



A UK Intellectual Property Office (UK-IPO)

Technology Report

on

**GENOMIC MEDICINE**

**ANNEXES**

A Response to the Call for Evidence of the  
House of Lords Select Committee on  
Genomic Medicine

April 2008

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# **ANNEX 1**

## **QUESTIONS FROM CALL TO EVIDENCE ANSWERED IN THIS REPORT**

Responses are provided in this report to the following Questions from the Call of Evidence issued by the House of Lords Select Committee on Genomic Medicine:

### **Policy Framework – SEE CHAPTER 3**

- Who is in charge of setting and reviewing policy in this area?
- Who provides scientific advice on policy development? Who monitors and anticipates potential scientific developments and their relevance to future policy? How effective are these mechanisms?
- Does the existing regulatory and advisory framework provide for optimal development and translation of new technologies? Are there any regulatory gaps?
- In what way is science and clinical policy decision-making informed by social, ethical and legal considerations?
- How does the framework compare internationally?

### **Research and Scientific Development – SEE CHAPTERS 4-9**

- What is the state of the science? What new developments are there? What is the rate of change? [see **CHAPTER 5**]
- Who is taking the lead in the consideration and co-ordination of research and the development of new technologies? [see **CHAPTER 6**]
- How effective is the policy and investment framework in supporting research in this area?
- How does research in the UK compare internationally? How much collaboration is there? [see **CHAPTER 7**]
- What are the current research priorities? [see **CHAPTER 8**]
- What is the role of industry? How much cross-sector collaboration takes place?

[see **CHAPTER 9**]

### **Translation – SEE CHAPTER 10**

- What opportunities are there for diagnostics, therapeutics and prognostics – now and in the future?

# **ANNEX 2**

## **METHODOLOGY USED IN DATA ANALYSIS**

## **Data cleaning of Patent Assignee/Company Name data (see Chapter 8)**

The data collected in relation to the patent assignee (i.e. company names) was subjected to a data cleaning process. This data cleaning process uses an automated algorithm and a manual method of assignment. The automated algorithm could introduce unaccounted for errors in the data sets though these errors are generally small when compared with the total number of patent records processed. Furthermore, due to time constraints only applicants with 3 or more patent applications were considered when cleaning this data (this does not affect the overall figures in the main genomics graph or the country tables).

There may also be similar errors arising when assigning the type of applicant (e.g. academic, corporate, government etc) as this is also done using a combination of a manual system and an automated algorithm.

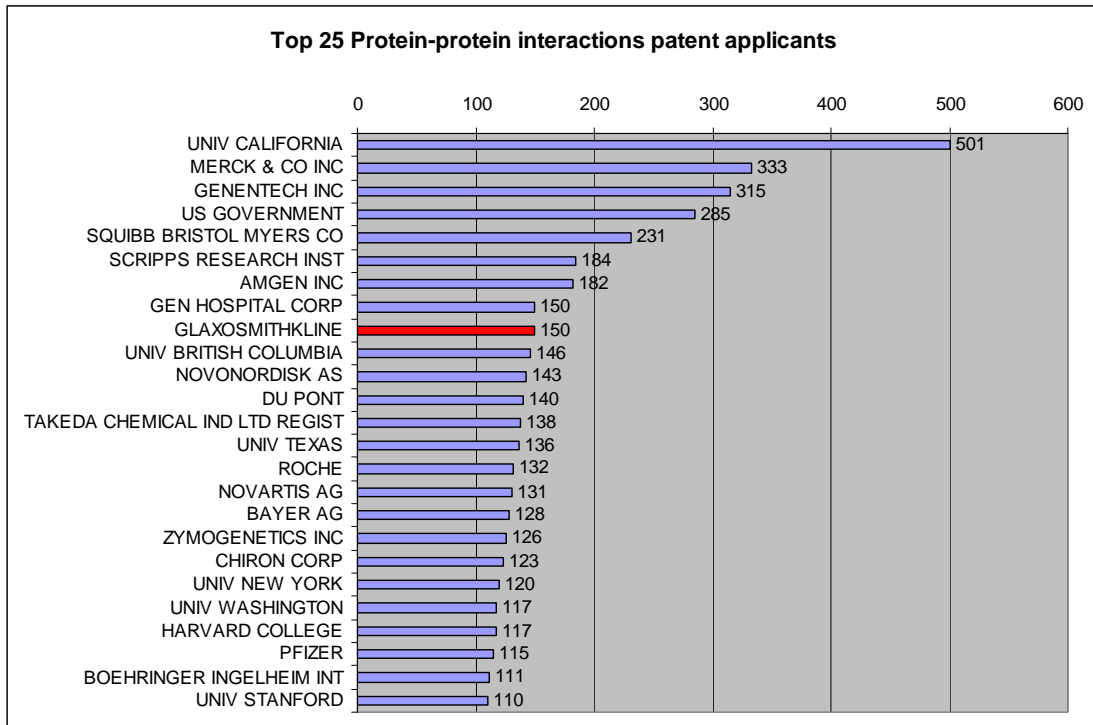
The determination of whether an applicant or an inventor may also be incomplete because the country code field used within the EPODOC database is not fully populated.

## **ANNEX to CHAPTER 6**

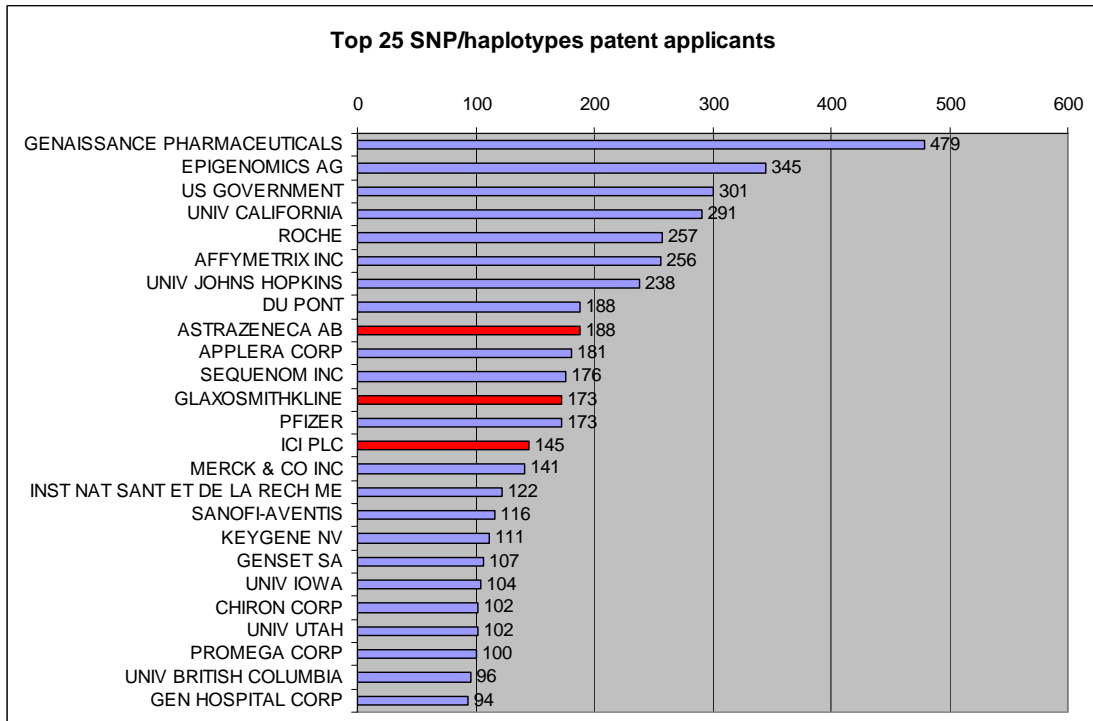
Figures 6.4 to 6.8

Top 25 patent applicants

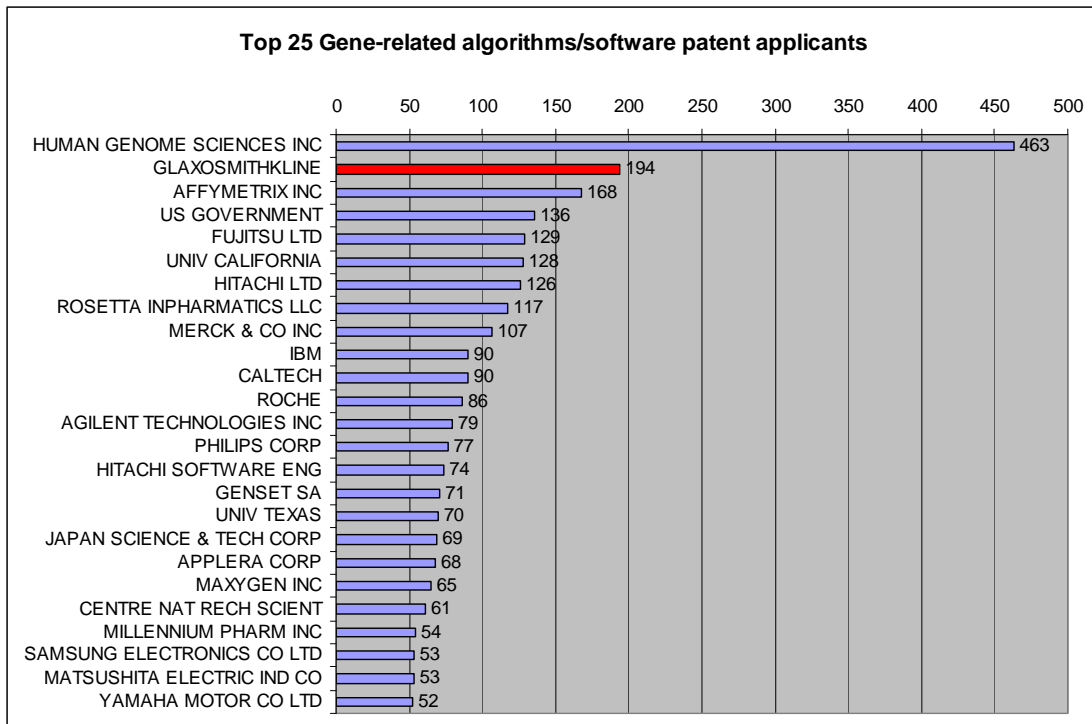
Area	Figure
Protein-protein interactions	<b>6.4</b>
SNP/haplotypes	<b>6.5</b>
Algorithms/software	<b>6.6</b>
Modified animals	<b>6.7</b>
Protein structure	<b>6.8</b>



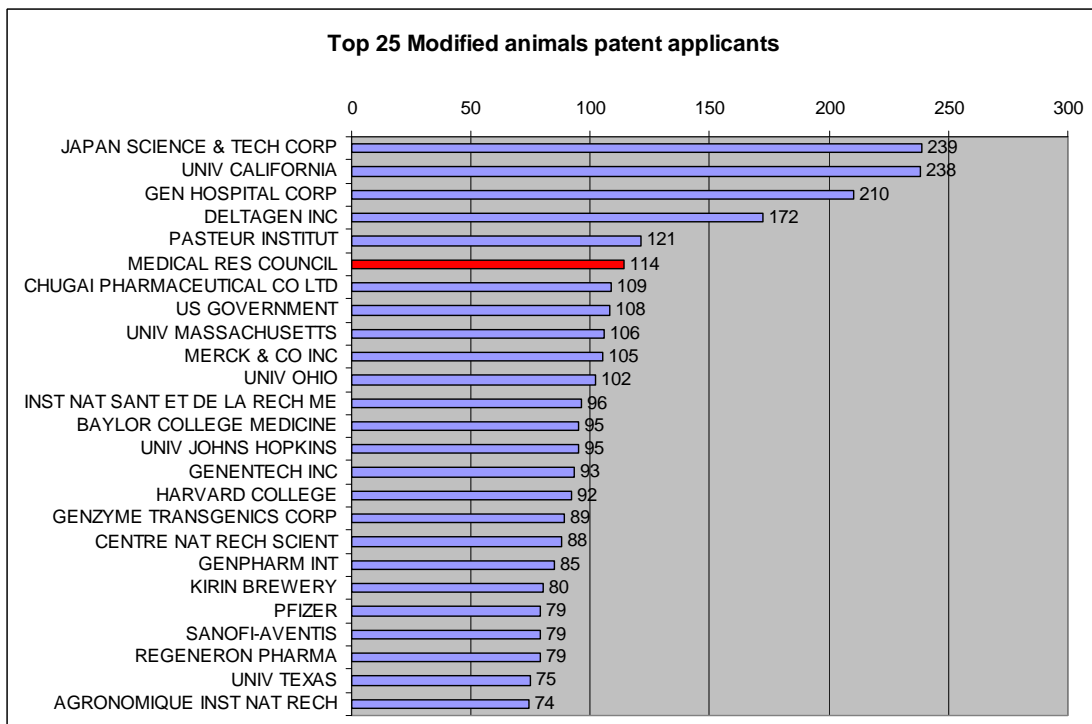
**Figure 6.4** Top 25 applicants in the field of **protein-protein interactions**



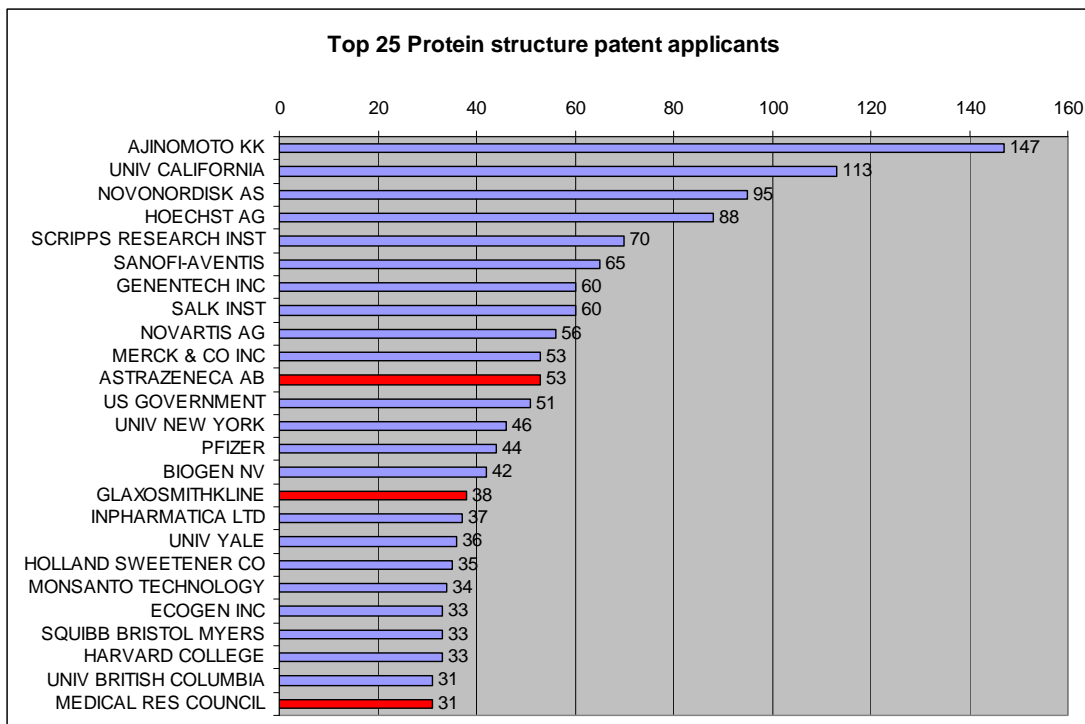
**Figure 6.5** Top 25 applicants in the field of **SNPs / haplotypes**



**Figure 6.6** Top 25 applicants in the field of **gene-related algorithms/software**



**Figure 6.7** Top 25 applicants in the field of **modified animals**



**Figure 6.8** Top 25 applicants in the field of **protein structures**

# ANNEX to CHAPTER 7

Figures 7.14-7.18

## Collaboration Maps

Collaboration Map	Figure (in Annex)
Human gene patents	<b>7.9</b>
Protein structure patents	<b>7.10</b>
Gene expression profile patents	<b>7.11</b>
Genes and regulatory sequences	<b>7.12</b>
Protein-protein interactions	<b>7.13</b>
SNP/haplotypes	<b>7.14</b>
Algorithms/software	<b>7.15</b>
Modified animals	<b>7.16</b>

**Please Note:** The eight collaboration maps below show all the entities involved in collaborations with at least one UK entity. The size of the (blue) dot representing each entity is proportional to the total number of patent applications filed by that entity or assigned to it. Thus, in general, the large pharmaceutical companies like GlaxoSmithKline show larger dots than those of the academic entities like the University of Manchester, as in Figure 7.9, the collaboration map for UK entities in the **human gene patents** field. However, not all of the patents represented by the (blue) dot are involved in collaborations. The entities involved in collaborations are joined by a broken or full line, the thickness of which indicates the degree or strength of collaboration between them.

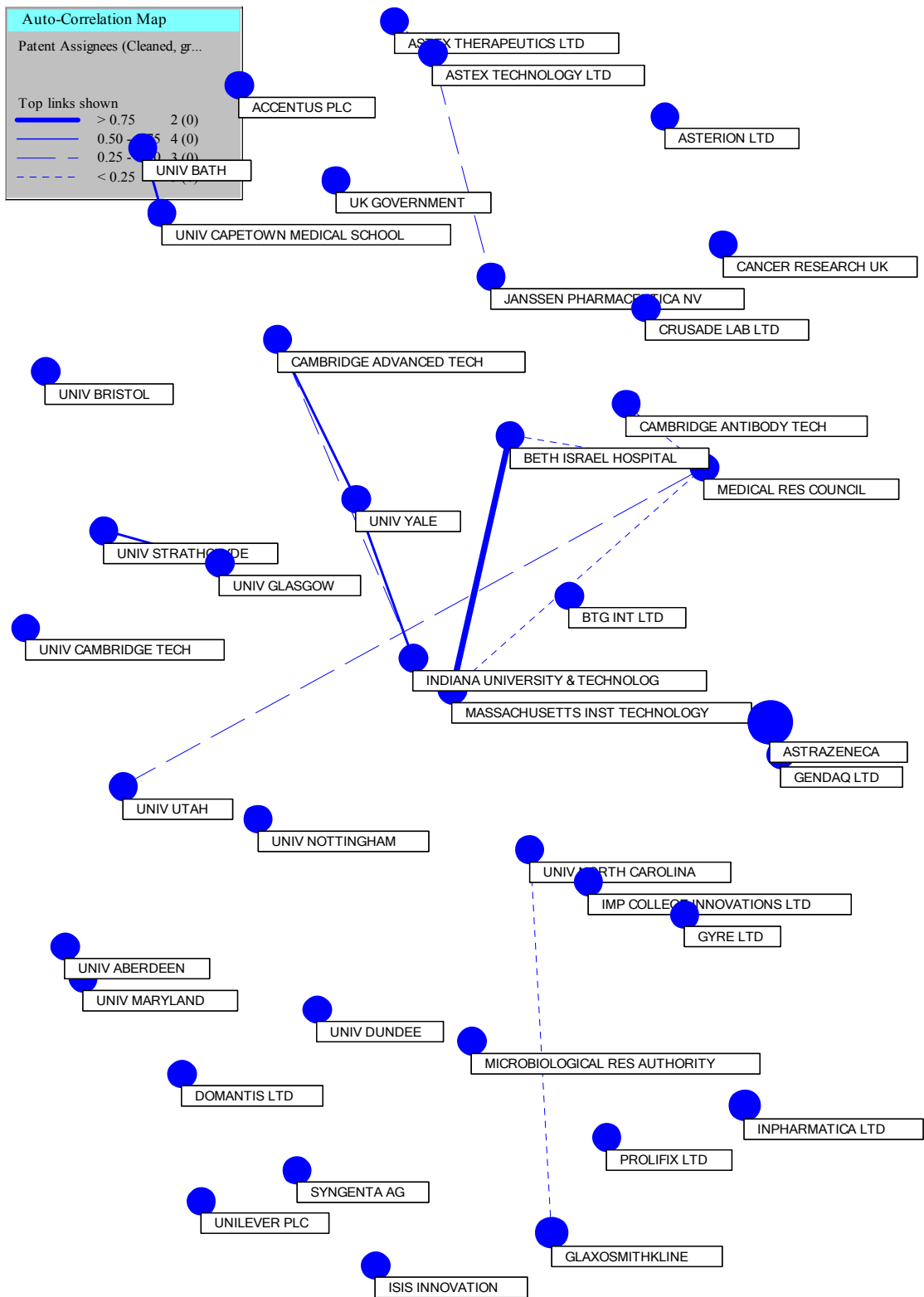
Short broken line (— — — —) = <25%

Long broken line (— — —) = 25-50%

Narrow full line (————) = 50-75%

Thick full line (————) = >75%





**Figure 7.10** Collaborations for UK companies filing in the **protein structure patents** field

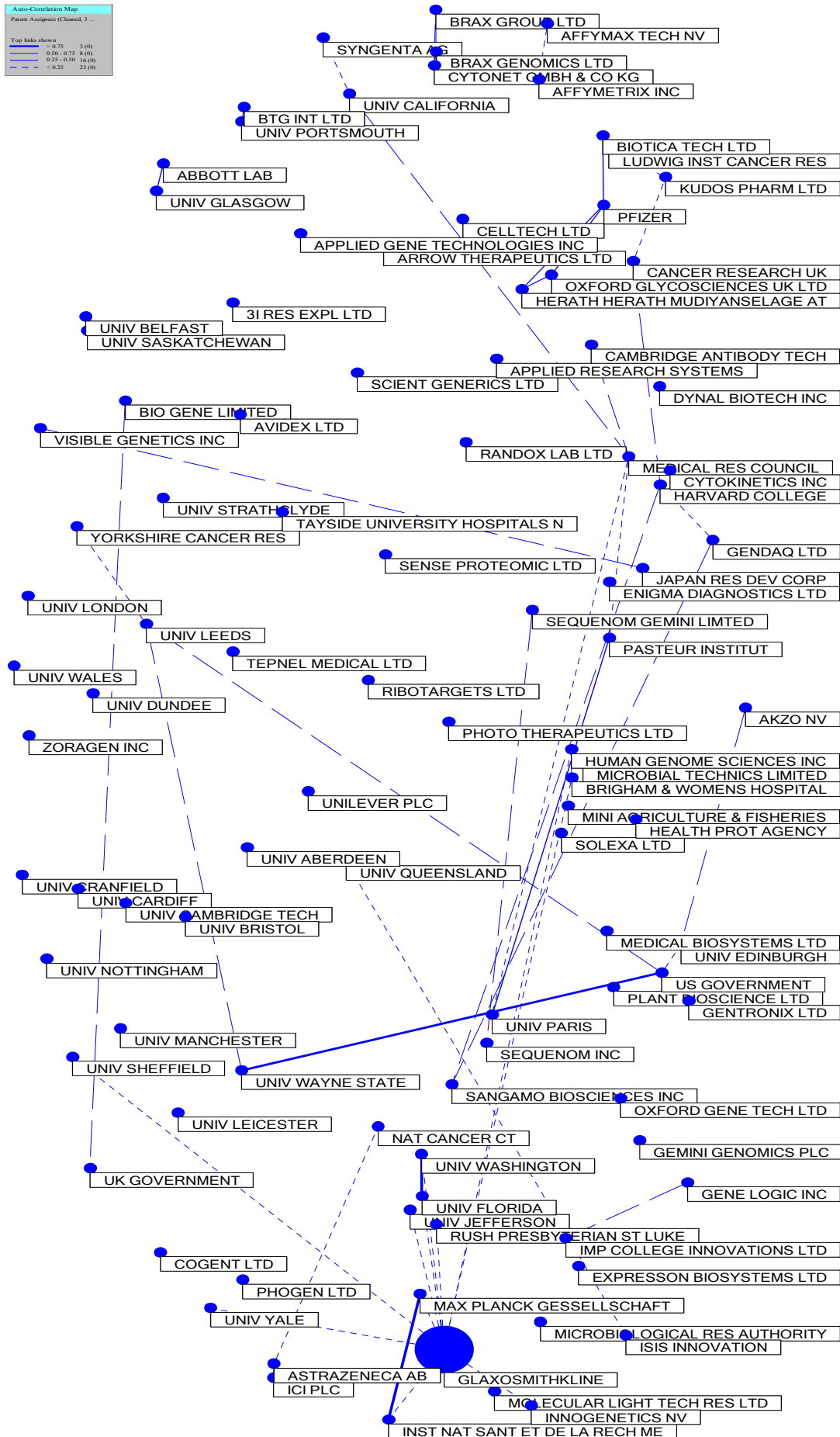


Figure 7.11 Collaborations for UK companies filing patents in the field of **gene expression** profiles



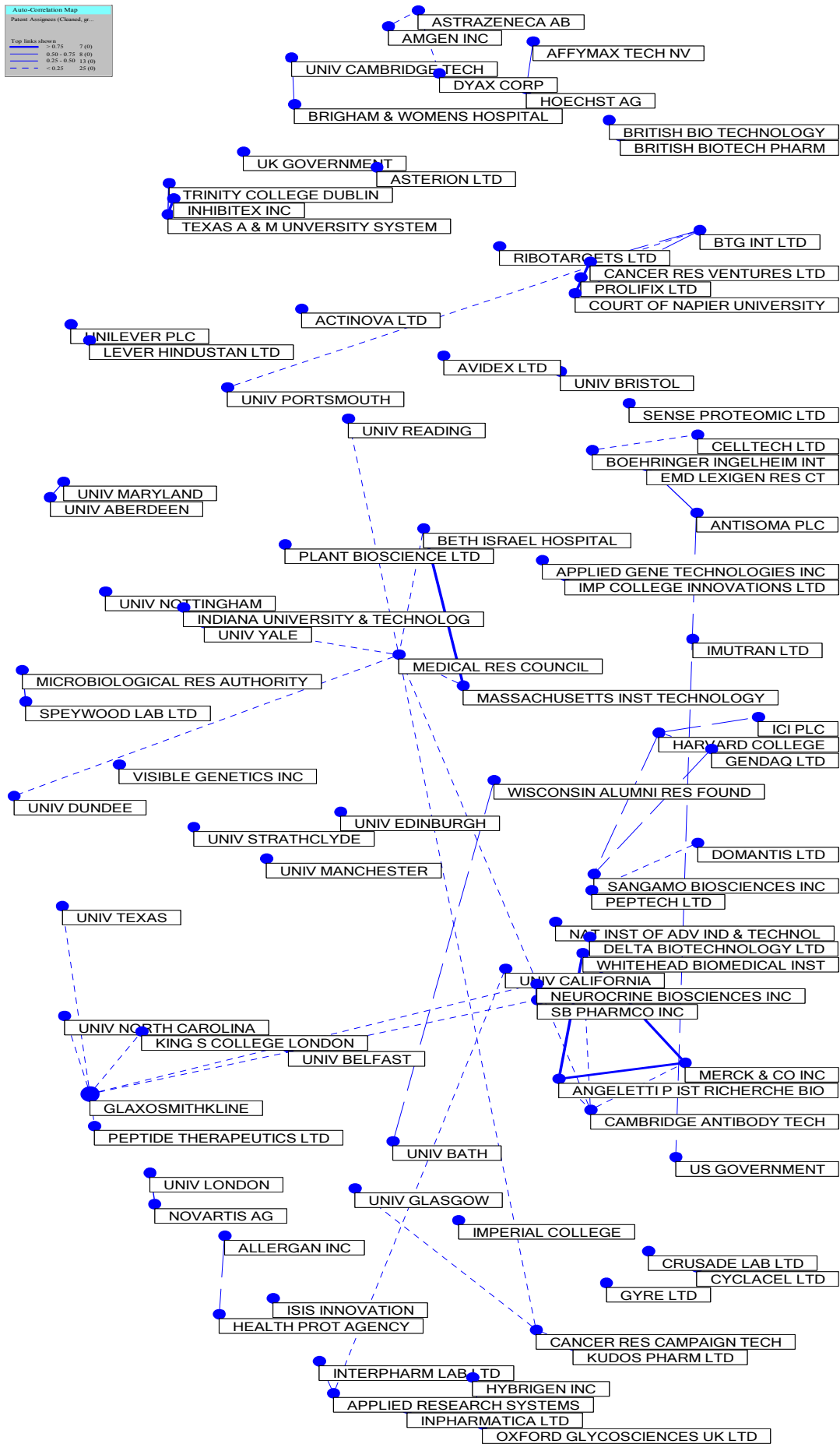
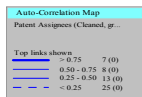
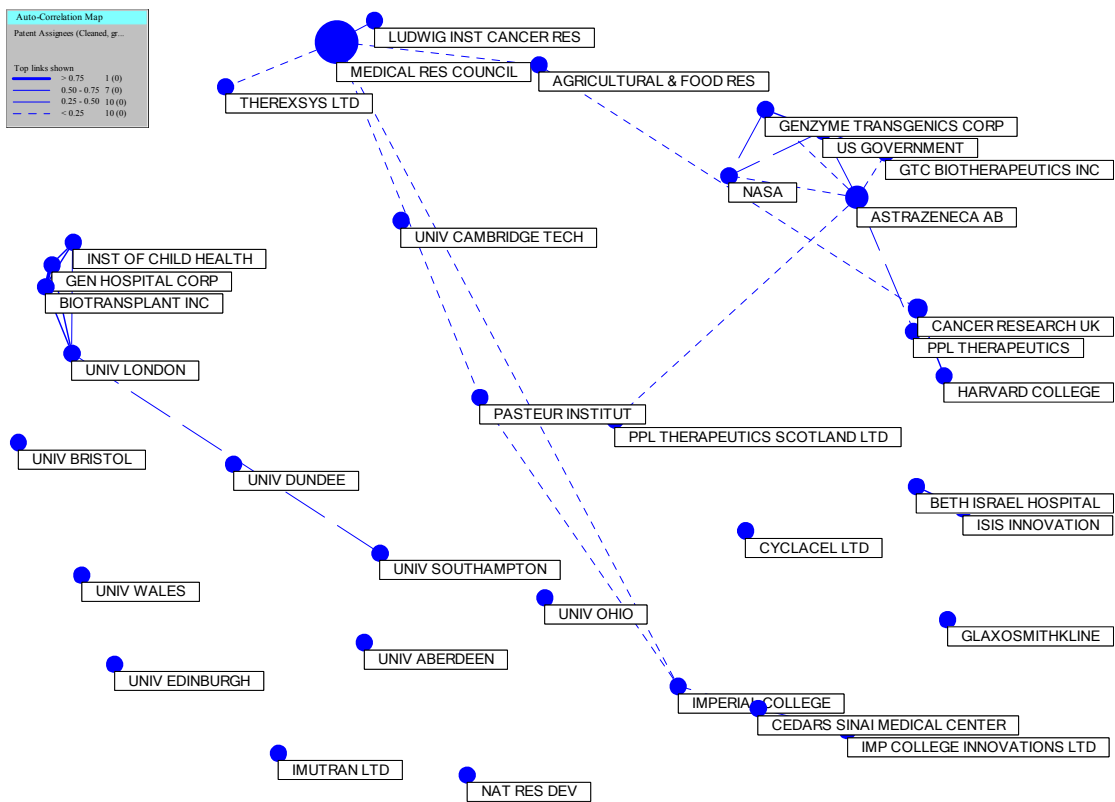


Figure 7.13 Collaborations for UK companies in the field of **protein-protein interactions**







**Figure 7.16** Collaborations for UK companies filing in the field of **modified animal patents**

# **ANNEX to CHAPTER 10**

## **Table 10.1**

### **Nucleic Acid-based Cancer Diagnostics**

**Table 10.1** Numbers of Patents filed worldwide by company/institution in nucleic acid-based cancer diagnostics<sup>1</sup>

<b>COMPANY/INSTITUTION NAME</b>	<b>Probes for cancer<sup>#</sup></b>	<b>Probes for mutations related to cancer<sup>\$</sup></b>
1. UNIV JOHNS HOPKINS	115	65
2. UNIV CALIFORNIA	80	58
3. SEQUENOM INC	53	5
4. EPIGENOMICS AG	23	26
5. US GOVERNMENT	31	18
6. UNIV TEXAS	18	23
7. DANA FARBER CANCER INST INC	12	26
<b>8. VISIBLE GENETICS INC</b>	<b>23</b>	<b>13</b>
9. PENN STATE RES FOUND	12	18
10. EXACT SCIENCES CORP	13	16
11. MASSACHUSETTS INST TECHNOLOGY	24	3
12. UNIV UTAH	25	1
13. WHITEHEAD BIOMEDICAL INST	18	8
14. ROCHE	8	17
15. SAMSUNG ELECTRONICS	14	11
16. PROMEGA CORP	15	8
17. UNIV BRITISH COLUMBIA	4	18
18. GENSET SA	21	
<b>19. ASTRAZENECA AB</b>	<b>16</b>	<b>4</b>
20. HOPE CITY	11	9
21. UROCOR INC		20
22. AGENSYS INC		19
23. MYRIAD GENETICS INC	19	
24. LUDWIG INST CANCER RES	1	17
25. MASSACHUSETTS EYE & EAR INFIRM	18	
26. OKLAHOMA MED RES FOUND	16	2
27. BAYLOR COLLEGE MEDICINE	8	9
28. GEN HOSPITAL CORP	9	8
29. GEN PROBE INC	12	5
30. NOVARTIS AG	10	6
31. BAYER AG	3	12
<b>32. CANCER RESEARCH UK</b>	<b>15</b>	<b>2</b>
33. GENAISSANCE PHARMACEUTICALS	15	
34. CORIXA CORP		14
35. MILLENNIUM PHARM INC		14
36. ONCOMEDX INC		14
37. AEOMICA INC		13
38. BEHRINGWERKE AG	13	
39. EXACT LAB INC	9	4
40. DAIKIN IND LTD	12	

<sup>1</sup> This covers RNA and DNA based cancer diagnostics which are classed in ECLA mark C12Q1/68M6B

41. ONTARIO CANCER INST	12	
42. SUMITOMO GROUP	10	2
43. CENTRE NAT RECH SCIENT	2	9
44. GENE LOGIC INC	3	8
45. GENODYSSEE	11	
46. LOVELACE RESPIRATORY RES INST	8	3
47. NAT CANCER CT JAPAN	5	6
48. UNIV JEFFERSON		11
49. MAYO FOUNDATION	1	9
50. MOLECULAR DYNAMICS INC		10
51. NORDIAG AS	10	
52. ONCORMED INC	7	3
53. UNIV ERASMUS		10
54. UNIV MCGILL	8	2
55. UNIV OHIO	6	4
56. UNIV VANDERBILT	1	9
57. WAYNE JOHN CANCER INST	4	6
<b>58. GLAXOSMITHKLINE</b>	<b>4</b>	<b>5</b>
59. MEDINNOVA SF	6	3
60. UNIV EMORY	8	1
61. UNIV HONG KONG	1	8
62. UNIV OREGON HEALTH & SCIENCE	5	4
63. UPSTATE BIOTECH INC	9	
64. DARTMOUTH COLLEGE	5	3
65. JAPAN GOVERNMENT	7	1
66. RIGEL PHARMACEUTICALS INC		8
67. SLOAN KETTERING INST CANCER	2	6
68. UNIV RAMOT	6	2
69. UNIV VERMONT		8
70. AFFYMETRIX INC	3	4
71. AVITECH DIAGNOSTICS INC	7	
72. EPIDAUROS BIOTECHNOLOGIE AG	7	
<b>73. GENOSTIC PHARMA LTD</b>	<b>7</b>	
74. HITACHI	4	3
75. JAPAN FOUND CANCER	7	
76. MAX PLANCK GESSELLSCHAFT	5	2
77. PASTEUR INSTITUT		7
78. RECH DU CHUL CENTRE	7	
79. UNIV ALBERTA		7
80. UNIV CHICAGO	7	
81. VERIDEX LLC		7
82. BETH ISRAEL HOSPITAL	2	4
83. BIOMERIEUX SA		6
84. CHIRON CORP	6	
85. CHRONIX BIOMEDICAL		6
86. GENE LOGIC INC	5	1
87. GERON CORP	4	2
88. IMREG INC		6
89. INST NAT SANT ET DE LA RECH ME		6
90. ML TECHNOLOGY VENTURES	6	
91. ONCOTHERAPY SCIENCE INC		6
92. PHILADELPHIA HEALTH & EDUCATIO		6
93. RAGGIO ITALGENE SPA	4	2
94. SINAI SCHOOL MEDICINE	3	3

95. TRIPATH IMAGING INC		6
96. UNIV ARKANSAS		6
97. UNIV LEIDEN	6	
98. UNIV NEW JERSEY MED	4	2
99. VARIAGENICS INC	4	2
100. APPLERA CORP	2	3
101. ARCTURUS BIOSCIENCE INC		5
102. BIO MERIEUX		5
103. BOEHRINGER INGELHEIM INT	4	1
104. CETUS CORP	3	2
105. CHUGAI PHARMACEUTICAL CO LTD		5
106. COMPUGEN		5
107. COMMW SCIENT IND RES ORG	5	
108. CORNELL RES FOUNDATION INC		5
109. DEUTSCHES KREBSFORSCH	1	4
110. EXONHIT THERAPEUTICS SA		5
111. HISAMITSU PHARMACEUTICAL CO		5
<b>112. ICI PLC</b>	<b>5</b>	
113. INTERGENETICS INC	5	
<b>114. ISIS INNOVATION</b>	<b>2</b>	<b>3</b>
115. ISIS PHARMACEUTICALS INC		5
116. NASA		5
117. OLIGENE GMBH		5
118. ORAVAX INC		5
119. OREAL	5	
120. ORTHO CLINICAL DIAGNOSTICS	4	1
121. SALK INST	5	
122. TEXAS A & M UNIVERSITY SYSTEM		5
123. UAB RESEARCH FOUNDATION	2	3
124. UNIV MARYLAND	2	3
125. UNIV STATE CLEVELAND	5	
126. UNIV WASHINGTON	1	4
127. WISTAR INST	1	4
128. APPLIED HYDROGEL TECHNOLOGY CO	3	1
129. CALIFORNIA INST BIOLOG RES	4	
130. COLD SPRING HARBOR LAB		4
131. DIAGNOCURE INC		4
132. DNAPRINT GENOMICS INC	4	
133. FRANCE ETAT	2	2
134. FUNDACION PARA LA INVESTIGACIO	4	
135. GENZYME CORP		4
136. HUMAN GENOME SCIENCES INC		4
137. MERCK & CO INC		4
138. PACIFIC NORTHWEST RES INST		4
139. PHARMAGENICS INC		4
140. SANGTEC MEDICAL AB	4	
141. STRATAGENE INC	2	2
142. UNIV CASE WESTERN RESERVE		4
143. UNIV DUKE		4
144. UNIV LEIDEN		4
145. UNIV STANFORD	2	2
146. UNIV TOKYO	1	3
147. VYSIS INC		4

148.	YISSUM RES DEV CO	3	1
149.	ZILA INC	4	
150.	AARHUS UNI	3	
151.	ACADEMY OF APPLIED SCIENCES	2	1
152.	ACRONGENOMICS INC		3
153.	AGENCY IND SCIENCE TECHN		3
154.	ALLIED BIOTECH INC		3
155.	GENEBIOMED INC		3
156.	GILSON CHRISTOPHER RALEIGH	3	
157.	HARVARD COLLEGE		3
158.	INCYTE GENOMICS INC		3
159.	INNOCENTI FEDERICO	3	
160.	INTERNAT CT FOR GENETIC ENGINE	3	
161.	JAPAN RES DEV CORP		3
162.	LIFE TECHNOLOGIES INC	1	2
163.	MEDIZINISCHE HOCHSCHULE HANNOV	3	
164.	MTM LAB AG		3
165.	NAT UNIVERSITY CORP OKAYAMA UN	3	
166.	OLYMPUS CORP	1	2
167.	ONCOGENE SCIENCE INC	3	
168.	OTSUKA PHARMA CO LTD	3	
169.	PE CORP NY	1	2
170.	PURDUE RESEARCH FOUNDATION		3
171.	QUARK BIOTECH INC		3
172.	S R L KK		3
173.	SEATTLE GENETICS INC		3
174.	SUISSE RECH EXPERIMENT	3	
175.	<b>SYNGENTA AG</b>	<b>3</b>	
176.	SYSMEX CORP		3
177.	<b>TAYSIDE UNIVERSITY HOSPITALS N</b>		<b>3</b>
178.	UNIV GEORGETOWN	2	1
179.	UNIV MISSISSIPPI		3
180.	UNIV MISSOURI		3
181.	UNIV OTTAWA		3
182.	UNIV SOUTH AUSTRALIA	3	
183.	WHITTIER INST DIABETES & ENDOC		3
184.	YEDA RES & DEV		3
185.	AEGERA THERAPEUTICS INC		2
186.	APROGENEX INC		2
187.	AVITECH DIAGNOSTICS INC		2
188.	BARD DIAGNOSTIC SCIENCES INC		2
189.	BAXTER AG		2
190.	BRIGHAM & WOMENS HOSPITAL	1	1
191.	COMMISSARIAT ENERGIE ATOMIQUE		2
192.	COUNCIL OF SCIENT & INDUS RES	1	1
193.	CURIS INC	1	1
194.	DNA SCIENCES INC	2	
195.	DZ GENES LLC	2	
196.	EASTERN VIRGINIA MED SCHOOL		2
197.	EXIQON AS	1	1
198.	FRAUNHOFER GES FORSCHUNG		2
199.	FUJISAWA PHARMACEUTICAL CO		2
200.	<b>GEMINI RESEARCH LIMITED</b>	<b>2</b>	

201.	GENETICS INST		2
202.	IDGENE PHARMACEUTICALS LTD	2	
203.	ILLUMINA	1	1
204.	INST MEDICAL W & E HALL		2
205.	INST OF GENE AND BRAIN SCIENCE		2
206.	INTEGRIDERM L L C		2
207.	INVITROGEN CORP	1	1
208.	JAPAN SCIENCE & TECH CORP	2	
209.	K U LEUVEN RES AND DEV	2	
210.	LG GROUP		2
211.	MEDSTAR RES INST	1	1
212.	METAGEN GES FUR GENOMFORSCHUNG		2
213.	mitsubishi group		2
214.	NANOGEN INC		2
215.	NAT INST HEALTH		2
216.	NAT INST RADIOLOG	2	
217.	ONCOR INC		2
218.	ORCHID BIOSCIENCES INC	1	1
219.	ORION YHTYMAE OY		2
220.	PHILADELPHIA CHILDREN HOSPITAL	2	
<b>221.</b>	<b>RANDOX LAB LTD</b>		<b>2</b>
222.	RES FOUND MENTAL HYGIENE		2
223.	SAMYANG GENEX CORP		2
224.	SIGNALGENE	1	1
225.	SKY GENETICS INC		2
226.	SPECTRAL GENOMICS INC		2
227.	ST JUDE CHILDRENS RES HOSPITAL	2	
228.	TUM GENE INC	2	
229.	UNIV BOSTON		2
230.	UNIV EBERHARD KARLS		2
<b>231.</b>	<b>UNIV LONDON</b>	<b>1</b>	<b>1</b>
<b>232.</b>	<b>UNIV MANCHESTER</b>	<b>2</b>	
233.	UNIV MANITOBA		2
234.	UNIV PENNSYLVANIA	1	1
<b>235.</b>	<b>UNIV WALES</b>		<b>2</b>
236.	ABBOTT LAB		1
237.	ADNAGEN AG		1
238.	ALL INDIA INST MED		1
239.	ANGELETTI P IST RICHERCHE BIO		1
240.	ARTUS GES FUR MOLEKULARBIOLOGI		1
241.	ASSISTANCE PUBLIQUE	1	
242.	BIOMAEDRAB CO LTD		1
243.	BIONOMICS LTD		1
244.	BOSTON COLLEGE		1
245.	BURNHAM INST FOR MEDICAL RES		1
246.	CANCER RES INST		1
247.	CANON KK		1
248.	CALTECH	1	
249.	CEDARS SINAI MEDICAL CENTER		1
250.	CENIX BIOSCIENCE GMBH		1
251.	CHILDRENS MEDICAL CENTER		1
252.	CIBA GEIGY AG		1
253.	CLEVELAND CLINIC FOUNDATION		1

254.	DADE BEHRING INC	1	
255.	DIVERSA CORP		1
256.	EPPENDORF AG		1
257.	ERASMUS UNIVERSITY MEDICAL CT		1
258.	EURONA MEDICAL AB	1	
259.	FIVE PRIME THERAPEUTICS INC		1
260.	FOX CHASE CANCER CENTER		1
<b>261.</b>	<b>GEMINI GENOMICS PLC</b>	<b>1</b>	
262.	GENOMICS COLLABORATIVE INC	1	
263.	HOSPITAL FOR SICK CHILDREN	1	
264.	HUBIT GENOMIX INC	1	
265.	JOHNSON & JOHNSON	1	
266.	KARLSRUHE FORSCHZENT		1
267.	LYNX THERAPEUTICS INC		1
268.	MED COLLEGE GEORGIA RES INST		1
269.	MICROMET AG		1
270.	MOUNT SINAI HOSPITAL CORP		1
271.	NGK INSULATORS LTD		1
272.	NIIGATA UNIVERSITY		1
273.	NIPPON MEDICAL SCHOOL		1
274.	OREGON STATE		1
275.	ORION GENOMICS LLC		1
276.	PERLEGEN SCIENCES INC	1	
277.	PFIZER		1
278.	PRIMERA BIOSYSTEMS INC		1
279.	PROGENIKA BIOPHARMA S A		1
280.	QUEST DIAGNOSTICS INC		1
281.	SANGAMO BIOSCIENCES INC		1
282.	SANKYO CO		1
283.	SANOFI-AVENTIS		1
284.	SQUIBB BRISTOL MYERS CO	1	
285.	STICHTING KATHOLIEKE UNIV		1
286.	TAKARA BIO INC		1
287.	TAKARA SHUZO CO		1
288.	TAKEDA CHEMICAL IND LTD		1
289.	TEIJIN LTD		1
<b>290.</b>	<b>UNIV BELFAST</b>		<b>1</b>
<b>291.</b>	<b>UNIV BRISTOL</b>		<b>1</b>
292.	UNIV COLORADO	1	
293.	UNIV DUISBURG ESSEN	1	
294.	UNIV FLORIDA		1
295.	UNIV HOSPITAL NIJMEGEN		1
296.	UNIV KEIO		1
297.	UNIV KENTUCKY	1	
298.	UNIV KYOTO		1
299.	UNIV LAVAL	1	
<b>300.</b>	<b>UNIV LEEDS</b>		<b>1</b>
301.	UNIV MICHIGAN	1	
302.	UNIV NEW YORK		1
303.	UNIV NORTH CAROLINA		1
304.	UNIV PRINCETON		1
305.	UNIV ROCKEFELLER		1
306.	UNIV ROCHESTER	1	
307.	UNIV VIRGINIA		1

308.	UPJOHN CO		1
309.	US GENOMICS INC		1
310.	VANANDEL RES INST		1
311.	WISCONSIN ALUMNI RES FOUND	1	
<b>312.</b>	<b>YORKSHIRE CANCER RES</b>		<b>1</b>

# Taken from the **SNP/Haplotypes** area of technology

\$ Taken from the **Gene Expression profiles** area of technology