose, CA 8
Lexington, KY 2

FormFactor Inc *32 patents 96-00*
Oakland, CA 29
Santa Cruz-Watsonville, CA 4
New York, NY 3
Modesto, CA 1

Immersion Corp. *62 patents 96-00*
Oakland, CA 36
San Jose, CA 35
San Francisco, CA 29
New York, NY 2
Santa Cruz-Watsonville, CA 2
Boston-Worcester-Lawrence-Lowell-Brockton, 2
Ann Arbor, MI 2
Washington, DC-MD-VA-WV 1
Detroit, MI 1

Onyx Pharmaceuticals Inc *27 patents 96-00*
Oakland, CA 18
San Francisco, CA 15
Vallejo-Fairfield-Napa, CA 1
Denver, CO 1

Silicon Genesis Corp. *19 patents 96-00*
Oakland, CA 15
San Jose, CA 15
Boston-Worcester-Lawrence-Lowell-Brockton, 3

Xoma Ltd. *81 patents 96-00*
Oakland, CA 50
Los Angeles-Long Beach, CA 38
Vallejo-Fairfield-Napa, CA 21
San Francisco, CA 9
San Diego, CA 7
Santa Rosa, CA 6
Washington, DC-MD-VA-WV 5
Seattle-Bellevue-Everett, WA 4
Dallas, TX 1
Salinas, CA 1

Orange County, CA

Applied Medical Resources Co *44 patents 96-00*
Orange County, CA 37
San Diego, CA 9
St. Louis, MO-IL 3
San Francisco, CA 3
Boston-Worcester-Lawrence-Lowell-Brockton, 3
San Jose, CA 2
Los Angeles-Long Beach, CA 1
Washington, DC-MD-VA-WV 1
Riverside-San Bernardino, CA 1

Creative Integrated Systems In *16 patents 96-00*
Orange County, CA 16
Los Angeles-Long Beach, CA 2

GTCO Corp *17 patents 96-00*
Orange County, CA 7
Phoenix-Mesa, AZ 5
Los Angeles-Long Beach, CA 2
Baltimore, MD 2
Oakland, CA 2
Washington, DC-MD-VA-WV 1

ICU Medical Inc *19 patents 96-00*
Orange County, CA 19
Tampa-St. Petersburg-Clearwater, FL 2
Riverside-San Bernardino, CA 1

Irvine Biomedical Inc *31 patents 96-00*
Orange County, CA 30
Los Angeles-Long Beach, CA 9

Masimo Corp *42 patents 96-00*
Orange County, CA 29
San Francisco, CA 11
Denver, CO 7
San Jose, CA 3
Riverside-San Bernardino, CA 3
Los Angeles-Long Beach, CA 3
Boulder-Longmont, CO 3
Oakland, CA 1

Maxdem Inc *26 patents 96-00*
Orange County, CA 26
Los Angeles-Long Beach, CA 26

Micro Therapeutics Inc. *38 patents 96-00*
Orange County, CA 32
Tampa-St. Petersburg-Clearwater, FL 14
Los Angeles-Long Beach, CA 5
Minneapolis-St. Paul, MN-WI 4
Cleveland-Lorain-Elyria, OH 3
San Diego, CA 1
Houston, TX 1

Privatizer Systems Inc *15 patents 96-00*
Orange County, CA 12
Salt Lake City-Ogden, UT 7
Dayton-Springfield, OH 3
New Haven-Bridgeport-Stamford-Waterbury-Da 3

Staar Surgical Co. *46 patents 96-00*
Orange County, CA 36

Orange County, CA

Riverside-San Bernardino, CA	12
Los Angeles-Long Beach, CA	2
Universal Electronics Inc *19 patents 96-00*	
Orange County, CA	17
Los Angeles-Long Beach, CA	6
Riverside-San Bernardino, CA	1
San Diego, CA	1

Orlando, FL

Earth Resources Corp *21 patents 96-00*	
Orlando, FL	17
Atlanta, GA	2
Ocala, FL	2
Huntsville, AL	2
Houston, TX	1

Philadelphia, PA-NJ

3-Dimensional Pharmaceutica *15 patents 96-00*	
Philadelphia, PA-NJ	14
Trenton, NJ	11
Middlesex-Somerset-Hunterdon, NJ	6
Chicago, IL	2
Reading, PA	1
Accu-Sort Systems Inc *22 patents 96-00*	
Philadelphia, PA-NJ	19
Allentown-Bethlehem-Easton, PA	9
Trenton, NJ	2
Adolor Corp *19 patents 96-00*	
Philadelphia, PA-NJ	18
Rochester, MN	2
Reading, PA	2
San Francisco, CA	1
Cell Pathways Inc. *37 patents 96-00*	
Philadelphia, PA-NJ	34
Tucson, AZ	14
Stockton-Lodi, CA	13
Denver, CO	7
Cincinnati, OH-KY-IN	3
Mobile, AL	1
Genaera Corp *27 patents 96-00*	
Philadelphia, PA-NJ	27
Bergen-Passaic, NJ	6
Trenton, NJ	3
Chicago, IL	3
Albany-Schenectady-Troy, NY	3
Pittsburgh, PA	2
Lexington, KY	2
Wilmington-Newark, DE-MD	1
Geo Specialty Chemicals Inc *23 patents 96-00*	
Philadelphia, PA-NJ	13
Charlotte-Gastonia-Rock Hill, NC-SC	9
Greenville-Spartanburg-Anderson, SC	3
Middlesex-Somerset-Hunterdon, NJ	2
Wilmington-Newark, DE-MD	1

Philadelphia, PA-NJ

Kensey Nash Corp *35 patents 96-00*	
Philadelphia, PA-NJ	26
Duluth-Superior, MN-WI	8
San Diego, CA	2
NeoStrata Inc *72 patents 96-00*	
Philadelphia, PA-NJ	71
Newark, NJ	1
Middlesex-Somerset-Hunterdon, NJ	1
Opex Corp *16 patents 96-00*	
Philadelphia, PA-NJ	15
San Jose, CA	1
Wilmington-Newark, DE-MD	1
Oakland, CA	1
San Francisco, CA	1
Schweitzer Engineering Labor *21 patents 96-00*	
Philadelphia, PA-NJ	1

Pittsburgh, PA

Adams Mfg Corp *17 patents 96-00*	
Pittsburgh, PA	15
Crucible Materials Corp *18 patents 96-00*	
Pittsburgh, PA	17
Syracuse, NY	3
Frank Calandra Inc *21 patents 96-00*	
Pittsburgh, PA	20
Johnstown, PA	3
Lexington, KY	1
Fargo-Moorhead, ND-MN	1
Syracuse, NY	1
Tippins Inc *20 patents 96-00*	
Pittsburgh, PA	20
Youngstown-Warren, OH	1

Portland-Vancouver, OR-WA

Cascade Microtech Inc *16 patents 96-00*	
Portland-Vancouver, OR-WA	16
Digimarc Corp *21 patents 96-00*	
Portland-Vancouver, OR-WA	17
Seattle-Bellevue-Everett, WA	4
Boston-Worcester-Lawrence-Lowell-Brockton,	4
Endovascular Instruments Inc *18 patents 96-00*	
Portland-Vancouver, OR-WA	17
Seattle-Bellevue-Everett, WA	1
Warn Industries Inc *21 patents 96-00*	
Portland-Vancouver, OR-WA	18
Detroit, MI	4
Orange County, CA	1
Salem, OR	1

Providence-Warwick-Pawtucket, RI

Stem Cells Inc *31 patents 96-00*	
Providence-Warwick-Pawtucket, RI	29
Boston-Worcester-Lawrence-Lowell-Brockton,	18
Philadelphia, PA-NJ	7
Portland-Vancouver, OR-WA	2

Providence-Warwick-Pawtucket, RI

Chicago, IL	1
Tucson, AZ	1
Madison, WI	1

Pueblo, CO

Ramtron International Corp. — *76 patents 96-00*

Pueblo, CO	68
Colorado Springs, CO	14
San Diego, CA	3
Boston-Worcester-Lawrence-Lowell-Brockton,	1
Jackson, MS	1
Fort Collins-Loveland, CO	1

Symetrix Corp. — *80 patents 96-00*

Pueblo, CO	78
Los Angeles-Long Beach, CA	2
Phoenix-Mesa, AZ	1
Allentown-Bethlehem-Easton, PA	1

Racine, WI

Beere Precision Medical Instr — *15 patents 96-00*

Racine, WI	8
Milwaukee-Waukesha, WI	7
Kenosha, WI	3

Richmond-Petersburg, VA

Lisle Corp — *18 patents 96-00*

Cleveland-Lorain-Elyria, OH	1
Richmond-Petersburg, VA	1
Cincinnati, OH-KY-IN	1

Rochester, NY

Optex Communications Corp — *16 patents 96-00*

Rochester, NY	15
Washington, DC-MD-VA-WV	2
Trenton, NJ	1
Middlesex-Somerset-Hunterdon, NJ	1

Research Corporation Techno — *163 patents 96-00*

Rochester, NY	18
Springfield, MA	11
Champaign-Urbana, IL	9
Philadelphia, PA-NJ	9
Chicago, IL	9
Boston-Worcester-Lawrence-Lowell-Brockton,	8
Dallas, TX	7
San Diego, CA	7
Louisville, KY-IN	6
Oklahoma City, OK	6
Washington, DC-MD-VA-WV	5
Houston, TX	4
Tucson, AZ	4
Wilmington-Newark, DE-MD	4
Lafayette, IN	4
Memphis, TN-AR-MS	4
Los Angeles-Long Beach, CA	4
Fort Collins-Loveland, CO	4

Rochester, NY

Birmingham, AL	4
Madison, WI	3
Portland-Vancouver, OR-WA	3
Gainesville, FL	3
Minneapolis-St. Paul, MN-WI	3
Shreveport-Bossier City, LA	3
Dubuque, IA	3
Grand Junction, CO	3
Iowa City, IA	3
San Francisco, CA	2
Providence-Warwick-Pawtucket, RI	2
New Orleans, LA	2
San Antonio, TX	2
Middlesex-Somerset-Hunterdon, NJ	2
Scranton--Wilkes-Barre--Hazleton, PA	2
Monmouth-Ocean, NJ	1
Greenville-Spartanburg-Anderson, SC	1
Yakima, WA	1
Rockford, IL	1
St. Louis, MO-IL	1
Salt Lake City-Ogden, UT	1
Newark, NJ	1
Bergen-Passaic, NJ	1
Bloomington, IN	1
Trenton, NJ	1
Killeen-Temple, TX	1
Orange County, CA	1
San Jose, CA	1
Hartford, CT	1
Lansing-East Lansing, MI	1
Kalamazoo-Battle Creek, MI	1
New York, NY	1

Sacramento, CA

Op-D-Op Inc — *17 patents 96-00*

Sacramento, CA	17

Salt Lake City-Ogden, UT

Megadyne Medical Products I — *17 patents 96-00*

Salt Lake City-Ogden, UT	15
Denver, CO	3
Tulsa, OK	1

Myriad Genetics Inc — *27 patents 96-00*

Salt Lake City-Ogden, UT	27
Raleigh-Durham-Chapel Hill, NC	4
Philadelphia, PA-NJ	3

Sarcos Inc — *57 patents 96-00*

Salt Lake City-Ogden, UT	57

Specialized Health Products I — *22 patents 96-00*

Salt Lake City-Ogden, UT	22
Provo-Orem, UT	7

San Antonio, TX

Bionumerik Pharmaceuticals I — *47 patents 96-00*

San Antonio, TX	29

San Antonio, TX

Houston, TX 3

San Diego, CA

Advanced Tissue Sciences Inc *32 patents 96-00*

San Diego, CA 24
Atlanta, GA 3
San Francisco, CA 2
Riverside-San Bernardino, CA 2
San Jose, CA 2

Alliance Pharmaceutical Corp *94 patents 96-00*

San Diego, CA 69
Detroit, MI 8
Ann Arbor, MI 8
Middlesex-Somerset-Hunterdon, NJ 5
Philadelphia, PA-NJ 4
Seattle-Bellevue-Everett, WA 2
Burlington, VT 1
Buffalo-Niagara Falls, NY 1
Washington, DC-MD-VA-WV 1
Albany-Schenectady-Troy, NY 1
Orange County, CA 1
Birmingham, AL 1

Amylin Pharmaceuticals Inc *18 patents 96-00*

San Diego, CA 17
Philadelphia, PA-NJ 1
Raleigh-Durham-Chapel Hill, NC 1
San Francisco, CA 1

Anticancer Inc *18 patents 96-00*

San Diego, CA 18

Biosite Inc *25 patents 96-00*

San Diego, CA 25

Corvas International, Inc. *53 patents 96-00*

San Diego, CA 52
Boston-Worcester-Lawrence-Lowell-Brockton, 6
Boulder-Longmont, CO 5
Santa Cruz-Watsonville, CA 1

Diversa Corp *30 patents 96-00*

San Diego, CA 18
Philadelphia, PA-NJ 10
Los Angeles-Long Beach, CA 6
Wilmington-Newark, DE-MD 1

Epimmune Inc *27 patents 96-00*

San Diego, CA 27
Boston-Worcester-Lawrence-Lowell-Brockton, 4
San Francisco, CA 4
Ventura, CA 2
Los Angeles-Long Beach, CA 1
New York, NY 1

Genta Inc *21 patents 96-00*

San Diego, CA 19
San Luis Obispo-Atascadero-Paso Robles, CA 9
Oakland, CA 1
Los Angeles-Long Beach, CA 1

San Diego, CA

Baltimore, MD 1
Seattle-Bellevue-Everett, WA 1

Immune Response Corp *23 patents 96-00*

San Diego, CA 18
Hartford, CT 2
Fort Collins-Loveland, CO 2
New Haven-Bridgeport-Stamford-Waterbury-Da 2
Philadelphia, PA-NJ 2
Burlington, VT 1

Isis Pharmaceuticals Inc *306 patents 96-00*

San Diego, CA 299
Washington, DC-MD-VA-WV 10
Orange County, CA 9
Boulder-Longmont, CO 7
Houston, TX 7
Boston-Worcester-Lawrence-Lowell-Brockton, 6
Harrisburg-Lebanon-Carlisle, PA 2
York, PA 2
Richmond-Petersburg, VA 2
Tucson, AZ 1
Chicago, IL 1
Mobile, AL 1
New Haven-Bridgeport-Stamford-Waterbury-Da 1
Oakland, CA 1
San Francisco, CA 1
Seattle-Bellevue-Everett, WA 1
Steubenville-Weirton, OH-WV 1
Los Angeles-Long Beach, CA 1

Ligand Pharmaceuticals Inc. *82 patents 96-00*

San Diego, CA 41
Oakland, CA 31
San Francisco, CA 23
Boston-Worcester-Lawrence-Lowell-Brockton, 8
Vallejo-Fairfield-Napa, CA 5
Kalamazoo-Battle Creek, MI 3
Madison, WI 3
Boulder-Longmont, CO 3
Philadelphia, PA-NJ 2
Orange County, CA 2
New Haven-Bridgeport-Stamford-Waterbury-Da 2
Gainesville, FL 2
Eugene-Springfield, OR 2
Dallas, TX 2
Houston, TX 2
Los Angeles-Long Beach, CA 1
San Jose, CA 1

Litel Instruments *22 patents 96-00*

San Diego, CA 22
Orange County, CA 1

Nanogen Inc *21 patents 96-00*

San Diego, CA 18
San Jose, CA 3

San Diego, CA

San Francisco, CA 2
Orange County, CA 1

Peregrine Semiconductor Cor *16 patents 96-00*
San Diego, CA 15
San Jose, CA 2
Philadelphia, PA-NJ 1

Protein Polymer Technologies *17 patents 96-00*
San Diego, CA 15
Orange County, CA 4
San Jose, CA 2
Santa Cruz-Watsonville, CA 2

Quantum Group Inc *18 patents 96-00*
San Diego, CA 16
Boston-Worcester-Lawrence-Lowell-Brockton, 2
Philadelphia, PA-NJ 1
Orange County, CA 1
Nassau-Suffolk, NY 1

Quidel Corp *37 patents 96-00*
San Diego, CA 13
San Jose, CA 12
San Francisco, CA 8
Portland-Vancouver, OR-WA 7
Oakland, CA 4
Boston-Worcester-Lawrence-Lowell-Brockton, 1

Stratagene Holding Corp *22 patents 96-00*
San Diego, CA 22
San Jose, CA 3
Boston-Worcester-Lawrence-Lowell-Brockton, 2
Austin-San Marcos, TX 1
Nassau-Suffolk, NY 1
Atlanta, GA 1

Texas Biotechnology Corp *20 patents 96-00*
San Diego, CA 12
Houston, TX 9
Albany-Schenectady-Troy, NY 2
Brazoria, TX 2
San Francisco, CA 1
Oakland, CA 1
Wichita Falls, TX 1

Vical Inc *15 patents 96-00*
San Diego, CA 15
Madison, WI 4
Chicago, IL 2
Yolo, CA 1
Ann Arbor, MI 1
San Antonio, TX 1
Salem, OR 1

San Francisco, CA

Caliper Technologies Corp *50 patents 96-00*
San Francisco, CA 42
San Jose, CA 37
Santa Cruz-Watsonville, CA 4

San Francisco, CA

Cell Genesys Inc *29 patents 96-00*
San Francisco, CA 21
San Jose, CA 13
Oakland, CA 13
New York, NY 7
Boston-Worcester-Lawrence-Lowell-Brockton, 3
Raleigh-Durham-Chapel Hill, NC 2
New Haven-Bridgeport-Stamford-Waterbury-Da 2
Ann Arbor, MI 1
Baltimore, MD 1
St. Louis, MO-IL 1
Pittsburgh, PA 1

Cygnus Inc *31 patents 96-00*
San Francisco, CA 24
San Jose, CA 23
Oakland, CA 8
Seattle-Bellevue-Everett, WA 2
Boston-Worcester-Lawrence-Lowell-Brockton, 1
Wilmington-Newark, DE-MD 1
Raleigh-Durham-Chapel Hill, NC 1
Middlesex-Somerset-Hunterdon, NJ 1
Ann Arbor, MI 1
Albany-Schenectady-Troy, NY 1

Embol-X Inc. *40 patents 96-00*
San Francisco, CA 29
San Jose, CA 24
New York, NY 11
Boston-Worcester-Lawrence-Lowell-Brockton, 6
Oakland, CA 5

Foveon Inc *34 patents 96-00*
San Francisco, CA 26
San Jose, CA 17
Los Angeles-Long Beach, CA 3

Gemfire Corp *29 patents 96-00*
San Francisco, CA 29
San Jose, CA 28

Geobiotics Inc *15 patents 96-00*
San Francisco, CA 15

Geron Corp *37 patents 96-00*
San Francisco, CA 32
San Jose, CA 18
Oakland, CA 13
Vallejo-Fairfield-Napa, CA 6
Dallas, TX 4
Fort Worth-Arlington, TX 4
Boulder-Longmont, CO 2
Seattle-Bellevue-Everett, WA 1

Lynx Therapeutics Inc. *38 patents 96-00*
San Francisco, CA 20
San Jose, CA 10
Oakland, CA 9

RITA Medical Systems Inc *26 patents 96-00*

San Francisco, CA

- San Francisco, CA 19
- San Jose, CA 10
- Fort Pierce-Port St. Lucie, FL 1

Scientific Learning Corp *16 patents 96-00*

- San Francisco, CA 16
- Oakland, CA 7
- Philadelphia, PA-NJ 4
- Chicago, IL 1

Telik Inc *28 patents 96-00*

- San Francisco, CA 28
- Oakland, CA 12
- Rochester, NY 3
- New York, NY 1
- Boulder-Longmont, CO 1
- San Jose, CA 1
- Boston-Worcester-Lawrence-Lowell-Brockton, 1

Tularik Inc. *54 patents 96-00*

- San Francisco, CA 42
- Los Angeles-Long Beach, CA 18
- San Jose, CA 4
- Oakland, CA 3
- New York, NY 1
- San Diego, CA 1
- Nassau-Suffolk, NY 1

San Jose, CA

Affymax Inc. *67 patents 96-00*

- San Jose, CA 63
- San Francisco, CA 41
- Oakland, CA 21
- Los Angeles-Long Beach, CA 3
- San Diego, CA 3
- Hamilton-Middletown, OH 2
- Raleigh-Durham-Chapel Hill, NC 2
- Ann Arbor, MI 1
- Yolo, CA 1
- Philadelphia, PA-NJ 1

Alliance Semiconductor Corp. *51 patents 96-00*

- San Jose, CA 45
- Oakland, CA 13

Ampex Corp *36 patents 96-00*

- San Jose, CA 19
- Oakland, CA 9
- San Francisco, CA 8
- San Luis Obispo-Atascadero-Paso Robles, CA 4
- Orange County, CA 3
- Las Cruces, NM 1
- Dallas, TX 1

Aplus Flash Technology Inc *15 patents 96-00*

- San Jose, CA 15

ArrayComm Inc *15 patents 96-00*

- San Jose, CA 14
- San Francisco, CA 9

San Jose, CA

- Buffalo-Niagara Falls, NY 3
- San Diego, CA 1

Arthrocare Corp *32 patents 96-00*

- San Jose, CA 32
- Columbus, OH 32
- Oakland, CA 6
- San Diego, CA 2
- San Francisco, CA 2

Candescent Technologies Cor *123 patents 96-00*

- San Jose, CA 112
- San Francisco, CA 61
- Oakland, CA 21
- San Diego, CA 15
- Santa Cruz-Watsonville, CA 9
- Baltimore, MD 6
- Boston-Worcester-Lawrence-Lowell-Brockton, 4
- New Haven-Bridgeport-Stamford-Waterbury-Da 3
- Modesto, CA 3
- Los Angeles-Long Beach, CA 2
- Ventura, CA 2
- Salinas, CA 2
- Myrtle Beach, SC 1

Cardima Inc *27 patents 96-00*

- San Jose, CA 17
- Charlotte-Gastonia-Rock Hill, NC-SC 10
- Oakland, CA 10
- San Francisco, CA 9
- Orange County, CA 5
- Boston-Worcester-Lawrence-Lowell-Brockton, 3

CardioGenesis Corp. *53 patents 96-00*

- San Jose, CA 49
- Oakland, CA 20
- Milwaukee-Waukesha, WI 3
- Middlesex-Somerset-Hunterdon, NJ 2
- New York, NY 2
- Indianapolis, IN 2
- San Francisco, CA 1
- Orange County, CA 1
- Louisville, KY-IN 1

Centaur Pharmaceuticals Inc *21 patents 96-00*

- San Jose, CA 21
- Oakland, CA 17
- San Francisco, CA 5
- Washington, DC-MD-VA-WV 2
- Orange County, CA 2
- Philadelphia, PA-NJ 1
- Oklahoma City, OK 1

Cohesive Technologies Inc *23 patents 96-00*

- San Jose, CA 12
- San Francisco, CA 8
- Boston-Worcester-Lawrence-Lowell-Brockton, 6
- Boulder-Longmont, CO 2

San Jose, CA

Santa Fe, NM 1
Oakland, CA 1
Houston, TX 1
Denver, CO 1

Conductus Inc *15 patents 96-00*
San Jose, CA 12
Salinas, CA 2
San Francisco, CA 2
Oakland, CA 1
Raleigh-Durham-Chapel Hill, NC 1
Santa Cruz-Watsonville, CA 1
Austin-San Marcos, TX 1

Echelon Corp *24 patents 96-00*
San Jose, CA 23
San Francisco, CA 13
Oakland, CA 6
Santa Cruz-Watsonville, CA 1

Endotex Interventional System *15 patents 96-00*
San Jose, CA 10
San Francisco, CA 8
Orange County, CA 1
Charleston-North Charleston, SC 1
Pittsburgh, PA 1

Endwave Corp *28 patents 96-00*
San Jose, CA 28
Santa Cruz-Watsonville, CA 8
San Francisco, CA 3
Oakland, CA 1

Essential Therapeutics Inc *19 patents 96-00*
San Jose, CA 19
San Francisco, CA 13
Middlesex-Somerset-Hunterdon, NJ 7

Exar Corp. *51 patents 96-00*
San Jose, CA 42
Oakland, CA 7
San Francisco, CA 2
Washington, DC-MD-VA-WV 1
Santa Cruz-Watsonville, CA 1

Flashpoint Technology Inc *22 patents 96-00*
San Jose, CA 22
Oakland, CA 3
Raleigh-Durham-Chapel Hill, NC 1

Genelabs Technologies Inc *39 patents 96-00*
San Jose, CA 31
San Francisco, CA 27
Boston-Worcester-Lawrence-Lowell-Brockton, 8
Oakland, CA 8
Atlanta, GA 5
Corvallis, OR 5
San Antonio, TX 2

Globalstar LP *41 patents 96-00*
San Jose, CA 40

San Jose, CA

Oakland, CA 11
San Diego, CA 2
Santa Cruz-Watsonville, CA 1
Stockton-Lodi, CA 1

Health Hero Network Inc *28 patents 96-00*
San Jose, CA 18
San Francisco, CA 13
Middlesex-Somerset-Hunterdon, NJ 3

Insmed Inc *32 patents 96-00*
San Jose, CA 20
San Francisco, CA 16
Oakland, CA 12
Santa Cruz-Watsonville, CA 2
Birmingham, AL 1
Richmond-Petersburg, VA 1
Baltimore, MD 1

Integrated Silicon Solution Inc *37 patents 96-00*
San Jose, CA 30
Oakland, CA 7

Levelite Technology Inc *18 patents 96-00*
San Jose, CA 18
Santa Cruz-Watsonville, CA 2
San Francisco, CA 1

Lexar Media Inc *21 patents 96-00*
San Jose, CA 19
Oakland, CA 17

Macrovision Corp *25 patents 96-00*
San Jose, CA 25
San Francisco, CA 6
Seattle-Bellevue-Everett, WA 1

Membrane Technology & Rese *34 patents 96-00*
San Jose, CA 28
San Francisco, CA 15
Oakland, CA 14
Portland-Vancouver, OR-WA 1

Micro Linear Corp. *42 patents 96-00*
San Jose, CA 41
Oakland, CA 4
Sacramento, CA 2
Fort Lauderdale, FL 1
San Francisco, CA 1

Microunity Inc *33 patents 96-00*
San Jose, CA 30
Oakland, CA 8
Santa Cruz-Watsonville, CA 5

Monolithic System Technology *30 patents 96-00*
San Jose, CA 29
Oakland, CA 3
San Francisco, CA 3
Los Angeles-Long Beach, CA 3

Neomagic Corp. *38 patents 96-00*
San Jose, CA 27

San Jose, CA

Oakland, CA	15
Santa Cruz-Watsonville, CA	1
San Francisco, CA	1
Oak Technology Inc. *44 patents 96-00*	
San Jose, CA	20
Boston-Worcester-Lawrence-Lowell-Brockton,	15
Fort Lauderdale, FL	4
Austin-San Marcos, TX	4
West Palm Beach-Boca Raton, FL	3
Oakland, CA	3
Opti Inc *25 patents 96-00*	
San Jose, CA	25
Oakland, CA	3
Orange County, CA	1
Pericom Semiconductor Corp *23 patents 96-00*	
San Jose, CA	19
Oakland, CA	10
Orange County, CA	3
Sacramento, CA	1
Pharmacyclics Inc *31 patents 96-00*	
San Jose, CA	28
Austin-San Marcos, TX	23
San Francisco, CA	11
Oakland, CA	3
Elkhart-Goshen, IN	2
Cincinnati, OH-KY-IN	1
Norfolk-Virginia Beach-Newport News, VA-NC	1
Programmable Microelectroni *30 patents 96-00*	
San Jose, CA	24
Oakland, CA	15
Quicklogic Corp. *51 patents 96-00*	
San Jose, CA	51
San Francisco, CA	11
Portland-Vancouver, OR-WA	4
Oakland, CA	2
Rambus Inc. *87 patents 96-00*	
San Jose, CA	87
Oakland, CA	27
San Francisco, CA	25
Portland-Vancouver, OR-WA	1
Sangstat Medical Corp *15 patents 96-00*	
San Jose, CA	10
San Francisco, CA	8
Oakland, CA	5
Raleigh-Durham-Chapel Hill, NC	3
Silicon Genesis Corp. *19 patents 96-00*	
San Jose, CA	15
Oakland, CA	15
Boston-Worcester-Lawrence-Lowell-Brockton,	3
Silicon Image Inc *17 patents 96-00*	
San Jose, CA	9
Orange County, CA	2

San Jose, CA

San Diego, CA	1
Los Angeles-Long Beach, CA	1
Santa Cruz-Watsonville, CA	1
SONICBlue *105 patents 96-00*	
San Jose, CA	69
Oakland, CA	28
San Francisco, CA	10
Austin-San Marcos, TX	8
Portland-Vancouver, OR-WA	4
Dallas, TX	3
Modesto, CA	3
Seattle-Bellevue-Everett, WA	2
Santa Rosa, CA	2
Akron, OH	1
Santa Cruz-Watsonville, CA	1
Phoenix-Mesa, AZ	1
Cleveland-Lorain-Elyria, OH	1
Synaptics Inc *28 patents 96-00*	
San Jose, CA	25
Oakland, CA	10
Los Angeles-Long Beach, CA	6
San Francisco, CA	4
Santa Cruz-Watsonville, CA	2
Tessera Inc. *113 patents 96-00*	
San Jose, CA	96
New York, NY	14
Oakland, CA	12
Newburgh, NY-PA	10
Austin-San Marcos, TX	9
San Francisco, CA	4
Nassau-Suffolk, NY	4
Fort Lauderdale, FL	2
Dutchess County, NY	1
Philadelphia, PA-NJ	1
Providence-Warwick-Pawtucket, RI	1
Minneapolis-St. Paul, MN-WI	1
Newark, NJ	1
Transgenomic Inc *20 patents 96-00*	
San Jose, CA	13
Omaha, NE-IA	9
Ultratech Stepper Inc *19 patents 96-00*	
San Jose, CA	15
San Francisco, CA	3
Boston-Worcester-Lawrence-Lowell-Brockton,	2
Oakland, CA	2
Ann Arbor, MI	1
New Haven-Bridgeport-Stamford-Waterbury-Da	1
VISX Inc *18 patents 96-00*	
San Jose, CA	10
San Francisco, CA	7
Oakland, CA	3
New York, NY	2

San Jose, CA

Bergen-Passaic, NJ 1

Vivus Inc *17 patents 96-00*

San Jose, CA 10
Oakland, CA 5
San Francisco, CA 3
Bergen-Passaic, NJ 2
Denver, CO 2
Newark, NJ 2
Washington, DC-MD-VA-WV 1

WJ Communications Inc *36 patents 96-00*

San Jose, CA 18
San Francisco, CA 13
Santa Cruz-Watsonville, CA 10
Washington, DC-MD-VA-WV 6
Baltimore, MD 2
Chicago, IL 1
Oakland, CA 1

Xpoint Technologies Inc *23 patents 96-00*

San Jose, CA 22
Fort Lauderdale, FL 1
West Palm Beach-Boca Raton, FL 1

Zircon Corp *23 patents 96-00*

San Jose, CA 20
San Francisco, CA 5
Memphis, TN-AR-MS 1

Santa Barbara-Santa Maria-Lompoc, CA

Computer Motion Inc *19 patents 96-00*

Santa Barbara-Santa Maria-Lompoc, CA 18
Sacramento, CA 1

Khashoggi (E.) Industries *68 patents 96-00*

Santa Barbara-Santa Maria-Lompoc, CA 66
Chicago, IL 3
Minneapolis-St. Paul, MN-WI 1
Peoria-Pekin, IL 1
Richmond-Petersburg, VA 1

Superconductor Technologies *18 patents 96-00*

Santa Barbara-Santa Maria-Lompoc, CA 18
Ventura, CA 5
San Jose, CA 1

Turbodyne Systems Inc *23 patents 96-00*

Santa Barbara-Santa Maria-Lompoc, CA 21
San Diego, CA 17
San Antonio, TX 2
Los Angeles-Long Beach, CA 1

Scranton--Wilkes-Barre--Hazleton, PA

Arlington Industries Inc. *29 patents 96-00*

Scranton--Wilkes-Barre--Hazleton, PA 27
Fort Lauderdale, FL 6

Seattle-Bellevue-Everett, WA

Cell Therapeutics Inc *58 patents 96-00*

Seattle-Bellevue-Everett, WA 58
Philadelphia, PA-NJ 2

Seattle-Bellevue-Everett, WA

Denver, CO 1

Coinstar Inc *15 patents 96-00*

Seattle-Bellevue-Everett, WA 14
San Jose, CA 4
Indianapolis, IN 1
San Francisco, CA 1

Corixa Corp. *36 patents 96-00*

Seattle-Bellevue-Everett, WA 17
San Jose, CA 7
Oakland, CA 6
San Francisco, CA 5
Ann Arbor, MI 4
Miami, FL 4
Fort Lauderdale, FL 3
Bremerton, WA 2
Vallejo-Fairfield-Napa, CA 1
Omaha, NE-IA 1
Buffalo-Niagara Falls, NY 1
Nashville, TN 1

ICOS Corp *77 patents 96-00*

Seattle-Bellevue-Everett, WA 65
Oakland, CA 10
Boston-Worcester-Lawrence-Lowell-Brockton, 6
Portland-Vancouver, OR-WA 3
Nashville, TN 3
Philadelphia, PA-NJ 2
Salt Lake City-Ogden, UT 1
Nassau-Suffolk, NY 1
Los Angeles-Long Beach, CA 1

Light Sciences Lp *21 patents 96-00*

Seattle-Bellevue-Everett, WA 21
Phoenix-Mesa, AZ 12
Albuquerque, NM 1

Medisystems Technology Corp *22 patents 96-00*

Seattle-Bellevue-Everett, WA 21
Chicago, IL 5
San Jose, CA 1

Metawave Communications C *25 patents 96-00*

Seattle-Bellevue-Everett, WA 24
San Jose, CA 1

Neorx Corp *51 patents 96-00*

Seattle-Bellevue-Everett, WA 44
Birmingham, AL 1
St. Louis, MO-IL 1
Saginaw-Bay City-Midland, MI 1

Prolinx Inc *25 patents 96-00*

Seattle-Bellevue-Everett, WA 15
Los Angeles-Long Beach, CA 10
San Francisco, CA 4
San Diego, CA 1

Thermwood Corp *23 patents 96-00*

Seattle-Bellevue-Everett, WA 1

Seattle-Bellevue-Everett, WA

TriPath Imaging Inc — *79 patents 96-00*

Seattle-Bellevue-Everett, WA	57
New York, NY	8
Boston-Worcester-Lawrence-Lowell-Brockton,	6
Boulder-Longmont, CO	4
Chicago, IL	3
Greensboro--Winston-Salem--High Point, NC	2
San Jose, CA	2
Newburgh, NY-PA	1
Raleigh-Durham-Chapel Hill, NC	1
Nassau-Suffolk, NY	1
Bremerton, WA	1
Los Angeles-Long Beach, CA	1

Sherman-Denison, TX

BAG Corp — *25 patents 96-00*

Sherman-Denison, TX	15
Dallas, TX	12

Springfield, IL

Bunn-O-Matic Corp — *24 patents 96-00*

Springfield, IL	23
Chicago, IL	2

St. Louis, MO-IL

Highland Supply Corp — *20 patents 96-00*

St. Louis, MO-IL	20
Chicago, IL	1

Novus International Inc — *27 patents 96-00*

St. Louis, MO-IL	22
Atlanta, GA	3
Fort Worth-Arlington, TX	2
Dallas, TX	1
Galveston-Texas City, TX	1
Sheboygan, WI	1

Young Innovations Inc — *24 patents 96-00*

St. Louis, MO-IL	18
Santa Rosa, CA	4
Sacramento, CA	4
San Jose, CA	2
Minneapolis-St. Paul, MN-WI	1

Tampa-St. Petersburg-Clearwater, FL

Atrion Corp — *37 patents 96-00*

Tampa-St. Petersburg-Clearwater, FL	7
Birmingham, AL	6
Dallas, TX	4
Newark, NJ	2
Lakeland-Winter Haven, FL	2
Huntsville, AL	1
Washington, DC-MD-VA-WV	1
Richmond-Petersburg, VA	1

Toledo, OH

Glasstech Inc — *32 patents 96-00*

Toledo, OH	32

Toledo, OH

Detroit, MI	8

Vallejo-Fairfield-Napa, CA

Large Scale Biology Corp — *28 patents 96-00*

Vallejo-Fairfield-Napa, CA	24
Yolo, CA	9
San Francisco, CA	4
Riverside-San Bernardino, CA	4
Lakeland-Winter Haven, FL	4
Washington, DC-MD-VA-WV	3
San Jose, CA	1
Sacramento, CA	1

Washington, DC-MD-VA-WV

Face International Corp — *25 patents 96-00*

Washington, DC-MD-VA-WV	20
Norfolk-Virginia Beach-Newport News, VA-NC	17
Los Angeles-Long Beach, CA	1

Fusion Lighting Inc — *35 patents 96-00*

Washington, DC-MD-VA-WV	30
Houston, TX	3
Pittsfield, MA	1
Pittsburgh, PA	1
Chicago, IL	1
Boston-Worcester-Lawrence-Lowell-Brockton,	1

Genvec Inc — *16 patents 96-00*

Washington, DC-MD-VA-WV	16
New York, NY	3

IGEN Internaional, Inc. — *56 patents 96-00*

Washington, DC-MD-VA-WV	47
Boston-Worcester-Lawrence-Lowell-Brockton,	9
Philadelphia, PA-NJ	4
Omaha, NE-IA	3
Austin-San Marcos, TX	3
Oakland, CA	2
Wilmington-Newark, DE-MD	2
Trenton, NJ	1

Intracel Corp — *22 patents 96-00*

Washington, DC-MD-VA-WV	20
Seattle-Bellevue-Everett, WA	3
Boston-Worcester-Lawrence-Lowell-Brockton,	3
Philadelphia, PA-NJ	2
Madison, WI	1
Allentown-Bethlehem-Easton, PA	1

Medical Solutions Inc — *15 patents 96-00*

Washington, DC-MD-VA-WV	15
Richmond-Petersburg, VA	9

West Palm Beach-Boca Raton, FL

The Panda Project — *20 patents 96-00*

West Palm Beach-Boca Raton, FL	20
San Jose, CA	4
Ventura, CA	2
Los Angeles-Long Beach, CA	2
Oakland, CA	1

Wilmington-Newark, DE-MD

MSE Inc. *69 patents 96-00*

Wilmington-Newark, DE-MD	61
Philadelphia, PA-NJ	9
Baltimore, MD	6
Little Rock-North Little Rock, AR	1
Dover, DE	1
Columbus, OH	1

Yolo, CA

Agraquest Inc *16 patents 96-00*

Yolo, CA	16