

**UNITED STATES  
SECURITIES AND EXCHANGE COMMISSION**  
Washington, D.C. 20549

**FORM 8-K**

**CURRENT REPORT**  
Pursuant to Section 13 OR 15(d) of The Securities Exchange Act of 1934

Date of Report (Date of earliest event reported): December 2, 2004

**Arrowhead Research Corporation**

(Exact name of registrant as specified in its charter)

**Delaware**  
(State or other jurisdiction  
of incorporation)

**0-21898**  
(Commission File Number)

**46-0408024**  
(I.R.S. Employer  
Identification No.)

**1118 East Green Street, Pasadena, CA 91106**  
(Address of principal executive offices) (Zip Code)

**Registrant's telephone number, including area code: (626) 792-5549**

**Not Applicable**  
(Former name or former address, if changed since last report)

Check the appropriate box below if the Form 8-K filing is intended to simultaneously satisfy the filing obligation of the registrant under any of the following provisions (see General Instruction A.2. below):

- Written communications pursuant to Rule 425 under the Securities Act (17 CFR 230.425)
- Soliciting material pursuant to Rule 14a-12 under the Exchange Act (17 CFR 240.14a-12)
- Pre-commencement communications pursuant to Rule 14d-2(b) under the Exchange Act (17 CFR 240.14d-2(b))
- Pre-commencement communications pursuant to Rule 13e-4(c) under the Exchange Act (17 CFR 240.13e-4(c))

**Item 8.01. Other Events.**

On December 2, 2004, Arrowhead Research Corporation (the "Company") announced that CHI Research, Inc. issued a report on the Company's intellectual property portfolio. CHI Research was engaged by the Company to examine its intellectual property portfolio. Pursuant to the engagement, CHI Research was paid cash for services. To the Company's knowledge, CHI Research is not a stockholder of the Company.

The Company supplied CHI Research with information related to the portfolio. The findings of the report are the opinion of CHI Research. The Company has not independently verified the findings of the report. CHI Research used publicly available patent citation indicators to analyze the Company's patent portfolio. However, due to the complexities in working with US Patent and Trademark Office data, including, but not limited to, difficulties in identifying assignee names with company names, mergers and acquisitions, reassignment of patents, and similar matters, there can be no assurance that all patents and patent applications were accurately identified in CHI Research's review, which could have an effect on the accuracy of the report's conclusion.

CHI Research does not warrant the accuracy or completeness of the Company's patent portfolio review, and CHI Research will not be liable for any loss or injury caused in whole or part by reliance on the attached report. The information presented in the report should not be considered investment advice, nor should it in any way be construed to constitute a recommendation by CHI Research with respect to the purchase or sale of any security of the Company.

The entire report of CHI Research is attached as Exhibit 99.1. A copy of the press release announcing the findings of the report is also attached hereto as Exhibit 99.2 and is incorporated herein by reference.

**Item 9.01. Financial Statements and Exhibits.**

(c) Exhibits.

<u>Exhibit No.</u>	<u>Description</u>
99.1	CHI Research Report entitled "The Competitive Position of the Intellectual Property Controlled by Arrowhead Research."
99.2	Press Release, dated December 2, 2004.

**SIGNATURES**

Pursuant to the requirements of the Securities Exchange Act of 1934, the registrant has duly caused this report to be signed on its behalf by the undersigned hereunto duly authorized.

Date: December 3, 2004

ARROWHEAD RESEARCH CORPORATION

By: /s/ R. Bruce Stewart

---

R. Bruce Stewart, President

“The Competitive Position of the Intellectual Property Controlled by Arrowhead Research”

Prepared for:

Mr. John Miller  
Vice President, Intellectual Property  
Arrowhead Research Inc.  
150 S Los Robles Ave  
Pasadena, CA 91101

Prepared by:

Michael Albert  
and  
Paris Kucharski  
CHI Research, Inc.  
10 White Horse Pike  
Haddon Heights, NJ 08035  
Tel.: 856.546.0600 Fax: 856.546.9633  
E-mail: [malbert@chiresearch.com](mailto:malbert@chiresearch.com)  
[pkucharski@chiresearch.com](mailto:pkucharski@chiresearch.com)

CHI Project No. 2417

October 26, 2004

## Summary Report of Findings

CHI was asked by Arrowhead Research to examine the competitive position of its intellectual property, in particular to validate Arrowhead's commanding position in specific areas of nanotechnology. In the summary that follows we report our findings for each of the following Arrowhead operating units: Insert Therapeutics, Aonex, and Nanotechnica. Details of the various patent searches are included in a background section at the end of the report.

In general it appears that Arrowhead's nanotechnology IP already locks up, or is well on the way to locking up, those areas of nanotechnology that it has set out to control. Furthermore, we find that Arrowhead's entire nanotechnology patent portfolio is more broadly distributed across invention art classifications than that of its main competitors. In other words, among its main competitors, Arrowhead has the most diversified portfolio of patents in the nanotechnology space.

### **Insert Therapeutics**

#### **Linear Cyclodextrin Copolymer IP**

Insert Therapeutics controls the following IP claiming linear cyclodextrin copolymers: US patent 6,509,323 and seven published US patent applications, 20020151523, 20030008818, 20030017972, 20040063654, 20040077595, 20040087024 and 20040109888. We were asked to identify any IP claiming linear cyclodextrin copolymers controlled by others.

**Finding:** We did not identify any other linear cyclodextrin copolymer US patents or published patent applications. At present it appears that Arrowhead controls the IP for this technology area.

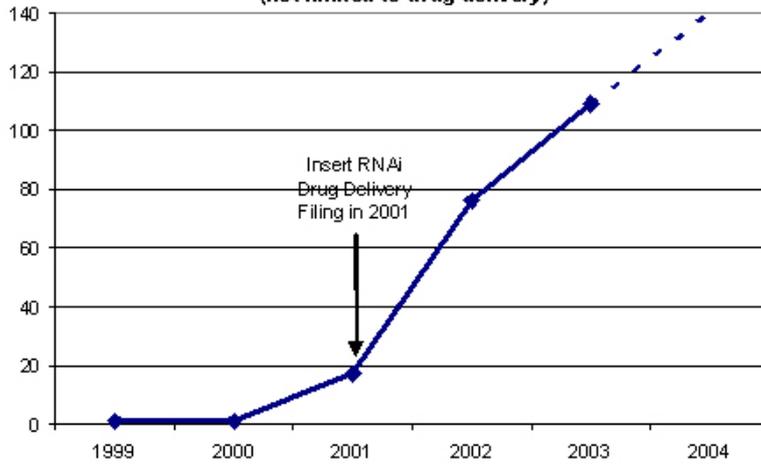
#### **RNA Interference IP**

Insert Therapeutics controls published patent application 20030157030 for drug delivery using RNA interference (RNAi). We were asked to identify any other patents or patent applications claiming RNA interference and when they were filed.

**Finding:** We found 213 US published patent applications that refer to RNAi. Based on inspection of a sampling of these, we determined that many of which are for diagnostic or analytical methods, rather than for drug delivery. We found no granted US patents that refer to RNAi.

Figure 1 shows the trend in number of published applications by application year. We see that one of these was applied for in 1999, one in 2000, 17, including the Insert Therapeutics one, in 2001, and many more in the years since.

**Figure 1. Number of published RNAi-related patent applications  
(not limited to drug delivery)**



At a minimum one may safely say that Insert Therapeutics controls one of the earliest applications. We did not determine with certainty that this application is the earliest one for RNAi use in drug delivery, nor are we qualified to state how broad this application's claims are, compared to other patents for RNAi use in drug delivery. Nonetheless, we find no reason to doubt that Insert could be in a position to be granted broad patent rights to any RNAi delivery mechanisms developed by other companies.

#### **Aonex**

Aonex is developing a process for transferring thin films of semiconductor materials: germanium (Ge), indium phosphide (InP) and gallium arsenide (GaAs), onto inexpensive substrates (silicon, glass, sapphire). We were asked to find any other patents claiming thin films or layer transfer through wafer bonding of Ge, InP, or GaAs on silicon substrates.

Finding: While there are numerous patents relating to all of these materials, particularly for the manufacture and makeup of semiconductors, we did not identify any that claim thin film or layer transfer of any of these onto silicon. Again, it appears that Aonex is likely to be in a controlling IP position in this area.

---

## **Nanotechnica**

### **NEMS**

Nanotechnica is developing processes for making nanoelectromechanical systems (NEMS). Several Roukes patents have been granted for this. We were asked to identify other patents that are related to NEMS.

Finding: None of the patents we found are relevant to make the sorts of NEMS devices Nanotechnica is developing. Thus, Nanotechnica appears to be in a strong IP position for making NEMS.

### **Microfluidics based on Parylene**

There is a fast growing body of patents related to microfluidics. However, Nanotechnica's microfluidics technology is unique in that it is based on parylene. We were asked to try to identify competitive patents related to microfluidics using parylene.

Finding: Over 550 microfluidics US patents were found, but none other than Nanotechnica's have any claims relating to parylene.

### **Arrowhead Patent Portfolio Diversity**

Based on the distribution of patents by International Patent Classification (IPC) at the subclass level, we found Arrowhead's nanotechnology patent portfolio to be more diverse than that of nine other key nanotechnology players. Figure 2 compares the number of subclasses with at least 5 percent of each company's portfolio for the ten players. Arrowhead's count is 9 subclasses, Nanosys' count is 8, Quantum Dot's is 6, and so on down to Carbon Nanotechnologies' situation, where all its patents are clustered in a single IPC subclass.



## Background Details of Project Execution

### Insert Therapeutics

#### Linear Cyclodextrin Copolymer IP

We searched a number of different ways for cyclodextrin copolymer IP. For example, in one approach we searched for the occurrence of keyword cyclodextrin within three words of polymer\* or copolymer.\* In another approach we searched with no word proximity requirement for the occurrence of keyword cyclodextrin and keywords copolymer\* or polymer\* in the patent title, abstract or any claim, not just the exemplary claim, while limiting possible picks to patents in examiner-assigned US patent classes 424 and 514. Hundreds of candidate hits were all reviewed by hand. Other than the Insert Therapeutics patents, none were found to be relevant. In most cases, the claims of patents found by the searches mentioned cyclodextrin and then some other polymer or copolymer, which was not cyclodextrin.

#### RNA Interference IP

We searched for documents with the following keywords, keyword strings or keyword combinations in titles, abstracts or claims: RNAi, "RNA silencing" or RISCs, "small interfering RNA" or SiRNA, as well as the obvious (RNA and (interfere\* or interferi\*)), where this latter was meant to pick RNA interference or interfering, while excluding interferon. The 213 published patent applications are distributed by US application year as follows:

<u>Application Year</u>	<u># of published applications</u>
1998	0
1999	1
2000	1
2001	17
2002	76
2003	109
2004 YTD	9

The counts drop off significantly in 2004 because published applications are kept secret for up to 18 months after priority date (the few that turn up in 2004 are most likely ones with an earlier foreign priority). Furthermore, after we have passed mid-2005, when at least 18 months will have passed from the application date of patents that would have been filed in 2003, we will find a considerably higher count for 2003 as well.

## **AONEX**

We found no explicit subclass within USPTO class 438 "Semiconductor manufacturing" for this novel process. Therefore we employed a search, based strictly on keywords in the titles, abstracts or claims of the patents, to look for granted US patents for transferring thin films, respectively, of germanium, gallium arsenide and indium phosphide onto (low-cost) silicon substrates:

For gallium: ((thin adj film\*) or (layer near3 transfer\*) or (ion near3 implant\*)) AND (silicon or (low adj cost)) AND (gallium or Ga)

For gallium arsenide: ((thin adj film\*) or (layer near3 transfer\*) or (ion near3 implant\*)) AND (silicon or (low adj cost)) AND ((gallium adj arsenide) or GaAs)

For indium phosphide: ((thin adj film\*) or (layer near3 transfer\*) or (ion near3 implant\*)) AND (silicon or (low adj cost)) AND ((indium adj phosphide) or InP)

None of the handful of patents identified by the searches were found upon inspection to be relevant. (If there had been more numerous hits we might have limited the search hits to patents assigned by the examiner to class 438, but that did not turn out to be necessary.) Examples of these non-relevant hits are patents for thin film transistors where silicon is not the substrate, patents dealing with gallium or gallium nitride on other substrates, indium phosphide as the substrate NOT the material being put down on the silicon substrate, and so on."

## **Nanotechnica**

### **NEMS**

The following search filter was devised: ((nano\* adj3 electr\* adj3 mech\*) or NEMS or bionems or nanoelectromechanical or (nano\* adj3 electromech\*)) AND NOT nanotube\*.

We searched through granted US, EPO and PCT documents from the last five years. Among the very small number of patent documents found, none are relevant to the sorts of NEMS devices Nanotechnica is developing as biosensors. For example, US 6,674,932 and 6,763,158 are for NEMS optical switches.

### **Microfluidics based on Parylene**

We developed a patent search filter that is microfluidics specific, that is, narrower than all of MEMS to avoid picking patents in micro-optics, micro-switches, micro-relays, etc. The complex search filter employed in this search may be summarized generally as follows: {microfluidic\* OR micro-fluidic\* OR [(MEMS or microelectromech\* or micro adj electro adj mech\* or micromachin\* or microdevic\*) AND (channel\* or pump\* or valve\* or nozzl\* or bellow\* or capillar\* or coupler\* or array\* or fluid\* or flow\* or mix\*)] OR (lab adj3 chip or microchannel\* or micropump\* or microvalv\* or micronozzle\* or microbellow\* or microcapillar\*, etc.) OR (micro adj channel\* or micro adj pump\*, etc.) OR [IPC=B81\* and (flow\* or fluid\* or channel\*, etc.)]}. (The keyword “array” and its variants were eventually dropped; in the absence of flow channels. Micro-array systems like those used in drug discovery are generally not considered to be microfluidics.)

We knew that this filter would not work 100% of the time. For example, a few known Caltech microfluidics patents would not be picked up by this filter because they refer to, say, etching or micromachin\* but don't claim anything that implies microchannel\*, pump\*, fluid\*, flow\*, valve\*, capillar\*, mix\*, coupler\* or nozzl\*, and so on. A specific example: Caltech 6,162,367 is for gas phase Si etching with bromine trifluoride, but doesn't say what the resulting MEMS device would be for.

Also note that searches for parylene included some synonyms: paraxylylene or para adj xylylene.

### **Arrowhead Patent Portfolio Diversity**

All US granted patents, that is, the full patent portfolios, of the nine competitor players were pulled for this. The first step was to determine all assignee names that belong to each of these players. For example, we determined that Nano-Proprietary holds patents under the assignee name SI Diamond Technology. The second step was to find patents that are licensed to each of these companies. This is entirely consistent with the situation for Arrowhead, where almost all the patents are under Cal Tech as assignee. For example, we found announcements of licensing agreements for Nanosys with Lawrence Berkeley National Lab, University of California and Hebrew University.

The granted US patent portfolio counts for the ten companies, including licensed patents, are as follows:

<u>parent</u>	<u>Total Of patent</u>
Arrowhead	32
Carbon Nanotechnologies	10
Nanogen	86
Nanolnk	26
Nano-Proprietary	68
Nanosphere	21
Nanosys	58
Nantero	6
NVE	32
Quantum Dot	27

The first-given IPC is generally considered to be the “main” classification of the invention. The IPC subclasses with the most patents for all these companies combined are: C12Q: Measuring or Testing Enzymes or Micro-organisms and G01N: Chemical or Physical Analysis of Materials. For Arrowhead the largest concentrations of patenting, while relatively small, are in B01D: Separation Methods for Solids, F01B (Pumps) and F16K (Valves). The important point is that no one IPC subclass contains a significant concentration of Arrowhead patents, and the opposite is true for many of the other players. The following table lists the highest percentage of each player’s patents in a single subclass:

Arrowhead	9%
Quantum Dot	22%
Nanosys	29%
Nanogen	35%
NVE	44%
Nano-Proprietary	47%
Nantero	50%
Nanolnk	62%
Nanosphere	76%
Carbon Nanotechnologies	100%

Arrowhead’s top concentration of only 9 percent is significantly less than that for any the other nine players.



PRESS RELEASE  
December 2, 2004

## ARROWHEAD RESEARCH CORPORATION ANNOUNCES RESEARCH REPORT ON NANO PATENT PORTFOLIO

Pasadena, California – (Businesswire) – December 2, 2004 – Arrowhead Research Corporation (NASDAQ: ARWR, ARWRW) announced today that CHI Research, a worldwide leader in intellectual property analysis, recently conducted a review of Arrowhead’s patent portfolio. The final report stated: “In general, it appears that Arrowhead’s nanotechnology IP already locks up, or is well on the way to locking up, those areas of nanotechnology that it has set out to control. Furthermore, we find that Arrowhead’s entire nanotechnology patent portfolio is more broadly distributed across invention art classifications than that of its main competitors. In other words, among its main competitors, Arrowhead has the most diversified portfolio of patents in the nanotechnology space.” Arrowhead has exclusive rights to 33 issued U.S. patents and, in total, over 180 U.S. and international patents and patent applications.

### ***About Arrowhead Research Corporation***

Arrowhead Research is a nanotechnology company structured to bring together a diverse and innovative mix of technologies, rights to a broad suite of intellectual property, and some of the most respected minds in this dynamic field. There are three strategic components to Arrowhead’s business model:

- The formation or acquisition of subsidiary companies that are engaged in pursuing specific product and technology development in nanotechnology.
- The funding of nanoscience research at universities in exchange for the right to commercialize resulting intellectual property.
- The acquisition, license and sublicense of intellectual property in the field of nanotechnology.

Arrowhead Research operates three majority-owned subsidiary companies:

- Aonex Technologies, Inc., developing and commercializing semiconductor nanomaterial technology.
- Insert Therapeutics, Inc. which is developing and commercializing a proprietary drug delivery system.
- Nanotechnica, Inc., formed to develop capabilities for mass-production of a variety of different nanoscale devices and systems.

### **Safe Harbor Statement under the Private Securities Litigation Reform Act of 1995:**

*This news release contains forward-looking statements within the meaning of the “safe harbor” provisions of the Private Securities Litigation Reform Act of 1995. These statements are based upon our current expectations and speak only as of the date hereof. Our actual results may differ materially and adversely from those expressed in any forward-looking statements as a result of various factors and uncertainties.*

including the recent economic slowdown affecting technology companies, our ability to successfully develop products, rapid technological change in our markets, changes in demand for our future products, legislative, regulatory and competitive developments and general economic conditions. Our Registration Statement on Form S-3, Annual Report on Form 10-K and 10-K/A, recent and forthcoming Quarterly Reports on Form 10-Q and 10-Q/A, recent Current Reports on Forms 8-K and 8-K/A, and other SEC filings discuss some of the important risk factors that may affect our business, results of operations and financial condition. We undertake no obligation to revise or update publicly any forward-looking statements for any reason.

**Contact**

R. Bruce Stewart, President

Telephone: 626.792.5549

Email: [bruce@arrowres.com](mailto:bruce@arrowres.com)