IP Wales:
Study of Intellectual Property in UK HEIs with emphasis on Wales

Editor: Andrew Beale

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PREFACE

The Intellectual Property Wales (IP Wales®) initiative operates under the third mission activities of the Law Department at Swansea University. IP Wales® aims to add value to Welsh business through the use of patents, trade marks, industrial designs, copyright, database rights and know-how.

To this end we offer a free on-line IP Guide giving firms an instant report on the IP issues they need to address. IP Wales® works with technology scouts to advise R&D active member firms about technology opportunities. A free subscription is arranged for its member firms to the World Intellectual Property Organization electronic Newsletter.

Whilst IP Wales® is a business support initiative a major strand of its activities is to critically reflect upon the phenomenon of IP as a mechanism for promoting economic activity amongst SMEs in Wales. Much of the IP Wales® business constituency is represented by small technologically driven firms and they have common concerns.

Our research has sought to focus upon these concerns, in particular the dilemma of raising finance experienced by such firms which have few tangible assets but may have a wealth of intangible assets, including IP rights. As such the research is outcome driven and is directed towards the economic and legal impact of IP activity.

Andrew Beale
Director, IP Wales

ABSTRACT

The aim of this research project is to benchmark the registered IP holdings of Welsh HEIs in comparison with their English (Russell Group)[1]; Scottish and Irish counterparts.

Our three objectives are:

• Ascertain how Wales' representative within the Russell Group sits in relation to the patent holdings of other members.

• Ascertain how Welsh HEIs sit in relation to the patent; trade mark; registered designs & domain name holdings of their Scottish and Irish counterparts.

• Identify to the IP Wales® SME client membership of R&D active firms HEI technology specialisms of commercial interest.

Acknowledgements – I would like to thank my colleague Julie Allan of Swansea PATLIB for the searches she undertook for the associated names and commercial entities of all the Universities and trade mark holdings, design registrations and domain name holdings of all the Universities in the dataset. The patent data contained within this Report was commissioned from MicroPatent Professional Services. I would particularly like to thank Susan Cullen; Brian Proctor and James Evans for the professionalism and quality of their service.

[1] Formed in 1994, the Russell Group is an association of 19 major research-intensive Universities of the United Kingdom which in 2001-2 accounted for 60% (£1.5 billion) of UK Universities research grant and contract income.

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PART I:

Overview of Patenting by Higher Education Institutions in the United Kingdom

The higher education institutions (HEI) studied in this project were the major institutions (and/or their commercial entities) in four regions; England, Scotland, Wales and Ireland. For this study, Ireland includes Northern Ireland and the Irish Republic. Within England, only the institutions of the Russell Group were considered.

Part I of the report is a survey of the quantity, subject matter and perceived impact of the patents and patent applications filed by the institutions examined. Applications filed in 5 different patent offices were studied. The abbreviations used to denote the offices are EP (European Patent Office), GB (United Kingdom), JP (Japan), US (United States) and WO (Patent Cooperation Treaty [PCT] applications filed in one of the World Intellectual Property Organization [WIPO] receiving offices. The progression from filing to issuance was examined for the EP and US documents. In all cases publication of documents lags filing by 18 months, and for this reason the data, which was collected in early 2005, is incomplete for the date range 2003-2005.

Quantity of applications and patents by region and by institution

Table 1. Summary information on the filings by region.

Region	EP	GB	JP	US	WO	Total
England (Russell Group)	1810	641	59	1539	2654	6703
Scotland	440	145	19	348	558	1510
Wales	133	87	6	106	175	507
Ireland	141	16	15	121	175	468
Total	2524	889	99	2114	3562	9188

Figure 1. Pie charts showing filings by region by patent office. Filing in the UK is proportionately higher in Wales and lower in Ireland.

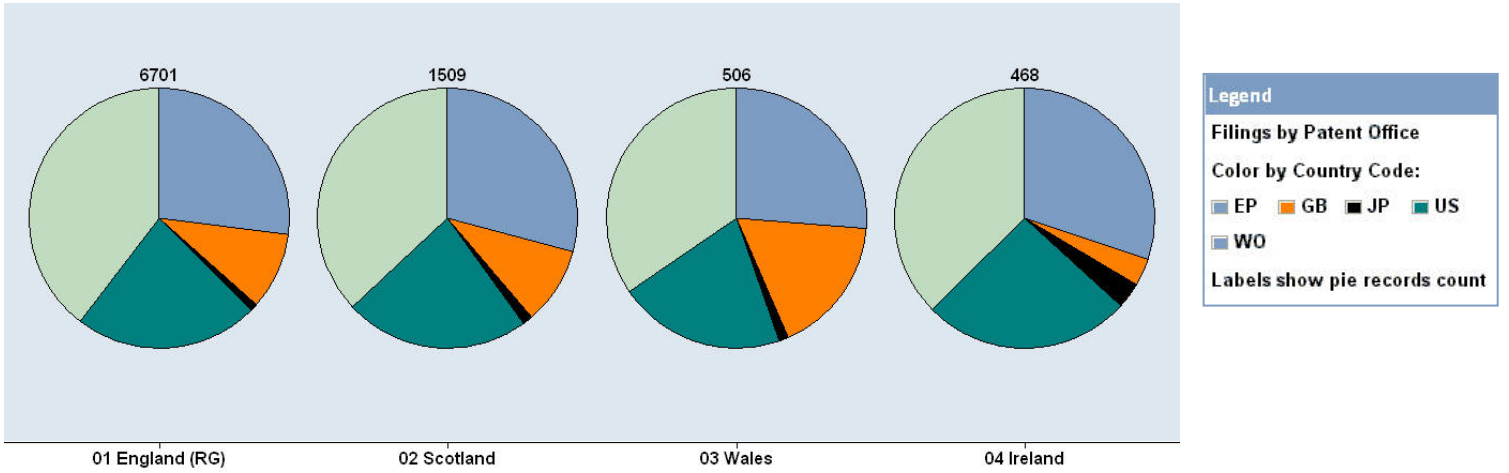


Table 2. Listing of Universities studied[2] with their filing totals.

University Name	EP	GB	JP	US	WO	Total
Region: England (Russell Group)						
Birmingham	68	15	3	55	74	215
Bristol	97	67	0	50	139	353
Cambridge	114	19	5	115	212	465
Imperial College	225	84	13	252	389	963
Kings College London	61	15	1	49	95	221
Leeds	70	17	1	56	102	246
Liverpool	66	26	4	47	68	211
Manchester	206	91	10	182	276	765
Newcastle	75	9	0	49	101	234
Nottingham	69	29	1	49	118	266
Oxford - Isis	306	45	7	273	453	1084
Sheffield	100	68	3	94	144	409
Southhampton	126	52	2	107	161	448
University College London	179	82	8	123	261	653
Warwick	48	22	1	38	61	170
England (RG) Subtotal	1810	641	59	1539	2654	6703
Region: Scotland						
Aberdeen	52	15	0	38	73	178
Abertay	3	1	0	3	3	10
Dundee	75	19	4	53	105	256
Edinburgh (RG)	43	13	1	39	66	162
Glasgow (RG)	96	28	5	89	110	328
Glasgow Caledonian	8	5	0	6	11	30
Heriot-Watt	19	13	2	13	22	69
Napier	7	11	0	4	13	35
Paisley	5	2	0	1	8	16
Queen Margaret	1	0	0	0	1	2
Robert Gordon	5	4	0	1	10	20
Scottish Agricultural	4	3	0	6	3	16
St Andrews	3	1	1	1	2	8
Stirling	2	1	0	0	2	5
Strathclyde	117	29	6	94	129	375
Scotland Subtotal	440	145	19	348	558	1510
Region: Wales						
Aberystwyth	9	10	0	5	14	38
Bangor	11	1	0	5	15	32
Cardiff (RG)	97	60	5	86	127	375
Glamorgan	6	5	1	6	4	22
North East Wales	0	1	0	0	0	1
Swansea	10	10	0	4	15	39
Wales Subtotal	133	87	6	106	175	507
Region: Ireland						
Belfast	42	11	0	34	51	138
Cork	16	0	2	14	24	56
Dublin (City U)	6	1	0	7	9	23
Dublin (U College)	21	1	2	19	29	72
Dublin (Trinity)	39	2	9	38	38	126
Galway	3	0	2	1	1	7
Limerick	0	0	0	0	3	3
Maynooth	1	0	0	0	1	2
Ulster	13	1	0	8	19	41
Ireland Subtotal	141	16	15	121	175	468
Total	2524	889	99	2114	3562	9188

[2] No IP filings were found for a number of other institutions including: London School of Economics, Bell College, Edinburgh College of Art, Glasgow School of Art, Royal Scottish Academy of Music, University of the Highlands, University Marine Biological Sta. Millport, Lampeter, Newport, Carmarthen, University of Wales Institute, Royal Welsh Conservatory, National College of Art and Design, Royal College of Surgeons, Royal Irish Academy.

Figure 2a. Bar chart showing counts of filings for each University, organized by region. Universities in the Russell Group are shown as darker bars. In this chart, all institutions are shown to the same scale.

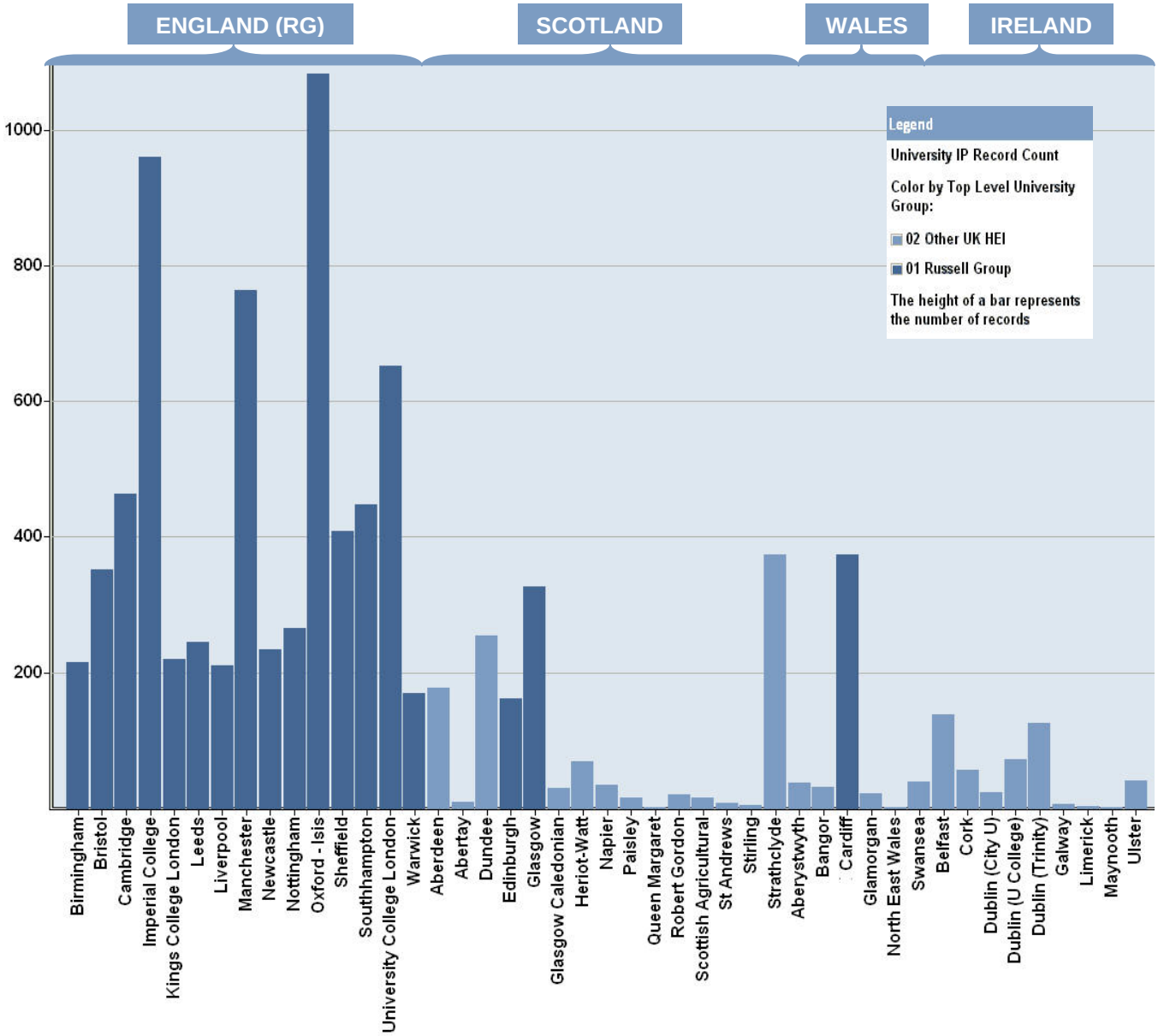
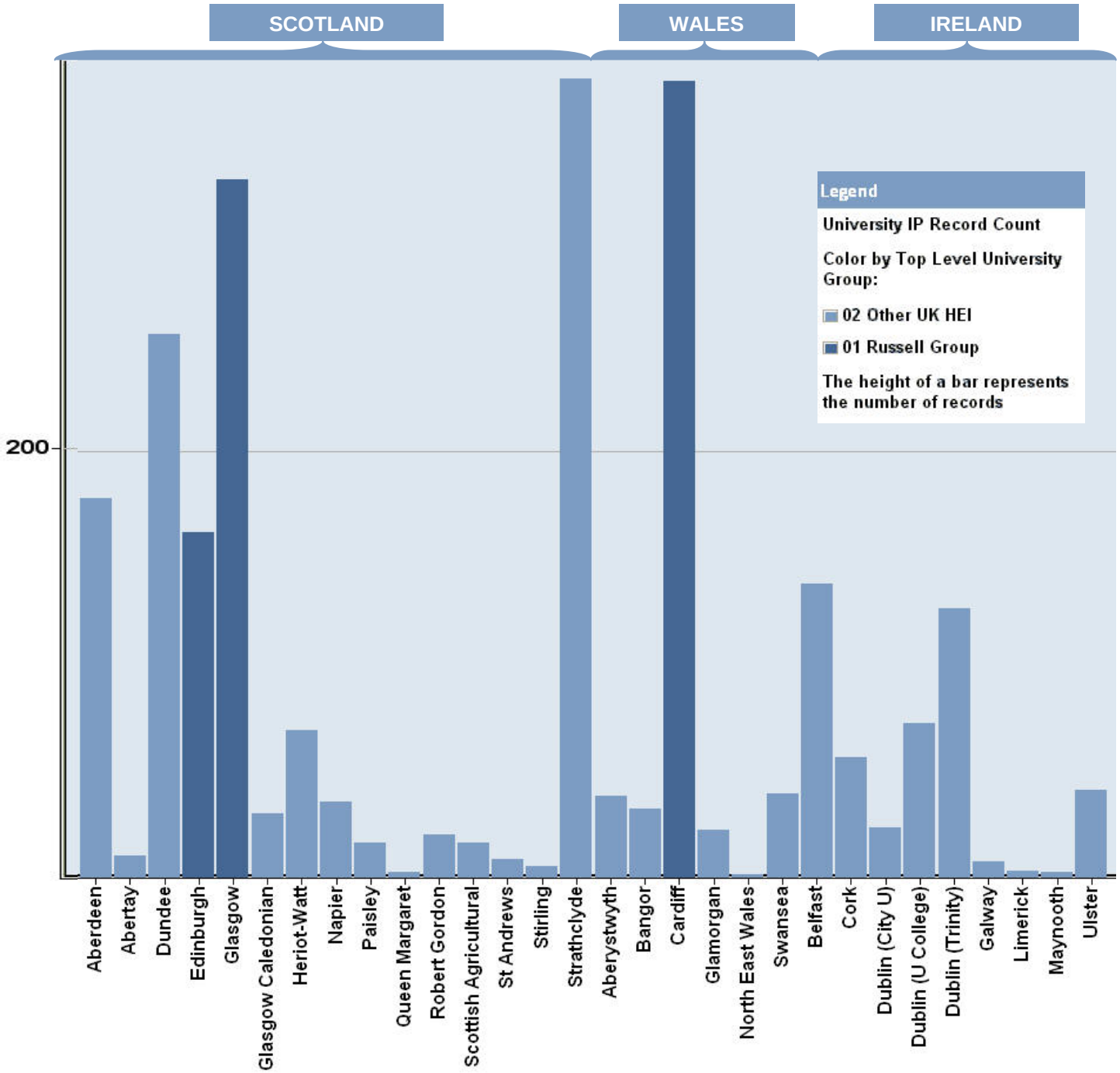


Figure 2b. Bar chart showing counts of filings for each University, with England omitted. Changing the scale of the Y axis allows a view of more detail for the regions shown. Universities in the Russell Group are shown as darker bars.



Ratio of issued patents to applications – EP and US

Once a patent application is filed, it may or may not be prosecuted to issuance. The reasons for failure to issue may vary, but overall it is desirable to have applications issue at a reasonably high rate in order to promote successful commercialization and in order to use funding for patent prosecution effectively. On this and the following pages the rate of issuance of EP and US patent applications is examined for the institutions in the study[3]. The EP data considered covers 1983-2005. The data for the US covers only 2000-2005 because US applications were unpublished in prior years, and no meaningful ratio can be calculated for US documents between 1983-1999.

Table 3. EP issuance ratios, 1983-2005. The ratio if patents/applications is rounded. Ratios above the all-region average are highlighted.

University Name	EP App	EP Pat	Total	P/A
Birmingham	28	40	68	1.4
Bristol	78	19	97	0.2
Cambridge	90	24	114	0.3
Imperial College	154	71	225	0.5
Kings College London	49	12	61	0.2
Leeds	48	22	70	0.5
Liverpool	37	29	66	0.8
Manchester	107	99	206	0.9
Newcastle	51	24	75	0.5
Nottingham	45	24	69	0.5
Oxford - Isis	228	78	306	0.3
Sheffield	68	32	100	0.5
Southhampton	63	63	126	1.0
University College London	119	60	179	0.5
Warwick	31	17	48	0.5
England Regional	1196	614	1810	0.5
Aberdeen	36	16	52	0.4
Abertay		3	3	-
Dundee	54	21	75	0.4
Edinburgh	31	12	43	0.4
Glasgow	72	24	96	0.3
Glasgow Caledonian	6	2	8	0.3
Heriot-Watt	14	5	19	0.4
Napier	6	1	7	0.2
Paisley	4	1	5	0.3
Queen Margaret		1	1	-
Robert Gordon	5		5	0.0
Scottish Agricultural	2	2	4	1.0
St Andrews	3		3	0.0
Stirling	2		2	0.0
Strathclyde	56	61	117	1.1
Scotland Regional	291	149	440	0.5
Aberystwyth	4	5	9	1.3
Bangor	7	4	11	0.6
Cardiff	65	32	97	0.5
Glamorgan	4	2	6	0.5
Swansea	6	4	10	0.7
Wales Regional	86	47	133	0.5
Belfast	30	12	42	0.4
Cork	10	6	16	0.6
Dublin (City U)	4	2	6	0.5
Dublin (U College)	13	8	21	0.6
Dublin (Trinity)	28	11	39	0.4
Galway	1	2	3	2.0
Maynooth	1		1	0.0
Ulster	10	3	13	0.3
Ireland Regional	97	44	141	0.5
All regions	1670	854	2524	0.5

[3] There are no double counts between patents and applications in any of the tables presented in this report. If an EP or US patent had issued, its corresponding application was removed from the dataset. Data on issuance of GB and JP applications is not presented in this report. PCT applications are a special case, because PCT (WO) applications *per se* do not "issue". Inventions in PCT applications progress to patent issuance only by prosecution of the application in individual national patent offices.

Table 4. US issuance ratios, 2000-2005. The ratio if patents/applications are rounded. Ratios above the all-region average are highlighted.

University Name	US App	US Pat	Total	P/A
Birmingham	8	17	25	2.1
Bristol	30	13	43	0.4
Cambridge	56	49	105	0.9
Imperial College	105	100	205	1.0
Kings College London	27	8	35	0.3
Leeds	22	16	38	0.7
Liverpool	11	10	21	0.9
Manchester	44	56	100	1.3
Newcastle	12	19	31	1.6
Nottingham	15	16	31	1.1
Oxford - Isis	131	95	226	0.7
Sheffield	26	34	60	1.3
Southhampton	29	51	80	1.8
University College London	35	40	75	1.1
Warwick	9	18	27	2.0
England Regional	560	542	1102	1.0
Aberdeen	16	11	27	0.7
Abertay		3	3	
Dundee	22	15	37	0.7
Edinburgh	17	10	27	0.6
Glasgow	30	31	61	1.0
Glasgow Caledonian	4	2	6	0.5
Heriot-Watt	3	5	8	1.7
Napier	3		3	0.0
Robert Gordon	1		1	0.0
Scottish Agricultural	3	1	4	0.3
Strathclyde	17	27	44	1.6
Scotland Regional	116	105	221	0.9
Aberystwyth	1	1	2	1.0
Bangor	3	2	5	0.7
Cardiff	25	21	46	0.8
Glamorgan	1	1	2	1.0
Swansea	2		2	0.0
Wales Regional	32	25	57	0.8
Belfast	17	7	24	0.4
Cork	5	5	10	1.0
Dublin (City U)	4	3	7	0.8
Dublin (U College)	5	8	13	1.6
Dublin (Trinity)	15	15	30	1.0
Ulster	6	1	7	0.2
Ireland Regional	52	39	91	0.8
All regions	760	711	1471	0.9

Table 5. Issuance rate when 1st assignee is a commercial entity is greater than the rate for all applications. For EP and US data as described in Tables 3 and 4, the patent/application ratio was calculated for documents with a commercial first assignee. As expected, inventions taken up by the commercial sector have a much higher rate of progression to issuance. This could be a consequence of commercialization activity or it could be that inventions more suitable for commercialization are more aggressively prosecuted.

Region	EP P/A all assignees	EP P/A with commercial 1st assignee	US P/A all assignees	US P/A with commercial 1st assignee
England Regional	0.5	1.0	1.0	1.5
Scotland Regional	0.5	0.9	0.9	1.6
Wales Regional	0.5	0.9	0.9	0.7
Ireland Regional	0.5	0.6	0.8	1.2
All Regions	0.5	1.0	0.9	1.4

On the following page, timelines on the EP patents and applications are shown for each region. The figures show patent and application numbers plotted by year of publication in each of the regions studied.

Figure 3a. Timelines for publication of EP patents or applications covering 1983-2003.

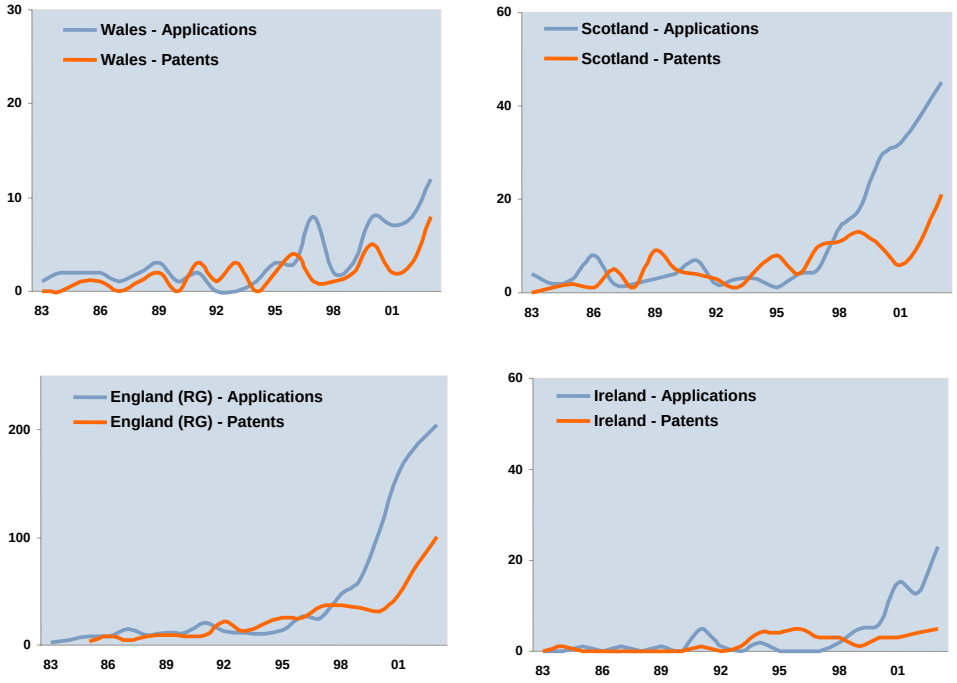
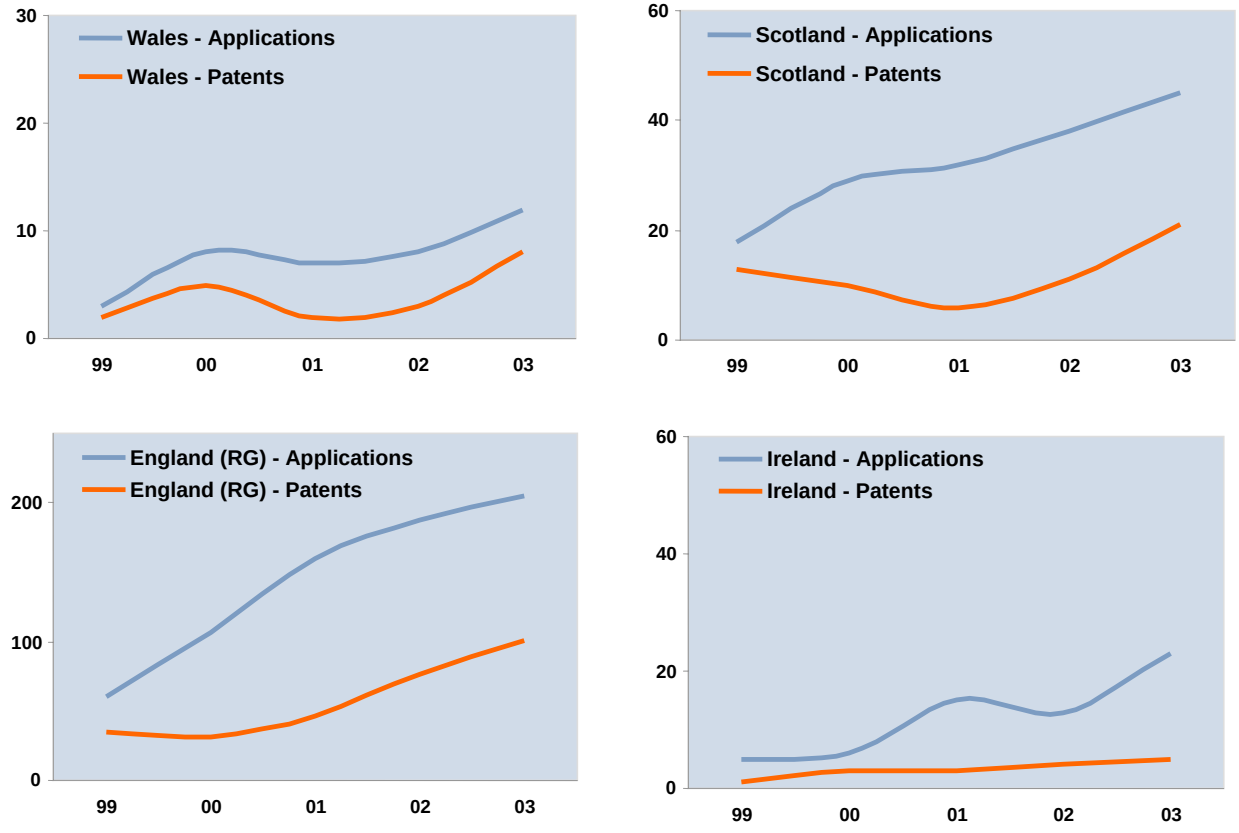


Figure 3b. Detail of EP timelines for the years 1999-2003. For most regions, the slopes are comparable.



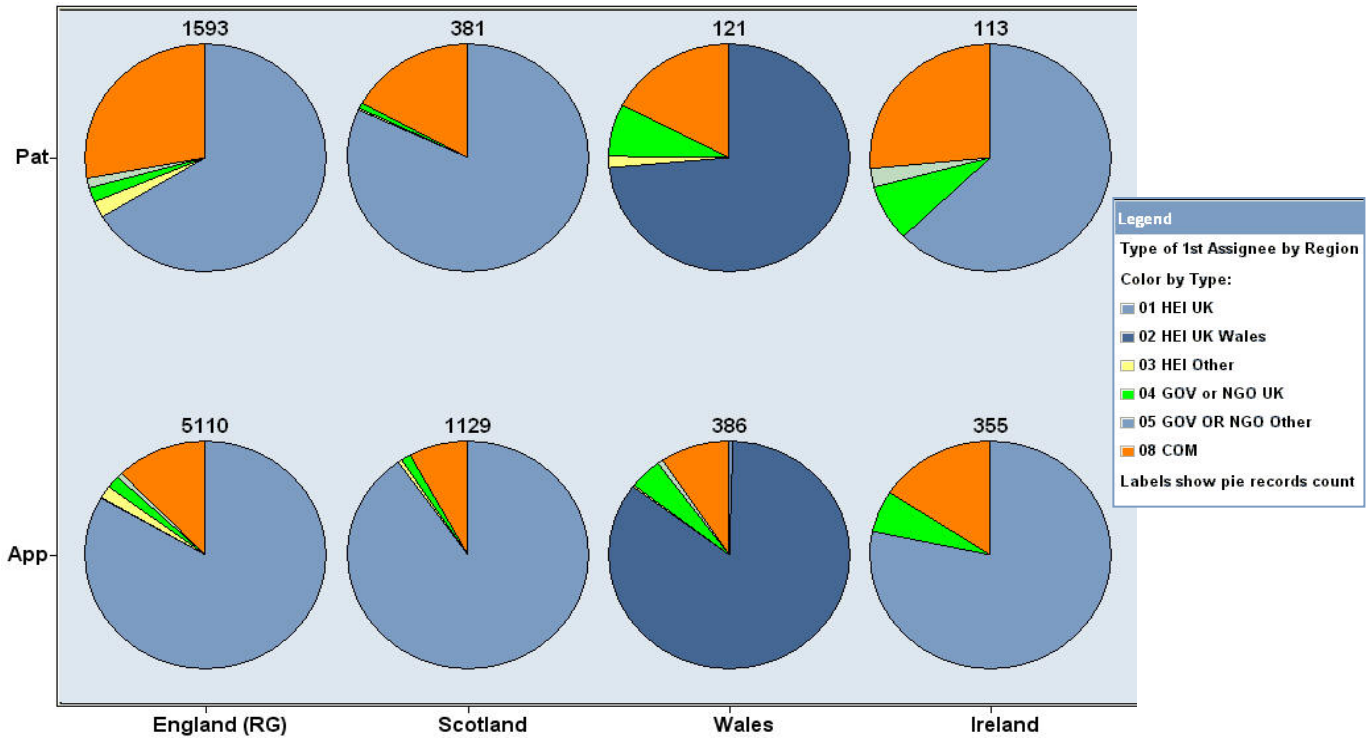
Assignee organisational types in the HEI portfolios

The HEI portfolios were assembled by including documents on which the institutions were named as an assignee (owner) or coassignee and documents that were family members of the university-assigned documents regardless of assignee name. The "family member" definition used is the INPADOC[4] definition, which is one of the more expansive ways to define invention families. INPADOC invention families can be roughly defined as documents that have been filed in different patent offices on the same invention, along with any other patent documents that rely on the original family members for "priority", meaning approximately that they represent a downstream development of the original invention on which they rely. Inclusion of all the INPADOC family members in the HEI portfolios means that some documents in the collection are "unassigned", and some are assigned to entities other than the institution itself. When a document was unassigned or inventor-assigned, its probable organizational assignment was inferred by examining the rest of the family members. The types of assignee entities present in the collection are shown in Table 6.

Table 6: Assignee codes

Code for sector of 1st Assignee	Sector Explanation	Found by Search for University name	Found by INPADOC Family Expansion	Total
HEI UK	Any UK HEI other than a Wales HEI, and includes Eire	6396	598	6994
HEI UK Wales	Wales HEI	385	36	421
HEI Other	HEI located outside the UK or Eire	39	100	139
GOV or NGO UK	UK government entity or non-govt organization	115	83	198
GOV or NGO Other	Non-UK government entity or non-govt organization	42	23	65
COM	Commercial entity	479	892	1371
Entire collection		7456	1732	9188

Figure 4. Pie charts of first assignee types present in the collection. Not surprisingly, the commercial sector is more frequently found among the issued patents.



[4] INPADOC is a database now maintained by the EPO. INPADOC (INternational PAtent DOcumentation Center) contains the bibliographic and family data of patent documents of 71 patent-issuing organizations.

Figure 5a. This bar chart provides a more detailed look at the assignee types present in the portfolios of each institution.

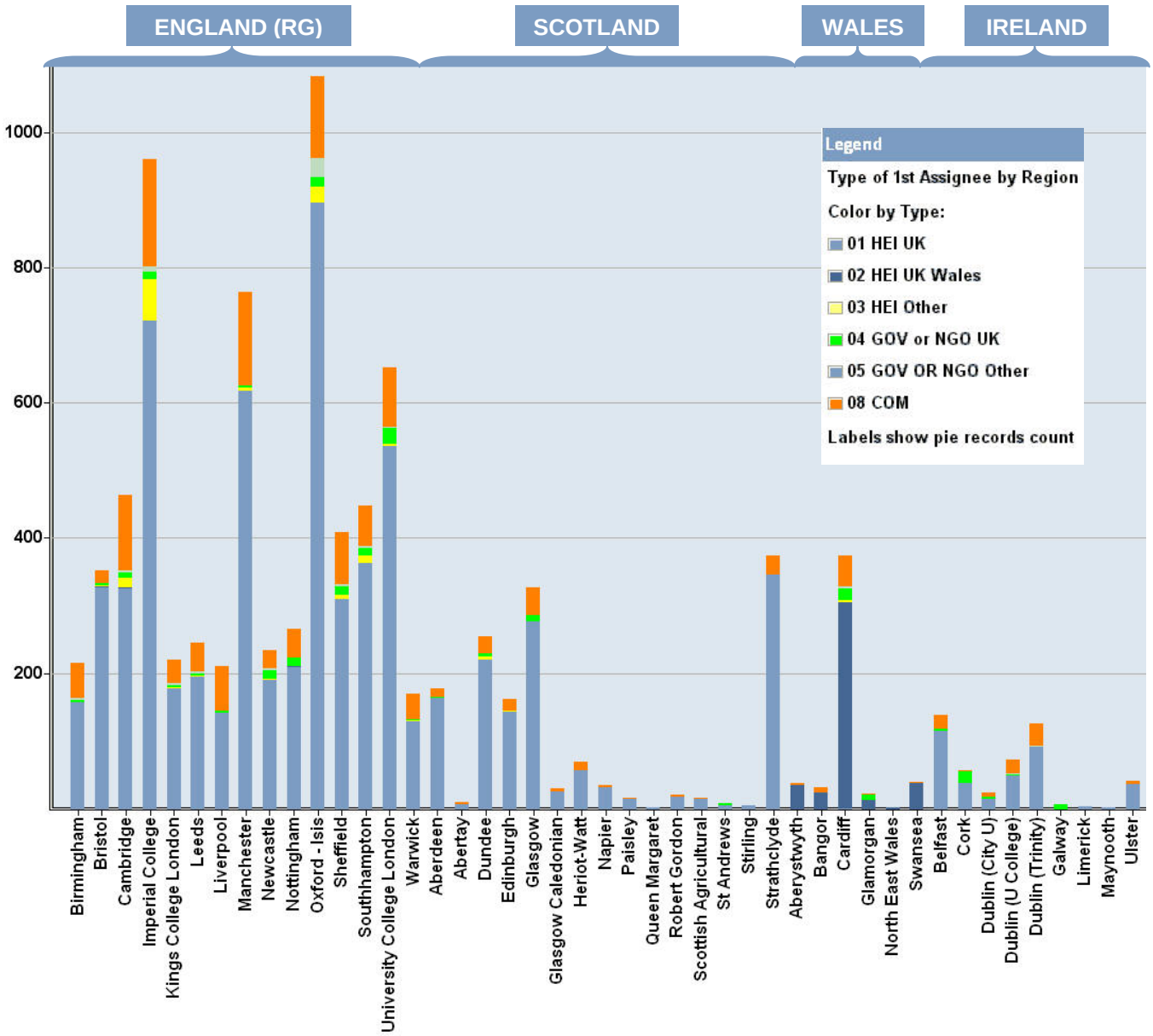


Figure 5b. This bar chart excludes England, and the expanded scale allows easier comparison of the other regional institutions. Some institutions have a proportionately high interaction with the commercial sector, even though their portfolios are relatively small.

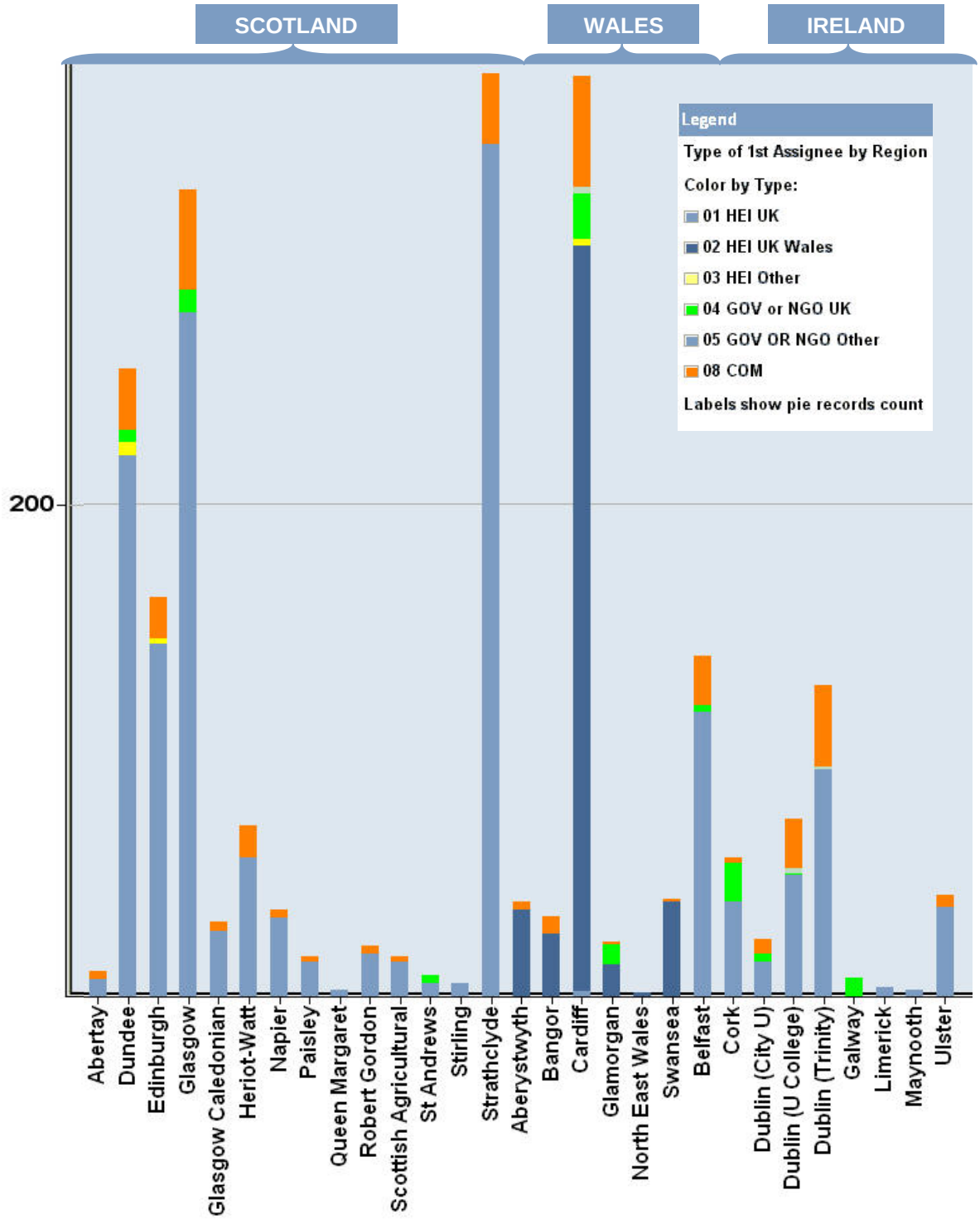
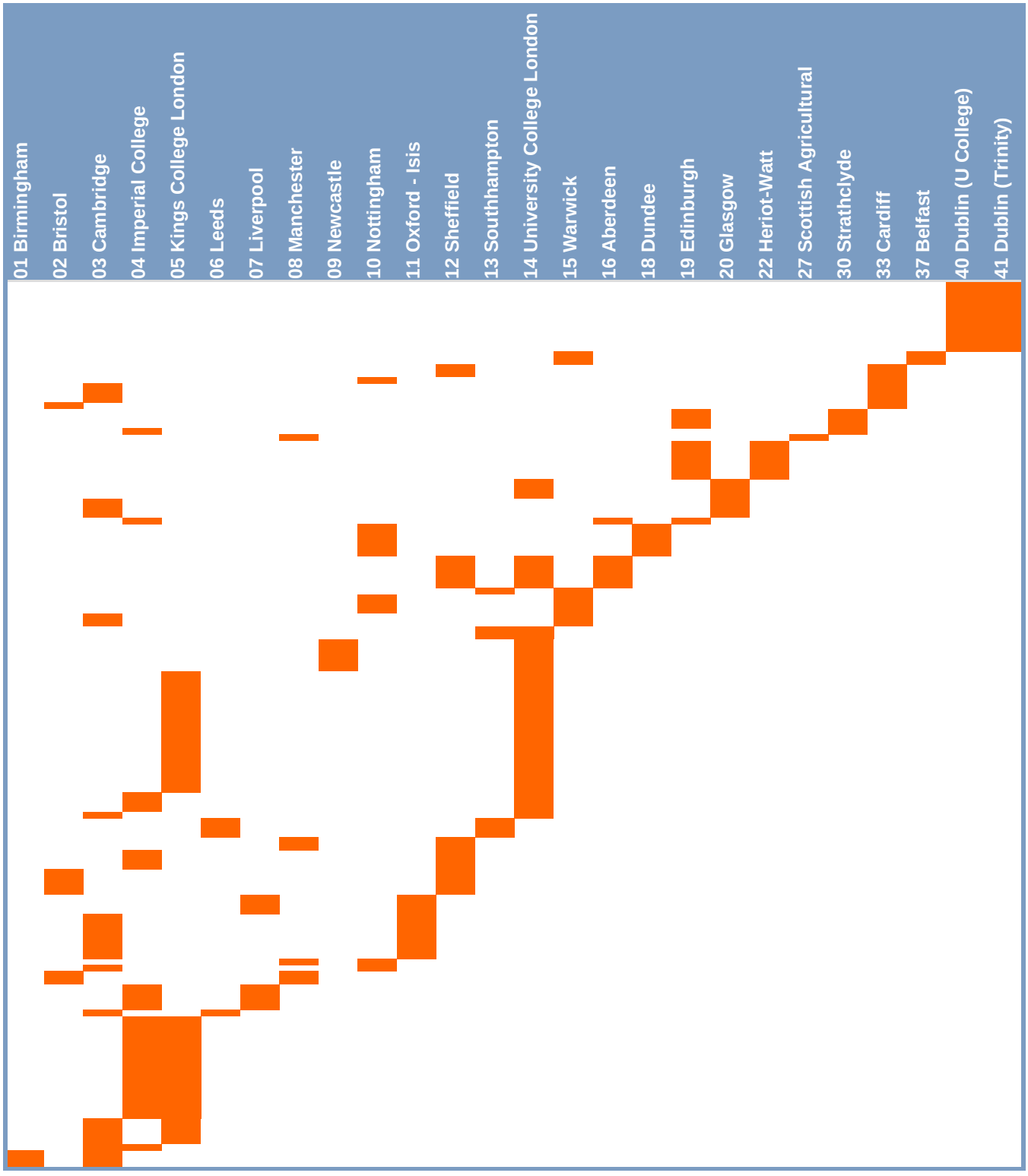


Table 7. UK HEI Collaborations that are revealed by co-assignment.

The table below (read horizontally) indicates that there were 139 instances of co-assignment between 2 or more HEIs found among the 9042 documents in the collection. The table shows that some HEIs habitually collaborate exclusively with one other institution, while in others collaboration is distributed among multiple institutions.



Company interactions detected through family co-assignment

Table 8a. England (RG) The companies listed in this table were coassignees on one or more members of patent families from the Universities shown. The timelines of publication are shown in order to give some idea of whether the activity is sustained or recent.

University Name	Commercial 1st Assignees	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	Total
01 Birmingham	Alizyme Therapeutics Ltd																			1					1
	Astron Clinica Ltd																		1	1	3		2		7
	Birmingham Research & Development Ltd															1									1
	BOC Group Plc													1		1									2
	British Nuclear Fuels Plc														1	1									2
	British Telecommunications			1	1																				2
	Cobra Therapeutics Ltd																	1		1					2
	CTP Davall Ltd																2								2
	Harmo Industries Ltd			1																					1
	Imperial Chemical Industries Plc									1															1
	Inverness Medical Switzerland Gmbh																				1				1
	Merck Patent Gmbh																					1			1
	Optiscan Ltd																	1		1					2
	Prizm Pharmaceuticals, Inc.													1	3	1	1				1				7
	Selective Genetics, Inc.																1	1	2	1		4	2		11
	Smithkline Beecham																1						1		2
	Unilever			1		1	1	1	1							1									6
02 Bristol	Apitope Technology (bristol) Ltd																					2			2
	Bioelastics Research Ltd														1		1	1							3
	British Technology Group Ltd															1	1								2
	Cambridge Isolation Technology Ltd								2																2
	Degree2 Innovations Ltd																				1				1
	Foss Tecator Ab																		1						1
	Neurotargets Ltd																					2			2
	Oratol Ltd																	1	1	2					4
	STmicroelectronics Ltd																		1						1
	Withers And Rogers																					1			1
03 Cambridge	Akubio Ltd																					2	1		3
	Alpha Fry Ltd																		1			2			3
	Andrew N. Schofield & Associates Ltd										1					2			1						4
	Applied Imaging Corporation																			1					1
	Avecia Ltd																					1	1	1	3
	Biorobotics Ltd																		1	4	2	2	1		10
	British Technology Group Ltd																	1	1		1				3
	Cambridge Correlators Ltd																						3		3
	Cambridge Microbial Technologies Ltd																	1		1					2
	Cantab Pharmaceuticals Research Ltd														1		1	1							3
	Cenfold Holdings S.a.																				1				1
	Ciba-Geigy Ag															1									1
	CPlane Inc.																		2						2
	Endozyme Ltd																1			1					2
	Fuji Electric Co																					2	1		3
	Genapta Ltd																					1	1	1	3
	Gendaq Ltd																				1	1			2
	Genomic Solutions Acquisitions Ltd																						1		1
	Glaxo Group Ltd																					1	1		2
	IBM																				2	1	2		5
	Infrared Integrated Systems																			1					1
	Lynxvale Ltd														7										7
	Novartis AG																						1		1
	Plastic Logic Ltd																					1	1		2
	Polight Technologies Ltd																				1				1
	Sangamo Biosciences, Inc.																				1				1
	Seiko Epson Corp																			3	9	1	3		16
	Smart Holograms Ltd																						1		1
	Smithkline Beecham																		1		3	3	2		9
	Telia Research Ab																1	1				2			4
	Thomas Swan & Co. Ltd																				1	1			2
	Tolerrx, Inc.																						1		1
	Unilever															1									1
	Warner-Lambert Company																		1				1		2
	Wellcome Foundation Ltd											2			1			2				1			6

Table 8a. continued

University Name	Commercial 1st Assignees	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	Total
04 Imperial College	3I Research Exploitation Ltd								1	2			1		1	1	1								7
	Aberdeen University																						1		1
	Allergan, Inc.																	1				1	1		3
	Amgen, Inc.																		1	1			1		3
	Biogen, Inc.																			1	1	1			3
	British Technology Group Ltd														1	1									2
	Caduceus Ltd																		1						1
	Cerestem																					1	2		3
	Circassia Ltd																		3	1			2		6
	Creatogen Biosciences Gmbh																		1	1					2
	Deltadot Ltd																						4		4
	D-gen Ltd																			1	2	2	1		6
	Diamond Optical Technologies Ltd																		1						1
	Elan Pharmaceuticals Inc																			1	1	1	1	1	5
	Elsworth Biotechnology Ltd																			1					1
	Fibrogen, Inc.																		1	1	1				3
	Garfield Weston Trust For Research Into Heart Su	1			1	1																			3
	Gene Expression Technologies Ltd																					2			2
	Gene Logic Inc.																		1						1
	General Electric Company																				1				1
	Holoscan (UK) Ltd																		1						1
	Hydroventuri Ltd																					1			1
	IC-Vec Ltd																						2		2
	Imperial Exploitation Ltd															1									1
	Innovative Materials Processing Technologies Ltd																				2	2	1		5
	Interval Research Corporation															1	2	2	3	1	1				10
	Lorantis Ltd																	2		1			1		4
	Marconi Corporation Plc																					3			3
	Microbiological Research Authority																		2	2		2			6
	Microscience Ltd																				1		1		2
	Nanobiodesign Ltd																				1				1
	NCS Pearson, Inc.																					1			1
	Novartis AG															1						3			4
	Parametric Optimization Solutions Ltd																						1		1
	Pharmacia & Upjohn Company																				2				2
	Protein Arrays Ltd																			1					1
	Protensive Ltd																					2	1		3
	RPMS Technology Ltd														1	1	1	1							4
	Shimadzu Research Laboratory (europe) Ltd																						1		1
	Smithkline Beecham																		1	1					2
	Sterix Ltd																	1	7	4	4	11	4		31
	Synovis Ltd																						2		2
	Turbo Genset Company Ltd													2						1	1	1			5
	Uponor Innovation Ab																						2		2
	USBiomaterials Corporation																		1						1
	Veryan Medical Ltd																						3		3
	WRC Plc																1					1			2
05 Kings College London	British Technology Group Ltd																	1			2				3
	Cerestem																					1	2		3
	Efamol Holdings P.l.c.								1																1
	GEC Alsthom Ltd										1														1
	Oxford Biomedica (UK) Ltd																			1	3	3	3		10
	Peptech Ltd																		1						1
	Peptide Technology Ltd											1			1										2
	Scotia Holdings Plc												1												1
	Sensornet Ltd																		2	1	2		1		6
	Wellcome Foundation Ltd														2										2
	Zycos Inc.																		1		1	1	1		4
06 Leeds	Advanced Technologies (cambridge) Ltd														1		2								3
	AE Turbine Components Ltd							3				1													4
	Akzo Nobel																	1							1
	British Technology Group Ltd													2						2	2		2		8
	British Textile & Technology Group																1								1
	Cranfield Biotechnology Ltd									1															1
	Ilford Imaging UK Ltd																			1					1
	Innovative Technologies Group Plc															1									1
	Intersurgical Ltd																			2	1	1			4
	Jopejo Ltd																			1	2		1		4
	Marathade, Ltd																1								1
	N.D. Marston Ltd										1														1
	Neugenesis Corporation																1								1
	Nickerson Biocem Ltd										1				1	1									3
	Photopharmica Ltd																					1			1

Table 8a. continued

University Name	Commercial 1st Assignees	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	Total
07 Liverpool	BICC Public Ltd Company					2	3	1																	6
	British Nuclear Fuels Plc															1		1							2
	British Technology Group Ltd														2										2
	Du Pont													1			1								2
	Eli Lilly And Company																	1					1		2
	Ethicon Inc.	2		3		3	5	5	4	2															24
	Imperial Chemical Industries Plc	2				1				1			1												5
	Pepsyn Ltd																		1		1				2
	Theryte Ltd																	10	2			8	1		21
08 Manchester	Advanced Bioprocess Development Ltd																						1		1
	Albright & Wilson Ltd					1																			1
	Astrazeneca																		1		1			1	3
	BP Chemicals Ltd				1																				1
	British Nuclear Fuels Plc															1	1						1		3
	British Technology Group Ltd											3	2	1											6
	C. R. Bard, Inc.							1																	1
	Capcis Ltd										3														3
	Delta Engineering Holdings Ltd																1	1							2
	Dow Corning Ltd												1	3	1	1									6
	Fruehauf Corp							2																	2
	Genencor International, Inc.																				1				1
	Gentronix Ltd																				1	1	1		3
	IIT Ltd																				2				2
	Imperial Chemical Industries Plc				2			2	2		3	1													10
	Manchester Lasers Ltd					1		2																	3
	Marshall Biotechnology Ltd														1										1
	Matrix Therapeutics Ltd																				1				1
	Microarray Ltd																				1				1
	Motac Neuroscience Ltd																					3	2	1	6
	Neutec Pharma Plc																1	1	2	1		1	1		7
	Nippon Paint Co Ltd	2					1		1																4
	Novartis AG																				1	1	1		3
	Oncoprobe Ltd																						1		1
	Renovo Ltd																	1		5	8	6	8		28
	Rexam Medical Packaging Ltd															1	2	1							4
	Rolls Royce Power Engineering Plc																		1		1				2
	Rolls-Royce Plc																		1						1
	Scott Bader Co Ltd														1		2								3
	Sensalyse Holdings Ltd																	2	1	2	3				8
	Siemens																						2		2
	Technical Services Consultants Ltd																						1		1
	Technological Resources Pty Ltd																						1		1
	Theramark Ltd																1	2	2						5
	Tidy Britain Group																					1			1
	Transitive Technologies Ltd																				1		2		3
	Tricorn Group Plc																					2			2
	Unilever											1	1		1		1								4
	Vuman Ltd							1																	1
09 Newcastle	Albright & Wilson (australia) Ltd																			1		2			3
	Arrow Therapeutics Ltd																			1	1				2
	Biotechnol & Biolog Sci Res Council																1								1
	Broncostat Pty. Ltd							1																	1
	Cookson Group Plc												1												1
	Flustat Pty. Ltd																1	1							2
	Medeva Europe Ltd																	1	1						2
	Novartis AG																					1	1		2
	Protensive Ltd																			1	6	2	2		11
	Rhone-Poulenc Australia Pty. Ltd										1														1
10 Nottingham	Bass Public Ltd Company																		2		2				4
	Biocatalysts Ltd																						1		1
	BP Chemicals Ltd			1	1																				2
	British Technology Group Ltd																					1	1		2
	Cantab Pharmaceuticals Research Ltd																			1	1				2
	Celltran Ltd																					1	2		3
	Chiron Corporation																	1	1			1			3
	Danbiosyst UK Ltd													1			5	3							9
	Ford Motor Company																		2		2				4
	General Electric Company			1	1																				2
	Kerry Ingredients (UK) Ltd																	1							1
	Micromass UK Ltd																	1							1
	Sharp Corp															1	1	1				1			4
	Smithkline Beecham																	1							1

Table 8a. continued

University Name	Commercial 1st Assignees	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	Total
11 Oxford - Isis	Avidex Ltd																				1				1
	Boston College																		1						1
	British Bio-technology Ltd										1		2		1						1				5
	British Gas Plc													1	1	1	1								4
	British Technology Group Ltd															2									2
	G. D. Searle & Co.																		1		1	1			3
	Genencor International, Inc.																		1		3	2	3		9
	Gist-brocades B.V.															1	2								3
	Greene, Tweed & Co.													3	1	1									5
	Inmos Ltd													2											2
	Jobling Purser Ltd																	1							1
	Mindweavers Ltd																					1			1
	Mirada Solutions Ltd																					2	3		5
	Motorola Inc																				4		4		8
	Oxford Biomedica (UK) Ltd																1	1	1	2		1			6
	Oxford Gene Technology Ltd												2			1	2	1	3	4	1	4	5	1	24
	Oxford Glycosciences (UK) Ltd																			1	3	2	1		7
	Oxxon Pharmaccines Ltd																		1	1	2	6	3		13
	Oxxon Therapeutics Ltd																						3		3
	Roche Diagnostics Gmbh																	1							1
	Seamless Display Ltd																					1	1		2
	SGS-Thomson Microelectronics Ltd													1											1
	Smithkline Beecham																					1			1
	STmicroelectronics Ltd																1			1					2
	Synaptica Ltd																				2	1			3
	Synergy Pharmaceuticals, Inc.																				1				1
	Thermotic Developments Ltd																	1							1
	Tolerrx, Inc.																						1		1
	United Biomedical, Inc.												1	2	1	1									5
12 Sheffield	Antenova Ltd																				2	1			3
	Avecia Ltd																					2			2
	Bioacta Ltd																					1			1
	Boots Company Plc																				2	4	2		8
	BP Chemicals Ltd			3	1	1	1	1																	7
	British Technology Group Ltd													1	1										2
	Celltran Ltd																				1				1
	Coastside Bio Resources																		1	1	1				3
	Genencor International, Inc.																		1	1			1		3
	IBM																	1							1
	Intercytex Ltd																		1	2					3
	Molecular Skincare Ltd																					1			1
	Oxford Biomedica (UK) Ltd																	2	1		2				5
	Procter & Gamble Company																1								1
	Schlumberger Industries Ltd													1											1
	Smithkline Beecham															2	2	10	4	10	5		1		34
	Zeneca Ltd																1								1
13 Southhampton	Amoco Corp									1	2	3					1								7
	ATX Telecom Systems, Inc.																1								1
	Bayer AG																				1				1
	BP Chemicals Ltd											2													2
	British Steel Ltd																	1							1
	Chevron U.S.A. Inc.																		2		1				3
	Corus UK Ltd																				1		1		2
	Crabtree Electrical Industries Ltd															1									1
	Eveready Battery Company Inc.																			1					1
	Finsbury (instruments) Ltd																	1							1
	Kennedy & Donkin Systems Control Ltd														2										2
	Micron Optics, Inc.													1					1						2
	Millennium Pharmaceuticals Ltd																		1	1					2
	Oecos Ltd				1																				1
	Pirelli Cavi e Sistemi S.p.a.																1	1	1	5	2				10
	Radiodetection Ltd																						1		1
	Reckitt Benckiser (UK) Ltd																	1	1	3	2	6	5		18
	Southampton Photonics Ltd																			1	2				3

Table 8a. continued

University Name	Commercial 1st Assignees	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	Total
14 University College London	Abonetics Ltd																			2					2
	Arrow Therapeutics Ltd																			1	1				2
	Biocompatibles Ltd																2	1					1		4
	Biovex Ltd																					1	2		3
	British Technology Group Ltd															1	1								2
	C. R. Bard, Inc.																1	1				1			3
	Celltech Therapeutics Ltd													1					1			1			3
	Chugai Seiyaku KK																						1		1
	Ebara Corporation													1		2		5	1		1	3	1		14
	Ethicon Endo Surgery Inc																						1		1
	Ethicon Endo-surgery, Inc.																						8		8
	Fibrogen, Inc.																		1	1	1				3
	G. D. Searle & Co.										1		1								1				3
	General Hospital Corporation															1									1
	Glaxo Group Ltd																				1				1
	Health Research, Inc.														1	1	1	1							4
	Innopeg Ltd																					1			1
	Intercytex Ltd																		1	1					2
	Ionix Pharmaceuticals Ltd																				1	3			4
	London Biotechnology Ltd						2			1	1		1												5
	Navigationzone Ltd																			1					1
	Neurovex Ltd																		1						1
	Novametrix Medical Systems, Inc.							1																	1
	Novartis AG										1	1							1	1	2	1			7
	Optical Generics Ltd																		1	1					2
	Pentraxin Therapeutics Ltd																						1		1
	Porton Products Ltd									1															1
	Rademacher Group Ltd																	1		1					2
	Stanford Rook Ltd																		2	1	2				5
15 Warwick	BAE Systems Ltd																			1		1	2		4
	Black & Decker Inc.																			5	4	1	3		13
	Dig-eprint Ltd																						2		2
	Imperial Chemical Industries Plc															1									1
	Lumonics Ltd														1										1
	M & A Packaging Services Ltd														1	1	1	1		2					6
	Pharming Holding N. V.																				1				1
	Rolls-Royce Plc													1	1										2
	Rover Group Ltd										1	2	1	1											5
	Stylacats Ltd																					1	1		2

Table 8b. Scotland

University Name	Commercial 1st Assignees	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	Total
16 Aberdeen	Astrazeneca																		1	1					2
	British Technology Group Ltd												2				1								3
	F. Hoffmann-la Roche Ag														1										1
	Henkel KgAA															1	1			1					3
	Monymusk Land Company											1				1									2
	Plasma Biotal Ltd													1			1								2
17 Abertay	Lignocell Holz-Biotechnologie GmbH																	1			2				3
18 Dundee	Aktina Ltd																						2		2
	British Technology Group Ltd												3										1		4
	Cyclacel Ltd																	1	2	2	1	2	1		9
	Glaxo Wellcome Inc.																1								1
	Newburn Ellis																		1						1
	Procter & Gamble Company									1															1
	Smithkline Beecham																2	1		1					4
	Wellcome Foundation Ltd									1				1	1										3
19 Edinburgh	Akzo Nobel																			1	2	1			4
	Api Foils Ltd																		4						4
	Artemis Intelligent Power Ltd												1	1											2
	British Technology Group Ltd															1				1		2			4
	British Telecommunications														1										1
	Golden River Traffic Ltd																					1			1
	Hunter-Fleming Ltd																			1					1
20 Glasgow	Abbott Laboratories												1			3		1				1			6
	British Technology Group Ltd													1	1	1	2					2			7
	Burstein Technologies, Inc.																			1		1			2
	C3D Ltd																			2	1				3
	Celltech Therapeutics Ltd					1				1	1						2								5
	Intense Photonics Ltd																						2		2
	Phytotech Ltd															1		1			1				3
	Seiko Epson Corp																		2			3	2		7
	Smithkline Beecham										1				1		1								3
	SRI International														1		1			1					3
21 Glasgow Caledonian	Diagnostic Instruments Ltd													1											1
	Glycologic Ltd																					1	2		3
22 Heriot-Watt	Api Foils Ltd																		4						4
	Edinburgh Acoustical Company Ltd												1		1										2
	Edinburgh Petroleum Development					1	1																		2
	Hyperlast Ltd																				1	1	1		3
	Lumonics Ltd															1									1
	Rover Group Ltd								1																1
23 Napier	Oxley Developments Company Ltd																				1				1
	Surfactant Solutions Ltd																					1	1		2
24 Paisley	Ampsys Ltd									1															1
	Meiklewall Ltd																						1		1
26 Robert Gordon	Univation Ltd																					2	1		3
27 Scottish Agricultural	JSR Clover Ltd																			1	1				2
30 Strathclyde	Astrazeneca																	1							1
	Automated Bacteria Counting Ltd				1																				1
	British Petroleum Company P.l.c.					1																			1
	British Technology Group Ltd												4									2			6
	British Telecommunications											1	1				1								3
	Cascade Technologies Ltd																							1	1
	Ciba Specialty Chemicals Corporation															1	3	1	1	1	1	1			9
	Flexigage Ltd				1																				1
	Oxley Developments Company Ltd								1																1
	Proteus Molecular Design Ltd													1				1							2
	Richmond Cell Screening Ltd							1				1													2
	Some Guys Ltd												1												1

Table 8c. Wales

University Name	Commercial 1st Assignees	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	Total
31 Aberystwyth	Aber Genomic Computing Ltd																			1		1			2
	Aber Instruments Ltd																					1			1
32 Bangor	Cambridge Biopolymers Ltd																						2		2
	Du Pont																		2	1	1		1		5
33 Cardiff	A.H. Robins Company Ltd					1	1																		2
	Amersham Life Science Ltd																	2							2
	BICC Public Ltd Company														1			1	1						3
	Biostatus Ltd																				1	2			3
	British Nuclear Fuels Plc											3			1										4
	Cardiff Laboratories For Energy							3		1															4
	GEC Alsthom Ltd															2									2
	Gen-Probe Incorporated														1	1	1								3
	Glaxo Group Ltd																		1			1			2
	Kawasaki Steel Corp											1													1
	Orb Electrical Steels Ltd													1		1	1								3
	Smithkline Beecham																1	1							2
	Switched Reluctance Drives Ltd																	1	1						2
	Wellcome Foundation Ltd												1	3	2	2									8
	Whitbread Plc													1		1	1								3
	Xerox Corporation		1																						1
34 Glamorgan	Critical Solutions Technology Ltd																						1		1
36 Swansea	British Petroleum Company P.l.c			1																					1

Table 8d. Ireland

University Name	Commercial 1st Assignees	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	Total
37 Belfast	Audio Processing Technology Ltd												1												1
	Merial																	1	1	3	4	4	2		15
	Qubis Ltd																						2		2
	Zahnradfabrik Friedrichshafen, Ag		2																						2
38 Cork	Hibergen Ltd (Hibergen Genomics)																						1		1
	Optronics Ireland											1													1
39 Dublin (City U)	Mitsubishi Denki KK																						3		3
	Siemens																			2	1				3
40 Dublin (U College)	American Biogenetic Sciences, Inc.												1		1	2	1		2	5	3				15
	Hibergen Ltd (Hibergen Genomics)																		1	1					2
	Horcom Ltd																		1			2			3
41 Dublin (Trinity)	Allegro Technologies Ltd																			1					1
	Enichem S.p.a.									2		1													3
	Ford Motor Company															1		1					1		3
	Hitachi Europe Ltd																1		1						2
	Horcom Ltd																		1			2			3
	IMS Ionen Mikrofabrikations Syst Gmbh																		2						2
	Inhibitex, Inc.																		2	2	2		6	1	13
	Optigen Patents Ltd																						1		1
	Optigen Technologies Ltd																						3		3
	Sony Corp														1		1								2
45 Ulster	Lambeg Industrial Research Association			2	1																				3
	Provita Eurotech Ltd																			1	1				2

Examination of types of technology emphasized by region and by institution

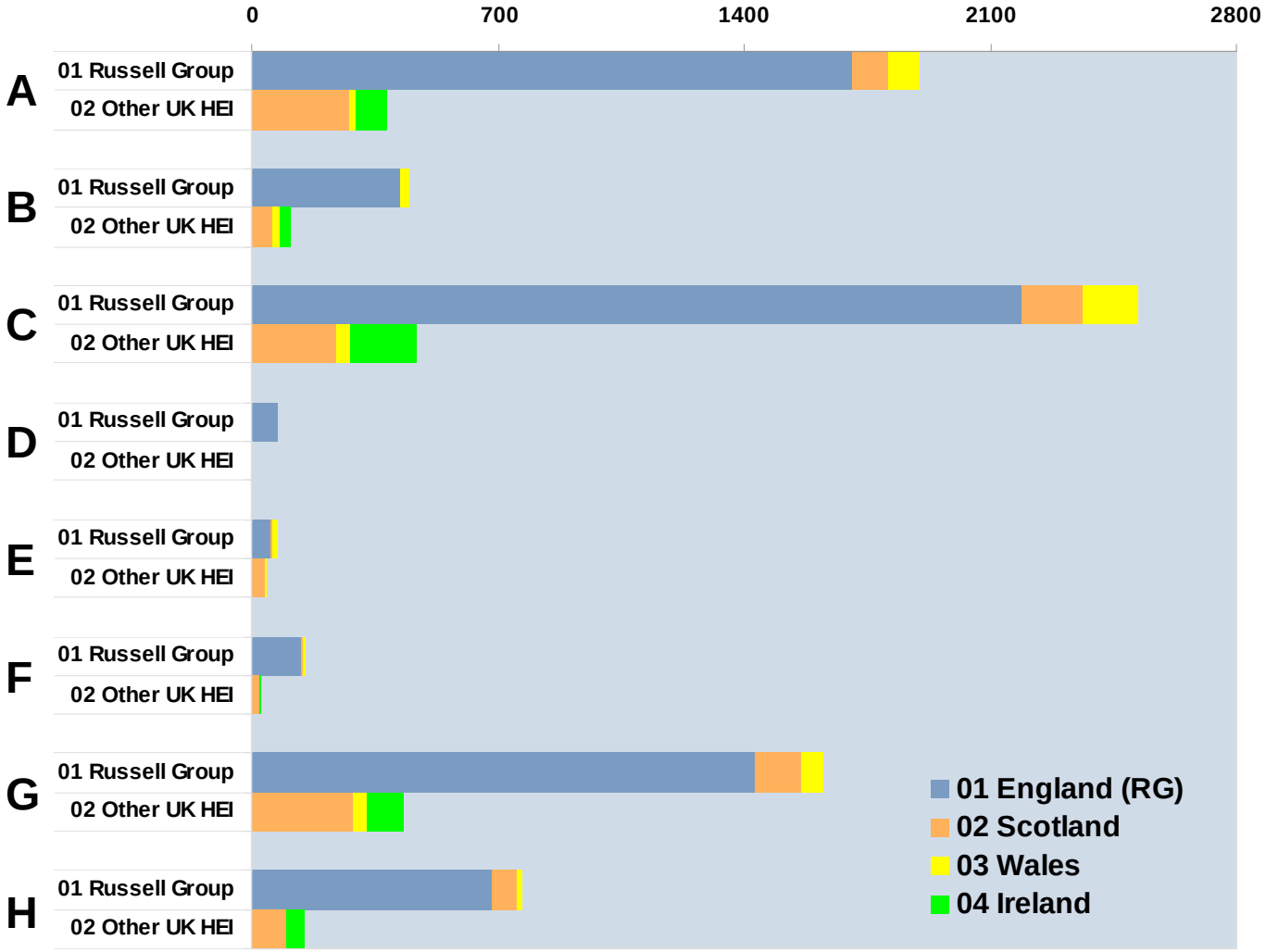
Patent Classification Survey (International Classifications)

One of the most straightforward ways to determine the areas of technical emphasis in the collections is to use the patent classification system. The International Patent Classification (IPC) system is hierarchical, and therefore the technical area can be probed at different levels of detail by using part or all of the code elements. The classification is attached to the patent by a patent examiner, who may assign multiple codes to the same document if more than one technical area is found in the application. The "primary" code is the one that is most closely tied to the claimed invention, and there is only one primary code per document. We have used the primary codes to characterise the documents in this collection.

Example of the hierarchical nature of an IPC code. Code elements include Section, Class, Subclass, Subclass Group, and the full code (Subclass Subgroup)

Section	A	HUMAN NECESSITIES
Class	A61	MEDICAL OR VETERINARY SCIENCE; HYGIENE
Subclass	A61B	**DIAGNOSIS; SURGERY; IDENTIFICATION** (analysing biological material G01N, e.g. G01N33/48; obtaining records using waves other than optical waves, in general G03B42/00)
Subclass Group	A61B1	**Instruments for performing medical examinations of the interior of cavities or tubes of the body by visual or photographical inspection, e.g. endoscopes** (examination of body cavities or body tracts using ultrasonic, sonic or infrasonic waves A61B8/12; instruments, e.g. endoscopes, for taking a cell sample A61B10/00; endoscopic cutting instruments A61B17/32; surgical instruments using a laser beam being directed along or through a flexible conduit A61B18/22; technical endoscopes G02B23/24); Illuminating arrangements therefor (for the eyes A61B3/00) [C9902]
	A61B1/00	as above
Full Code	A61B1/005 .	Flexible endoscopes [N9711]

Figure 6. Section-level view of the active technology areas. See the list below for Section definitions. In the collection, there is a relative paucity of documents classified in section E, which includes well-drilling, and which conventional wisdom suggests should be a strength in some of the regions studied. Documents relevant to this area could be hidden in section C (chemistry), but the mechanical patents (more likely in Section E) seem few in number. In Section G, representation of non-Russell Group institutions is relatively high, apparently due to a strong bent towards physical or biological measurement technology. The following pages contain some more detailed views of the classifications that are active.



IPC [7] English version

SECTION A – HUMAN NECESSITIES

SECTION B – PERFORMING OPERATIONS; TRANSPORTING

SECTION C – CHEMISTRY; METALLURGY

SECTION D – TEXTILES; PAPER

SECTION E – FIXED CONSTRUCTIONS

SECTION F – MECHANICAL ENGINEERING; LIGHTING; HEATING

SECTION G – PHYSICS

SECTION H – ELECTRICITY

Figure 7. IPC Class level display of the predominant classes in the collection. Life sciences and electronics dominate.

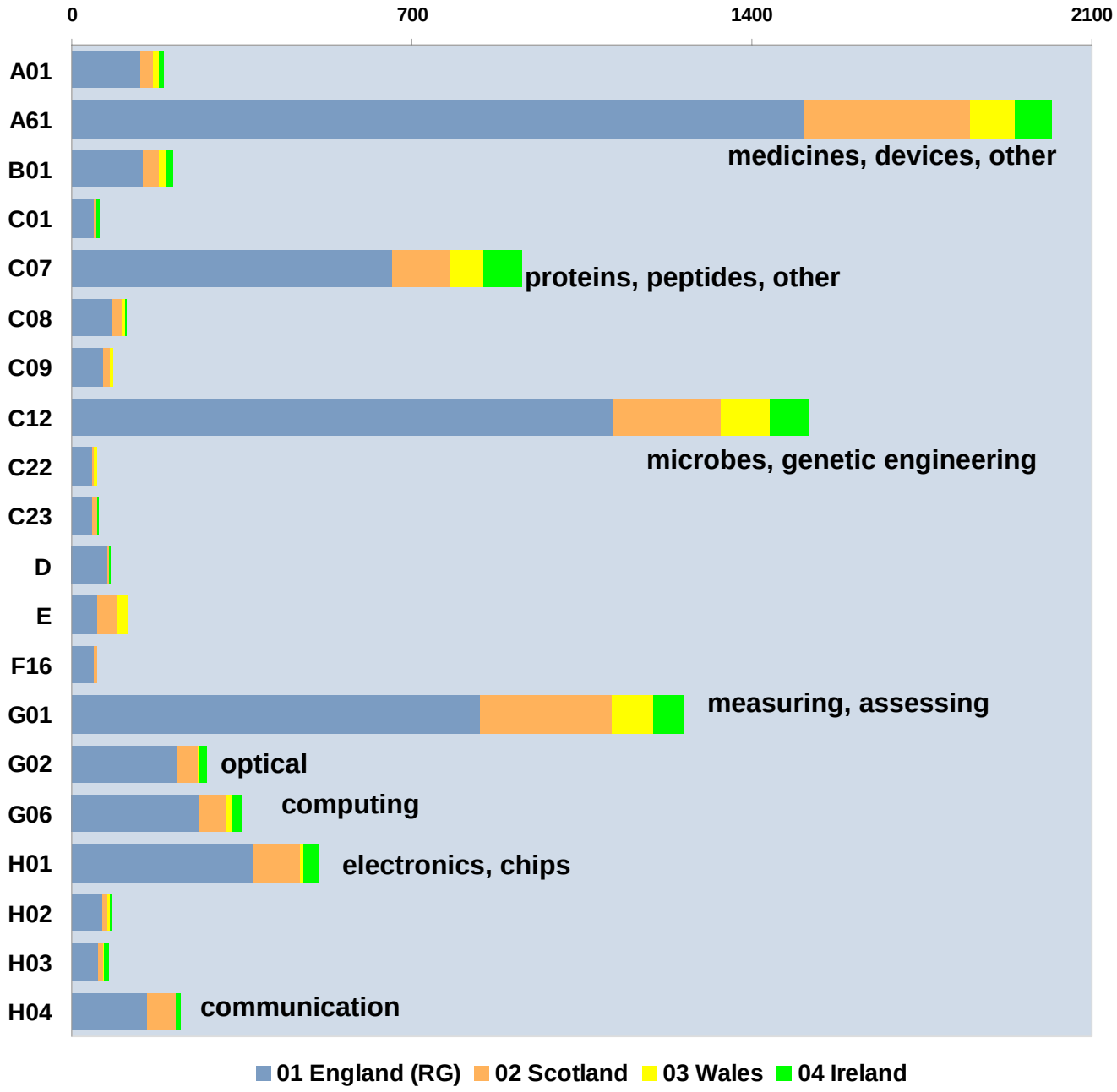


Figure 8. A closer look at the A61 Class. Predominating subclass groups are displayed.

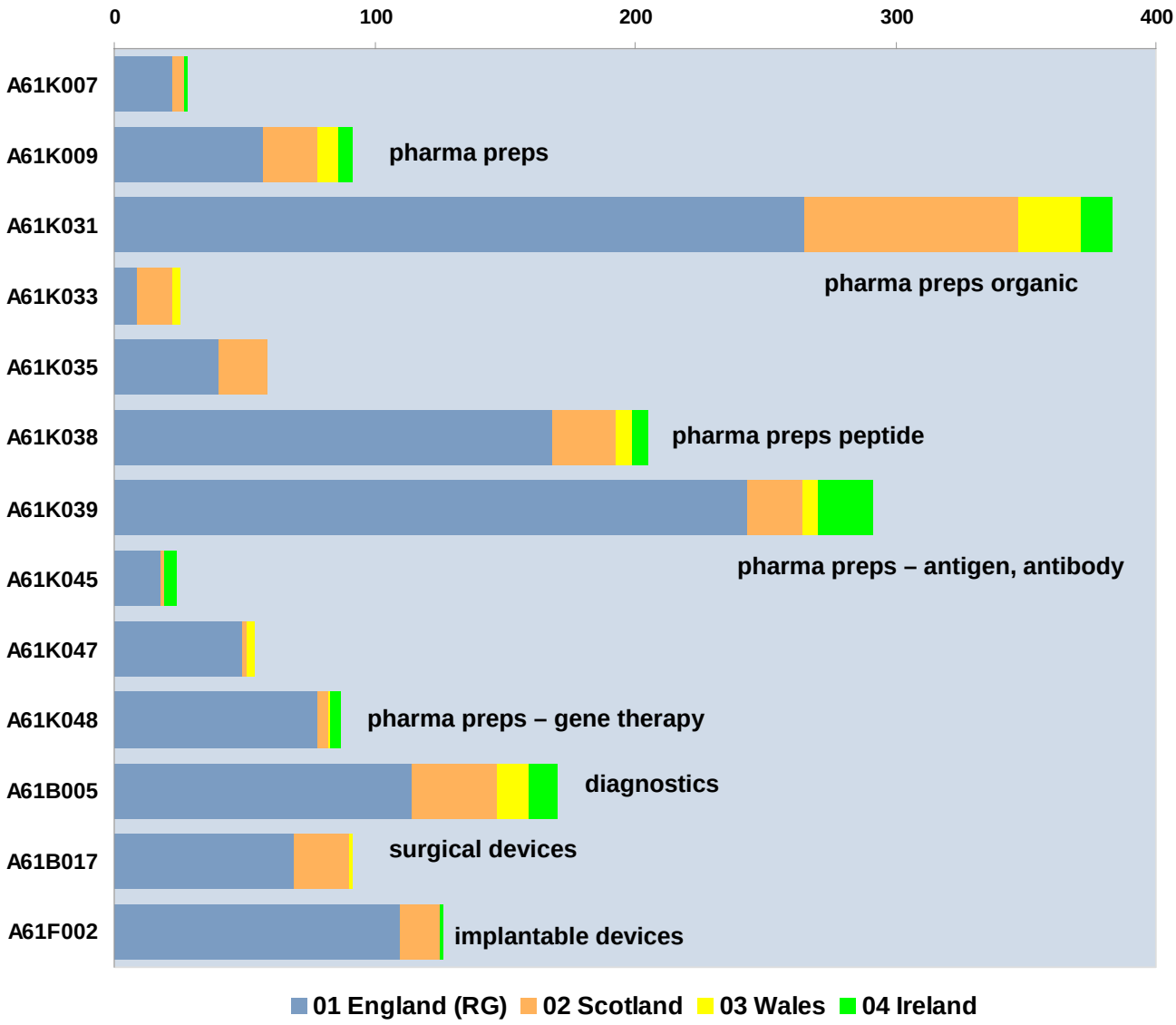


Figure 9. Display of the most dominant chemical code categories. This graph contains a mixture of levels, including Class, Subclass, and Subclass Group.

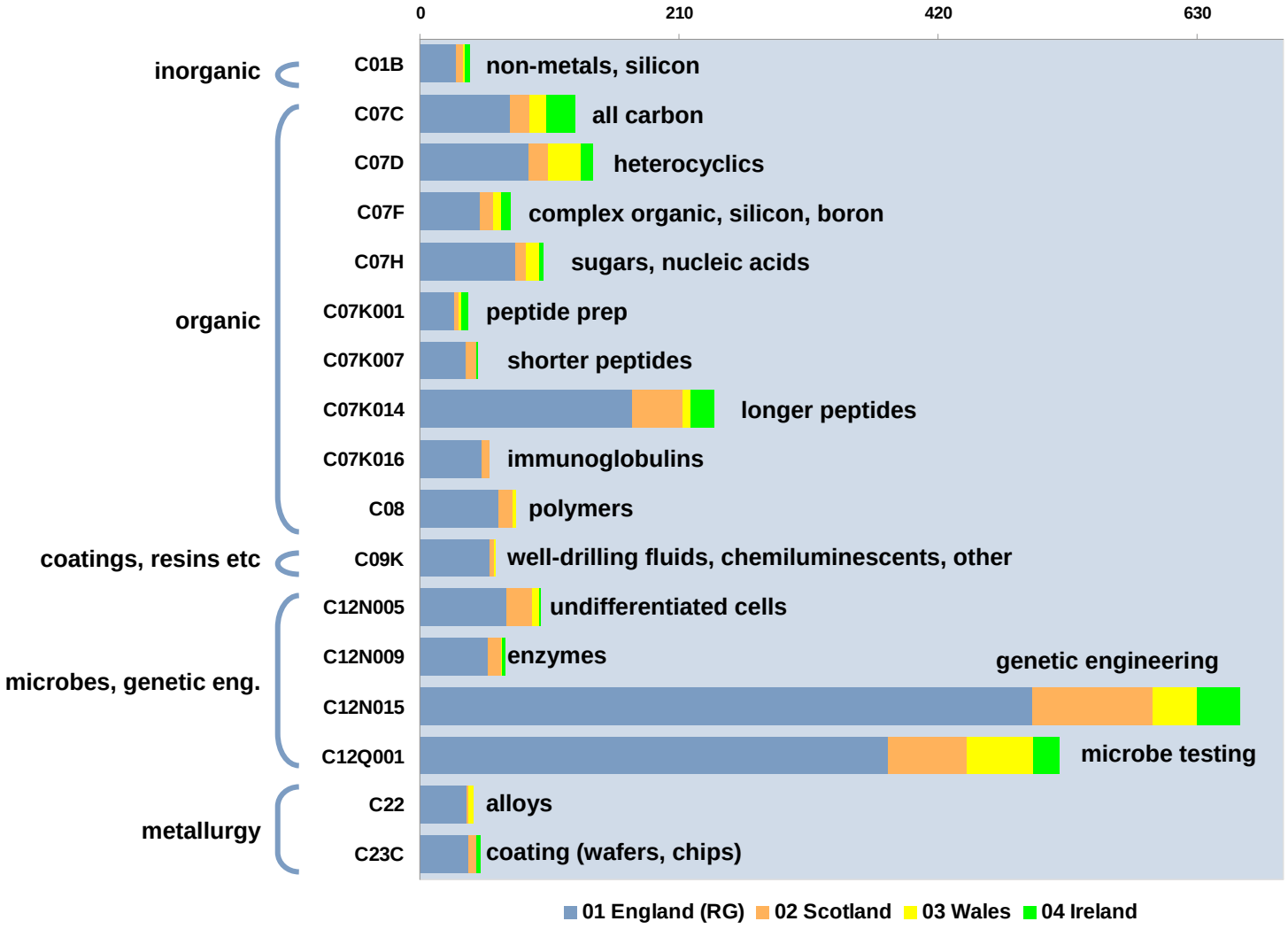


Figure 10. Display of the most dominant analytical code categories. This graph contains a mixture of levels, including Subclass and Subclass Group.

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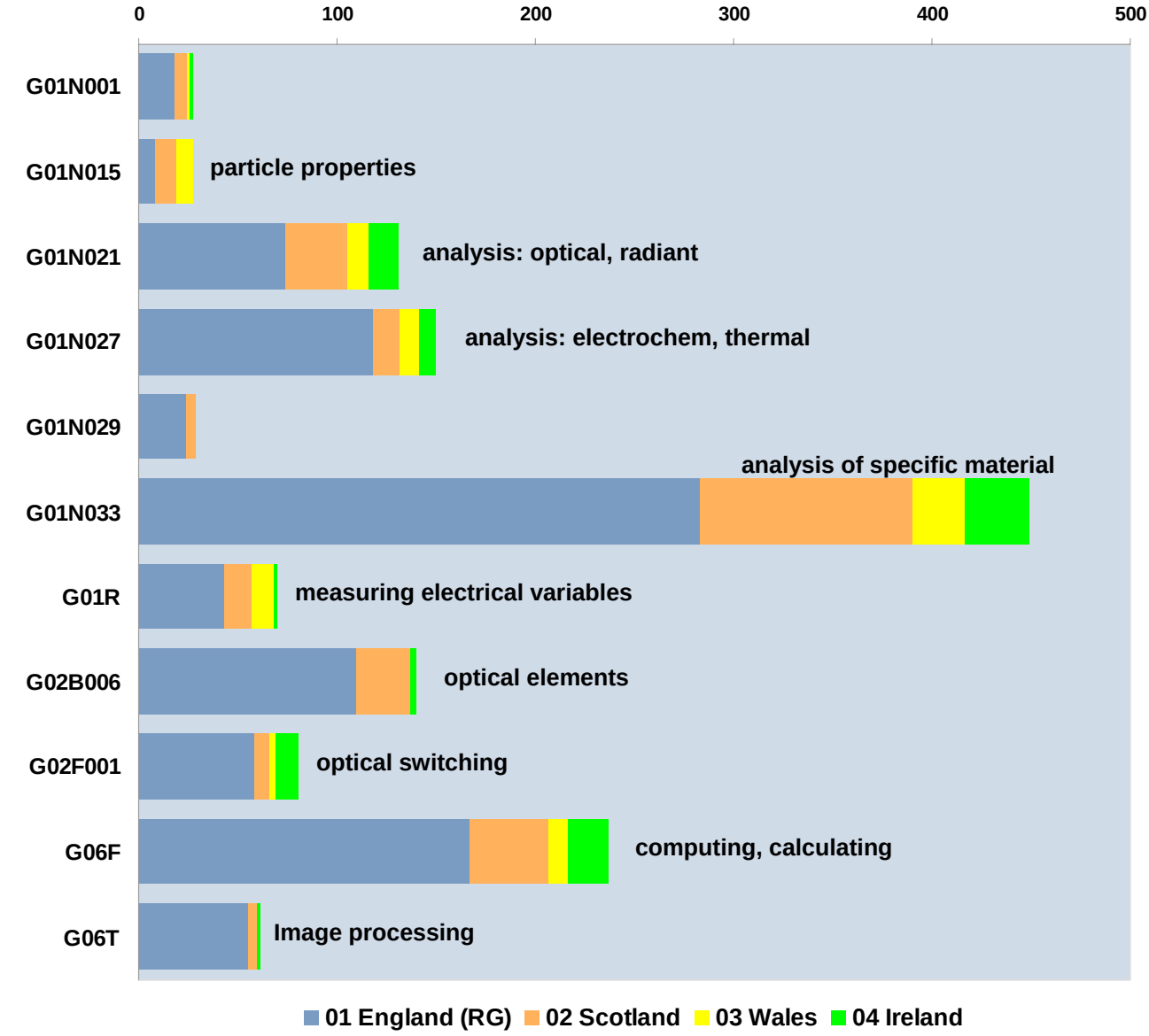


Figure 11. Display of the most dominant electronics code categories. This graph contains a mixture of levels, including Subclass and Subclass Group.

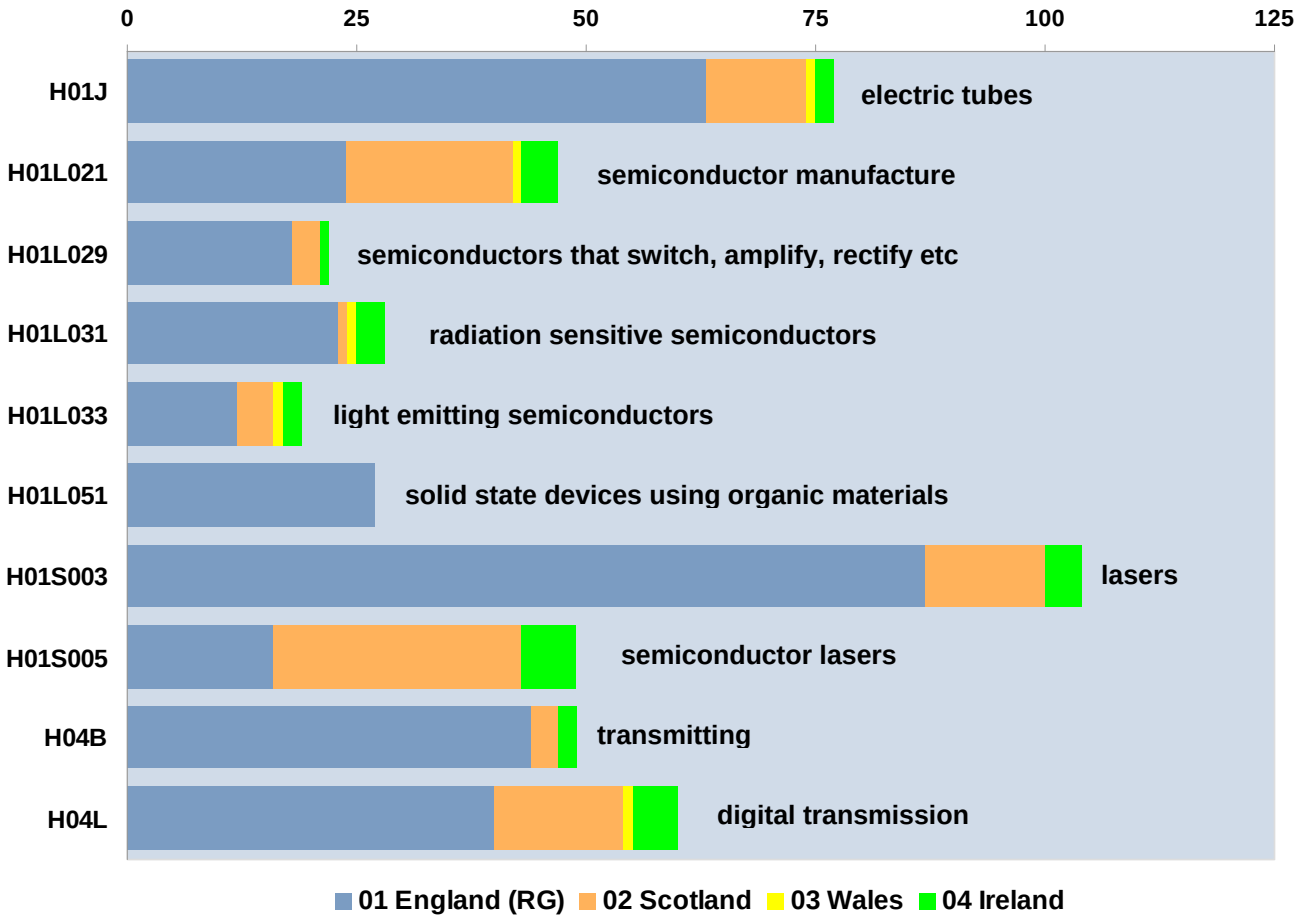


Figure 12. Distribution of Wales HEI documents in different IPC sections. Specialisation is detectable in this chart. For example, Bangor has a high fraction of its documents in Section B, while Swansea has more of its documents in Section G than in any other section. Cardiff has documents in Section E, a relative rarity in the entire collection.

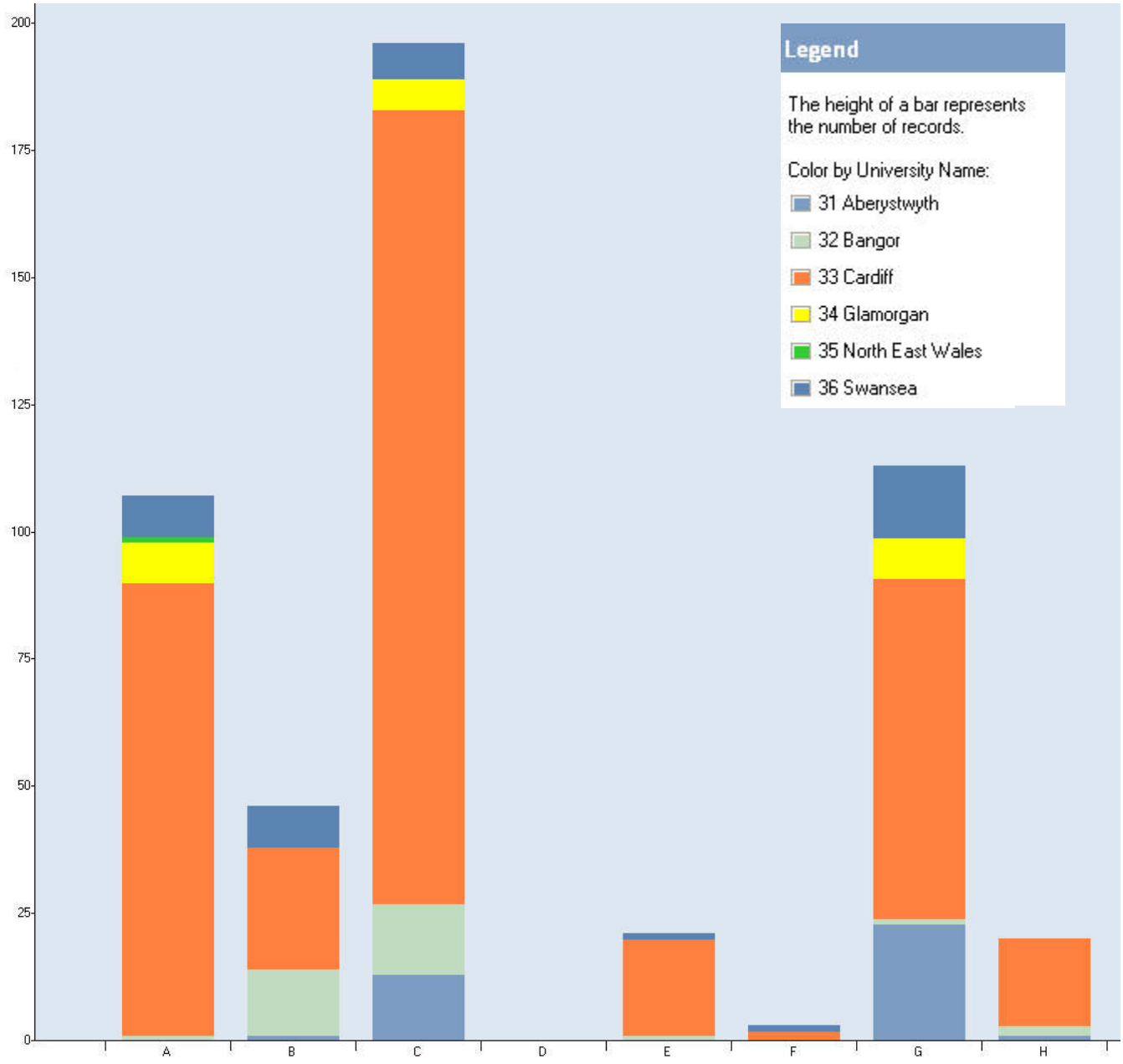
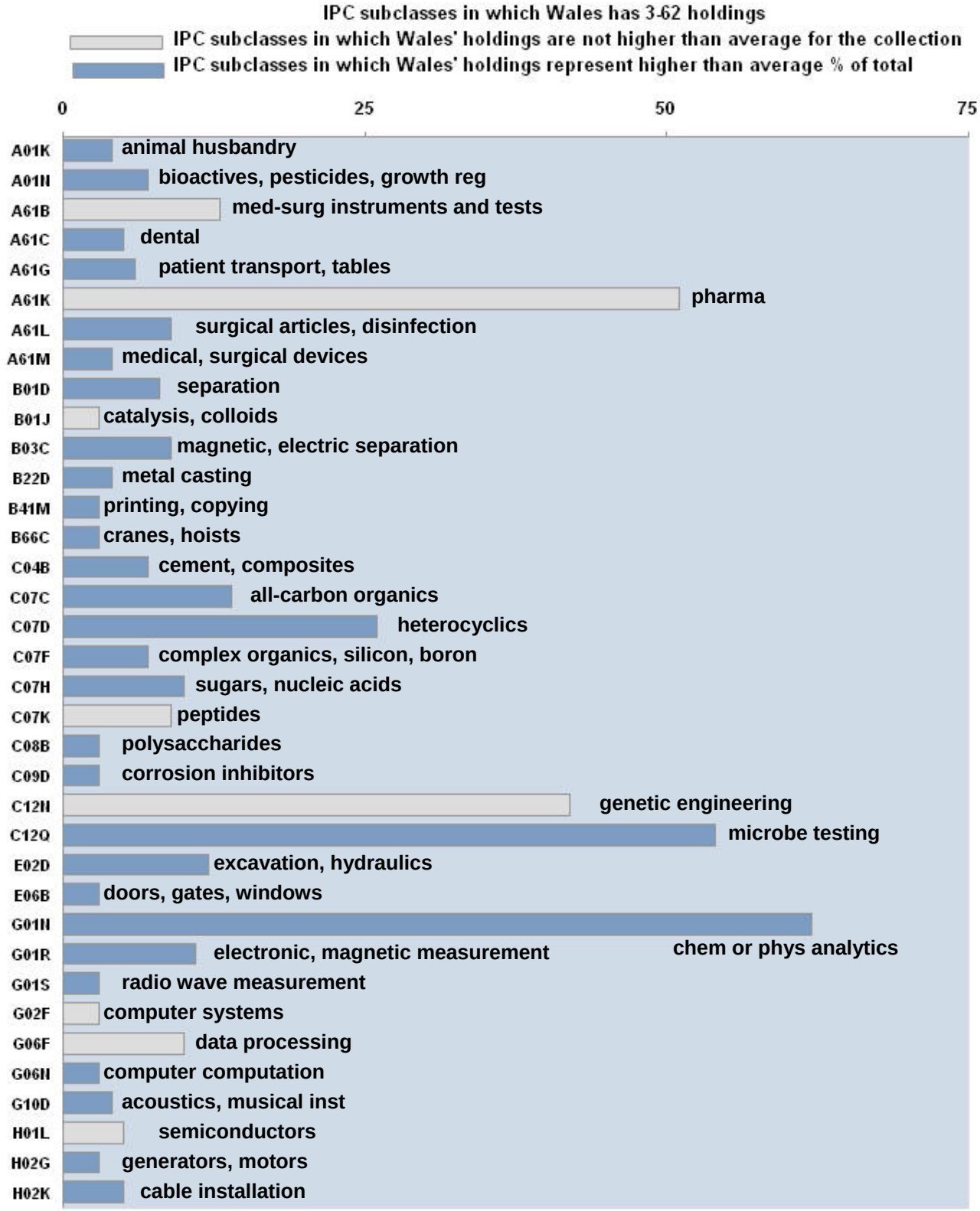


Figure 13. Probing for relative technical strength in Wales at the IPC Subclass level. The chart shows the subclasses in which Wales had most of its documents, and also assesses relative holdings against the other regions. On average, Welsh holdings represented about 5% of the total collection. In the subclasses highlighted in blue, Welsh holdings were greater than 5% of the collection in that subclass.



Text-Mining

Examination of the collections by text mining using ThemeScape™ permits an overview of the themes in the collection, and allows the user to probe the themes interactively. ThemeScape text mining was performed on various parts of the collection, and the maps were probed to identify documents from the Wales region, and to identify documents in the areas where citation tells us there is interest. Since the text-mining algorithm places documents with related topics near one another "geographically", it is possible to infer whether the area is crowded with other documents or sparsely populated, and to link together documents that cover similar subject matter but are owned by different entities.

Figure 14. The general parameters of mapping. This map is displayed to briefly describe mapping features. 'Wales' documents are highlighted as red dots. This map is repeated in more legible format on a subsequent page.

The right panel is an enlargement of the region highlighted on the complete map shown at left. Each dot is a single document, and this map contains 9024 documents. The enlargement shows areas of high and low density of documents, which are distinguished by the numbers of contours and the colour of the region. The "snow-capped mountains" are areas of high document density. The "oceans" contain fewer documents. Documents can be highlighted by searching on the basis of chosen criteria. Dots that are close together contain similar language and are therefore deemed to share themes. Distance on the map is significant, but direction, which is arbitrary, is not significant.

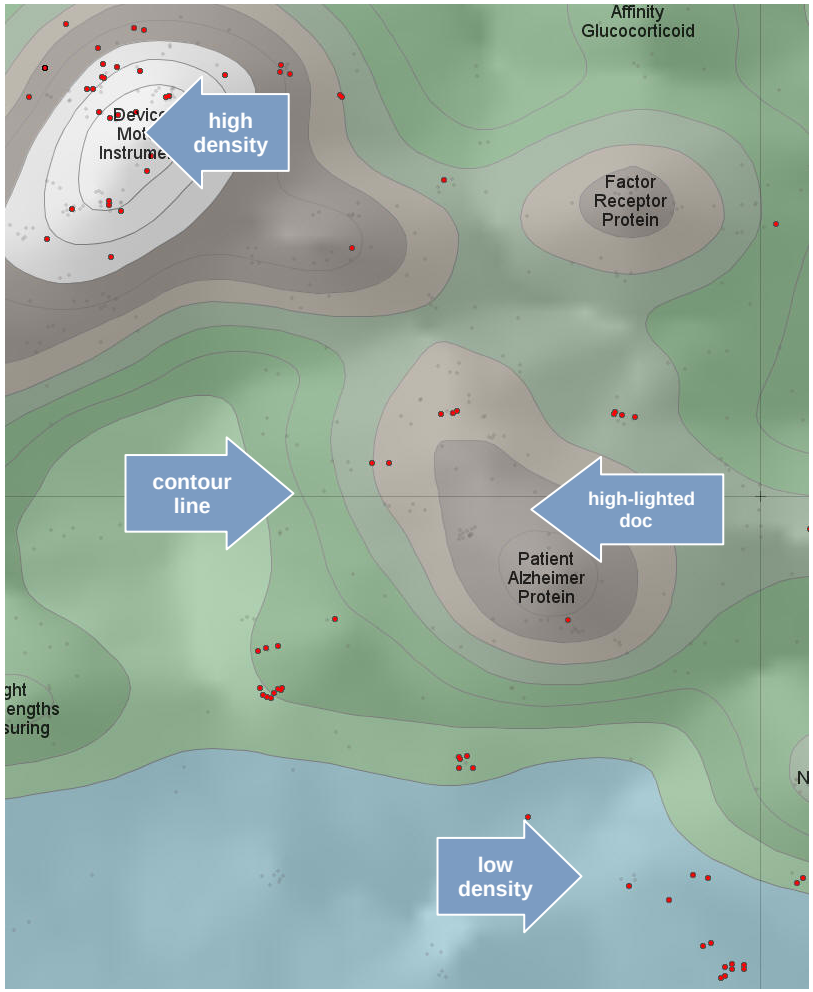


Figure 15. Theme map showing the full HEI collection (n = 9024). Main areas are marked: 1) Electronics 2) Analytics 3) Chemistry not Pharma 4) Therapeutics 5) Medical Devices

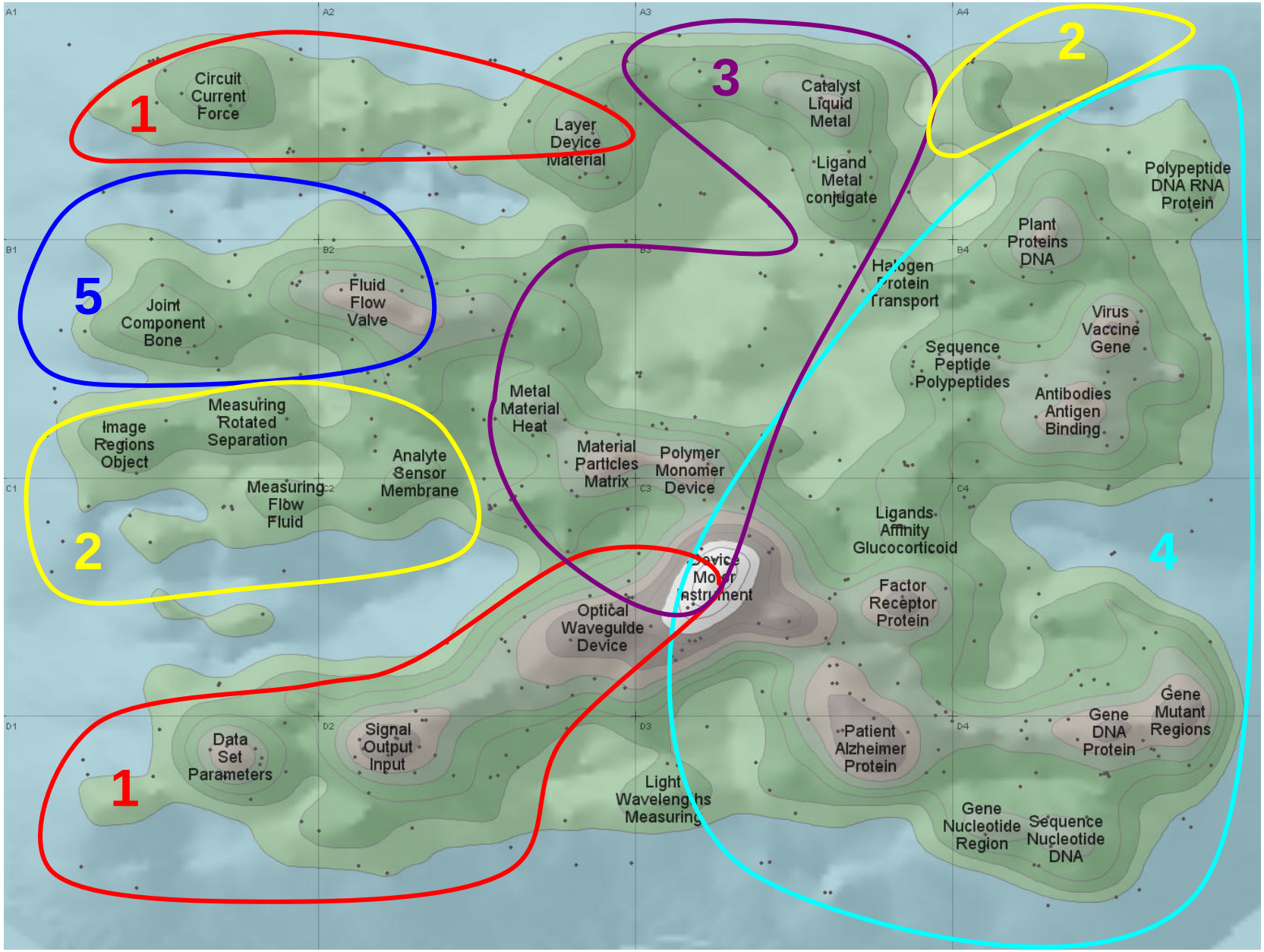
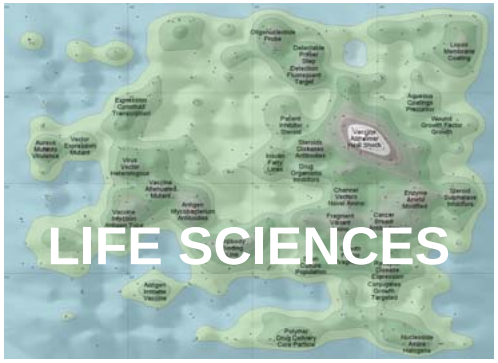
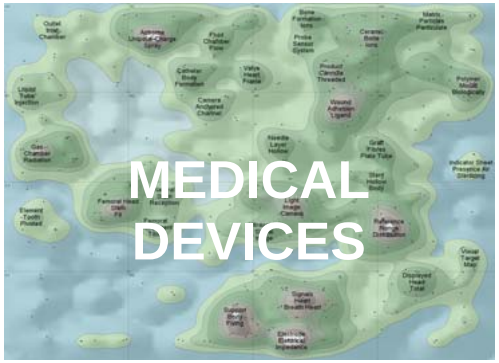
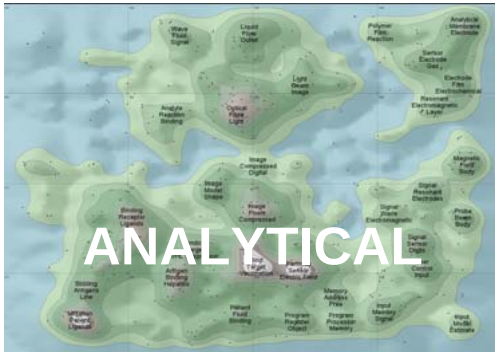
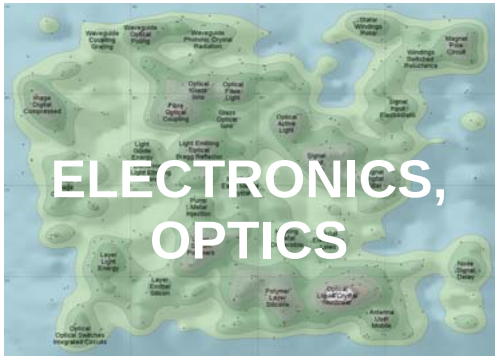


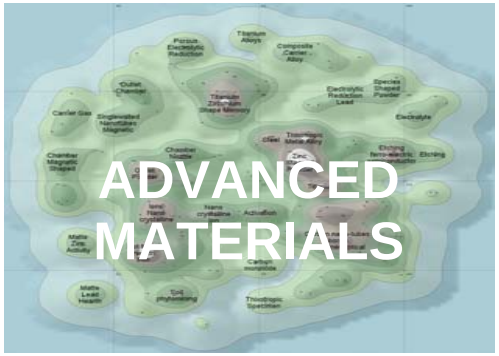
Figure 16. Additional mapping. It was decided to map the major subject matter areas separately, based on categorisation using the IPC codes at a high level. Seven maps were created, each covering a major subject area. A stopword list tailored to the needs of this mapping exercise was applied to all mapping performed. Stopwords clarified the maps by removing non-distinguishing terminology from use by the mapping algorithm. By way of illustration Tables Figures 17 a – c review Life Sciences, a major new investment area for Swansea University.











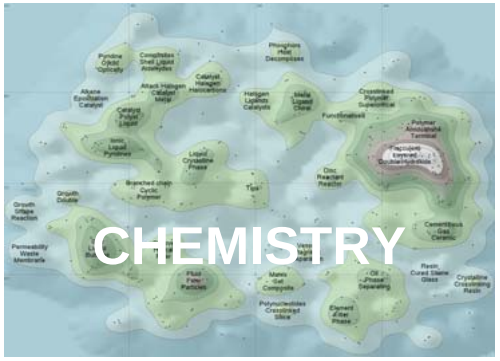


Figure 17a. Life Sciences, including biochemistry and molecular engineering. (n = 3656). This subject matter included IPC codes A61K, C07K and C12, roughly covering therapeutics, peptides and proteins, enzymes, microorganisms and genetic engineering. Additional views on subsequent pages.

Figure 17b. Life Sciences Time Slicing. The oldest documents are shown in yellow, and documents from the 2000s are shown in red.

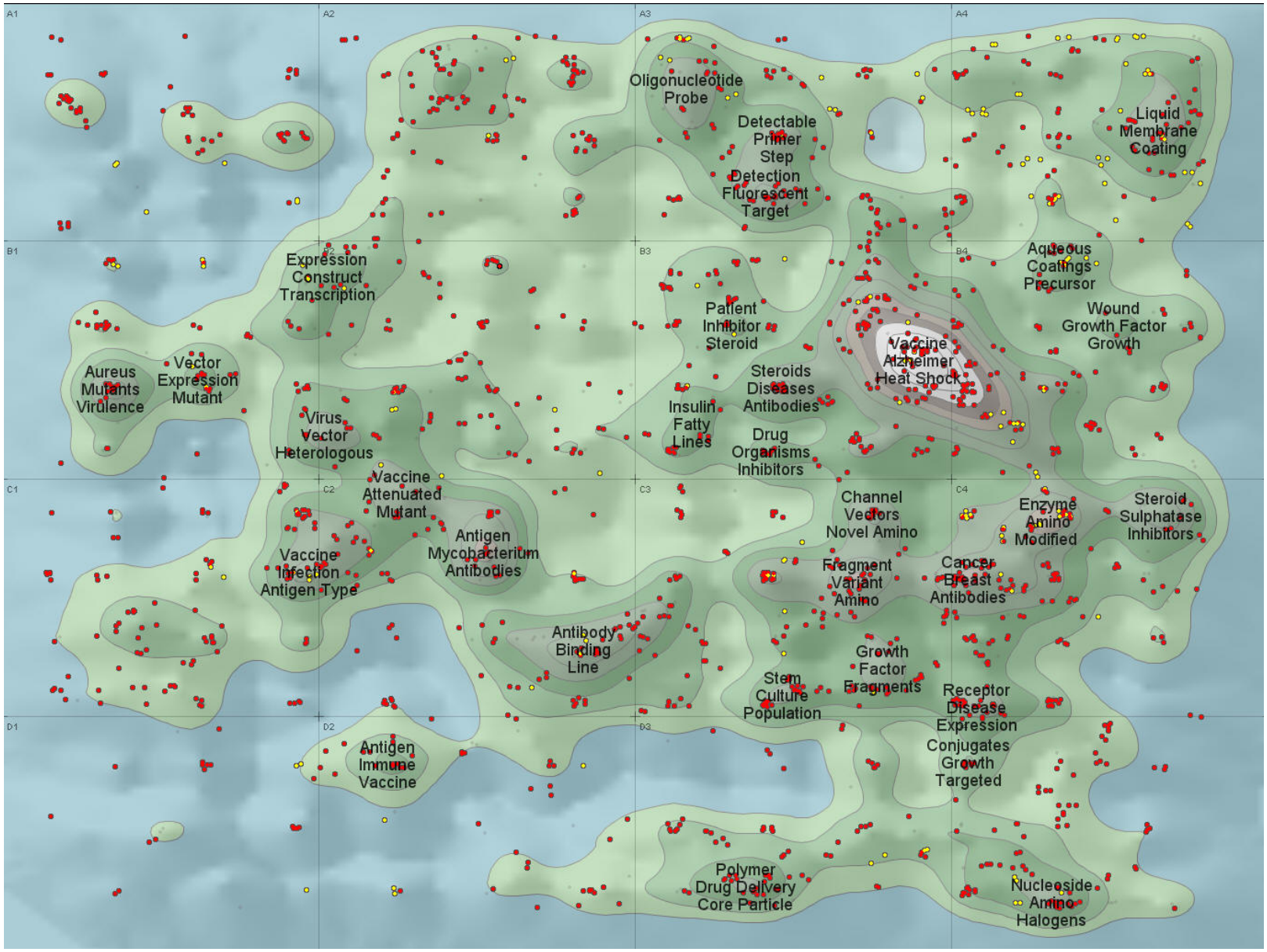
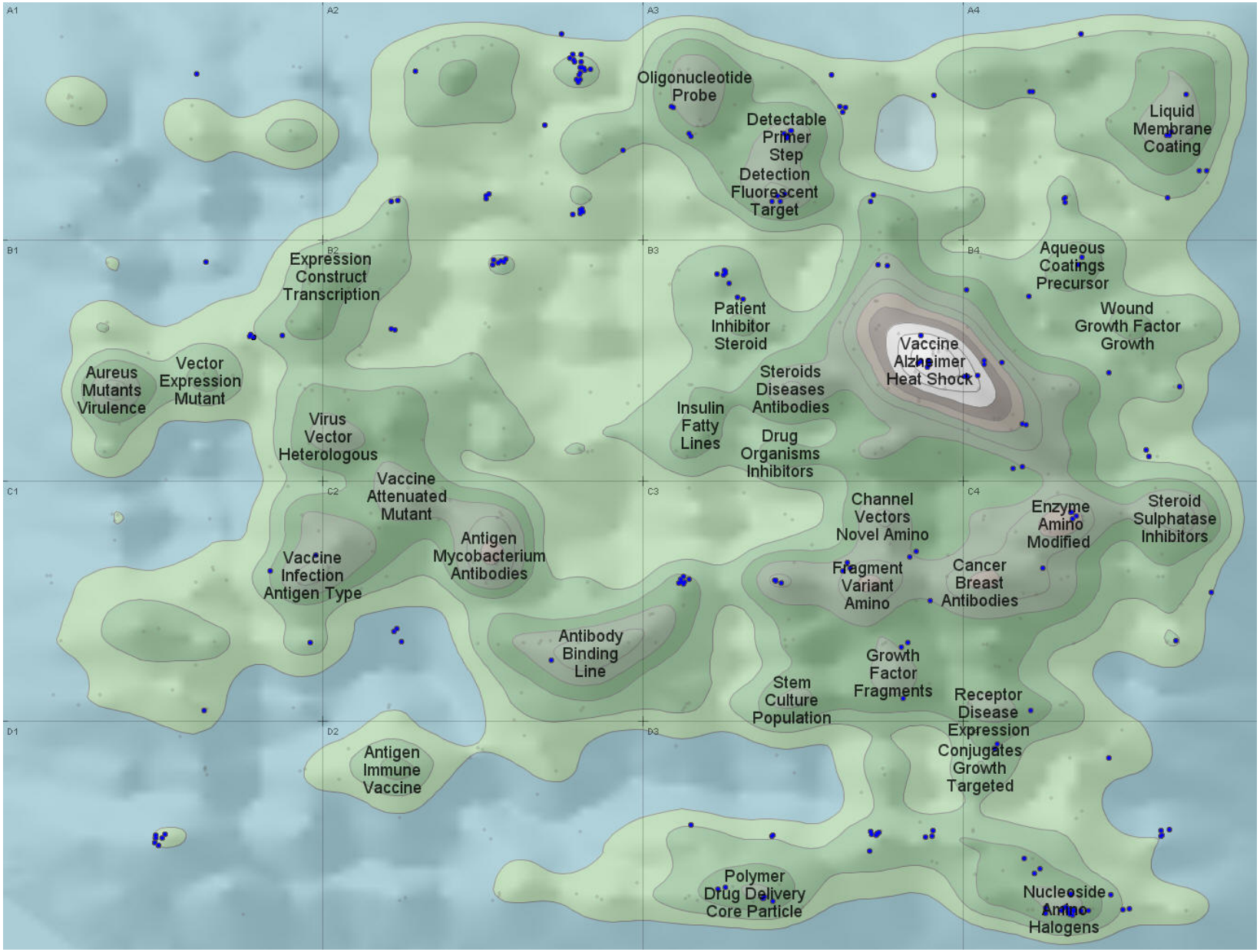
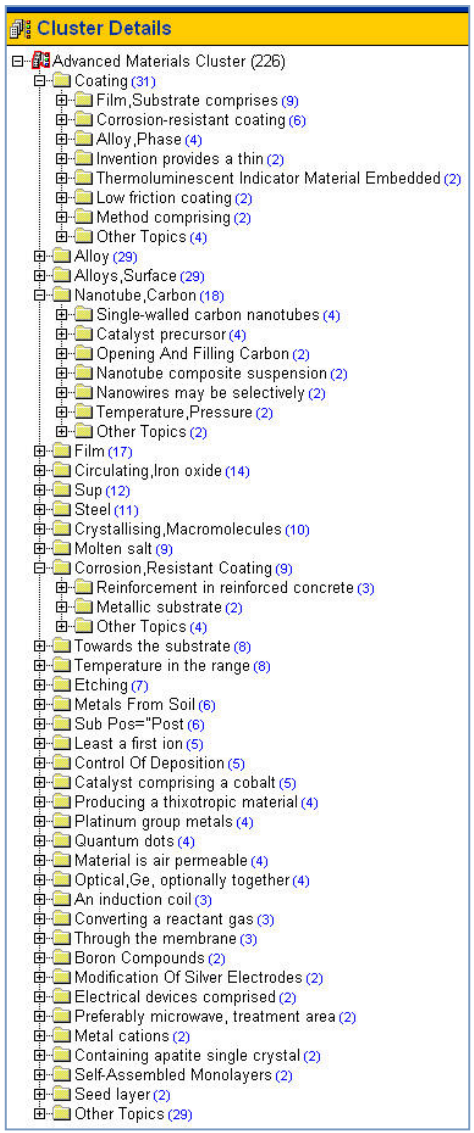
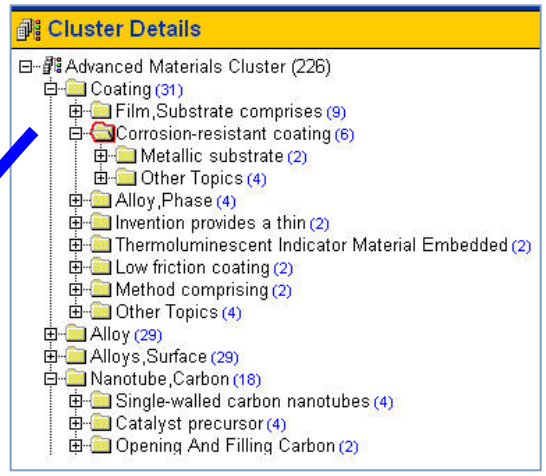


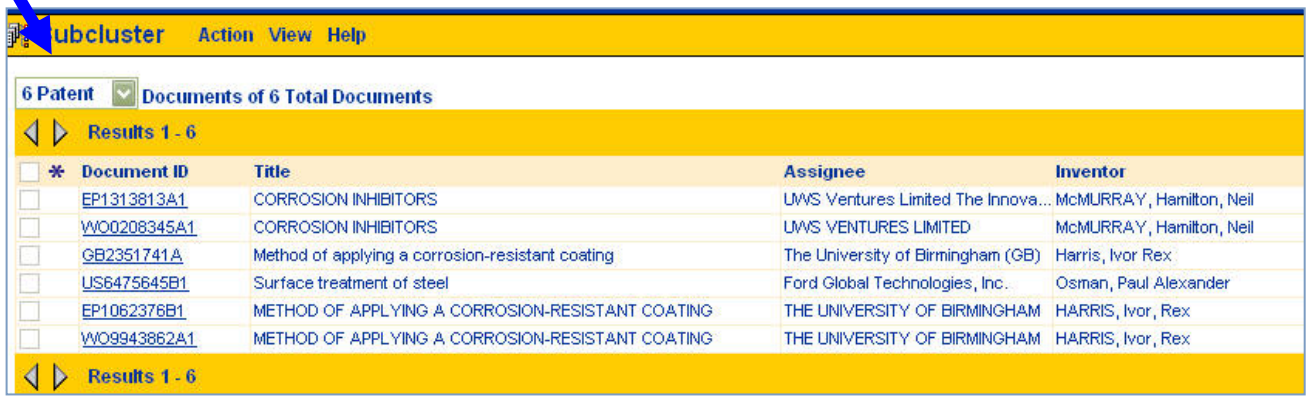
Figure 17c. Life Sciences with 'Wales' documents highlighted.



Where the number of documents was realistically too small e.g. 226 documents for the Advanced Materials Map, text-mining was supplemented by clustering analysis as illustrated in below: At left is a partially expanded folder hierarchy. At right, one of the folders is examined.







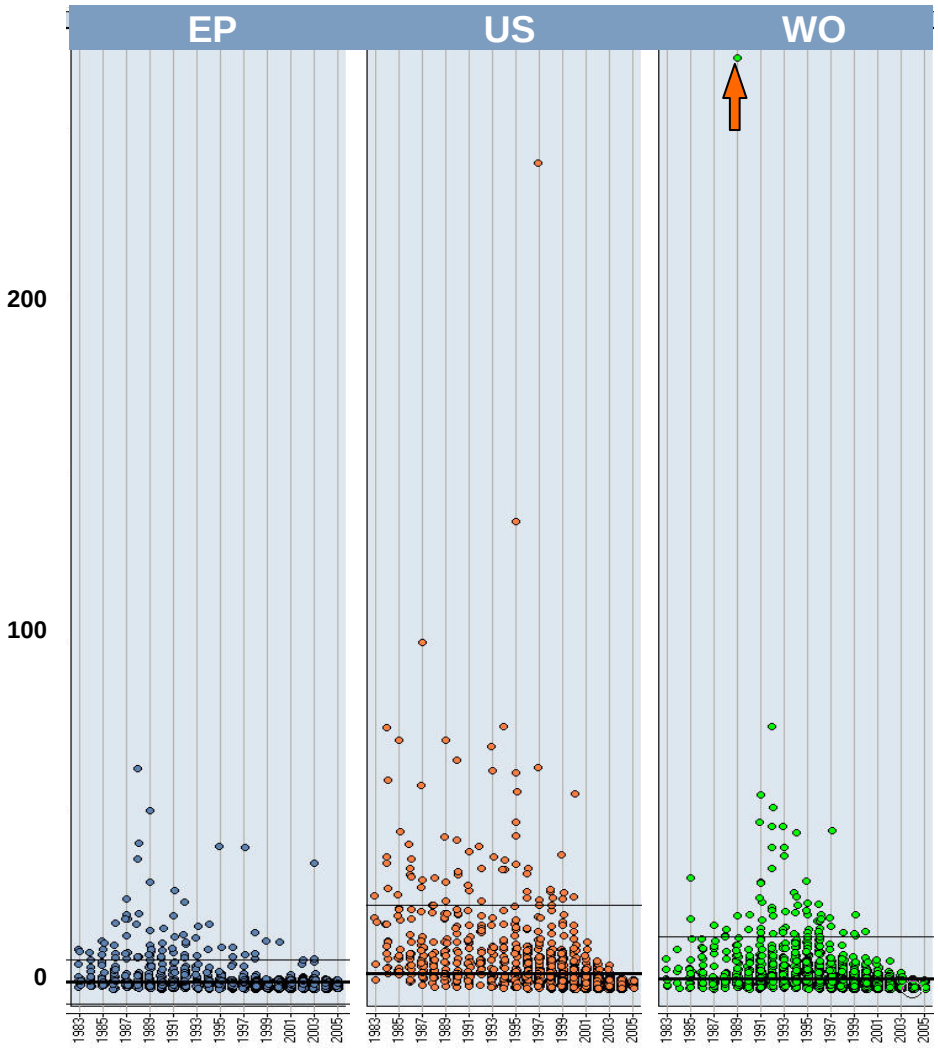
Citation Analysis

Citation Frequency

When a patent or application is published, it may serve as a reference for inventions that are subsequently filed, either by the same inventor or by others. If an inventor or an examiner makes reference to an earlier patent document, it implies some technical relationship, but the nature of that relationship may vary. The earlier work may be similar, or may be a different solution to the problem that is addressed by the new application. If a patent has had significant impact on the technical field, the number of times it is cited by others will tend to be higher. Citation by "self" (the same inventor or assignee) implies continued R&D investment in the technical area. Citation by others (other assignee entities or examiners) implies some recognition either of technical reliance on or advancement over the prior work.

Measurement of citation frequency is performed to assess patent value and impact. The measurement must compensate for date of publication, since newer patents obviously have had less opportunity to be cited. Measurement of citation frequency must also take into account the differences in citation practice between the United States and the European and WIPO (PCT) patent authorities.

Figure 18. Comparison of citation rate between US, EP, and WO documents in the collection. The average citation frequencies for the documents from each authority are plotted on the same Y axis to show the large differences in average citation rate. The table shows the number of citations required to exceed 2 S.D. above the average. The 2 S.D. hurdle is 2-3 times higher for the US than for EP or WO (PCT). Consequently, designation of documents in this collection as "highly cited" applied different criteria to the US vs EP and PCT.

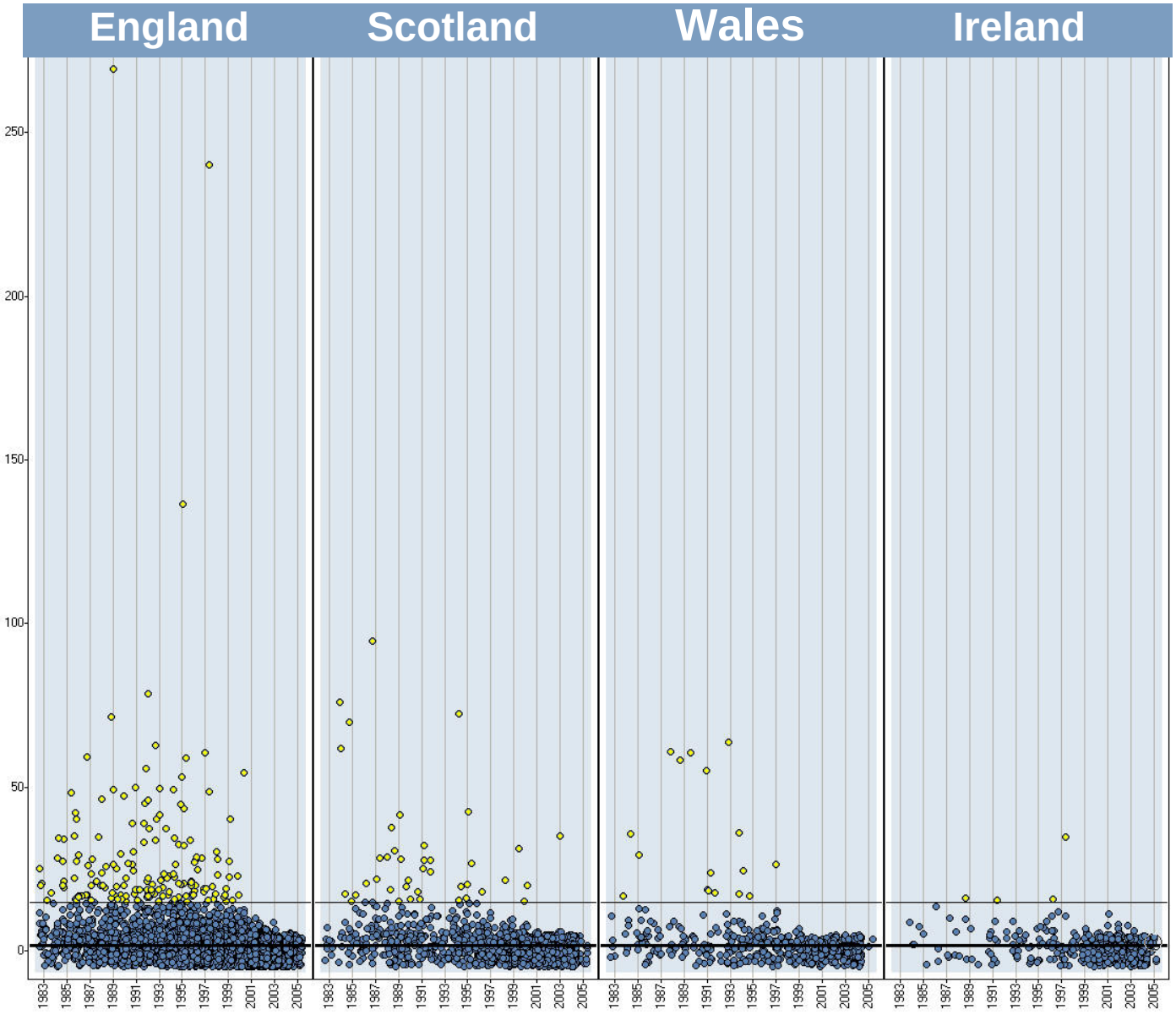


EP n = 2524	**2 S.D. = 6.4**
US n = 2114	**2 S.D. = 20.0**
WO* n = 3562	**2 S.D. = 8.2**

The arrow in the chart at left designates an outlier in the collection. This unusual PCT document is extremely highly cited, and was dropped from the 2 S.D. calculation so that the selection of "highly cited" PCT documents would not be unfairly disadvantaged. The outlier is the work of Edwin Southern on nucleic acid analysis, a founder patent in a rapidly developing technical area.

Use of citation frequency to assess impact by region

Figure 19. Display of highly cited documents in the collection by region. Criteria for selecting documents as "highly cited" are discussed above, and the highly cited documents are highlighted in yellow. It is noticeable that ,as a result of their recent publication, few documents in the 2000's meet the 2 S.D. hurdle that applies to the collection as a whole. Since these years probably do contain documents of still-emerging interest, a method for identifying documents with such potential is needed.



Use of citation frequency to identify technology of emerging interest

Figure 20. Criteria for selection of newer documents of emerging interest. When a separate calculation is performed for documents published in the 2000's, the 2 S.D. hurdle is much relaxed, and is at the 2.6 citation level. Documents that exceed this criterion are marked in yellow and are characterized as being of "emerging interest". None of the documents from the Wales region meet this criterion. In the next figure, the regional frequency is recalculated *inter se* to examine the Welsh situation in greater detail.

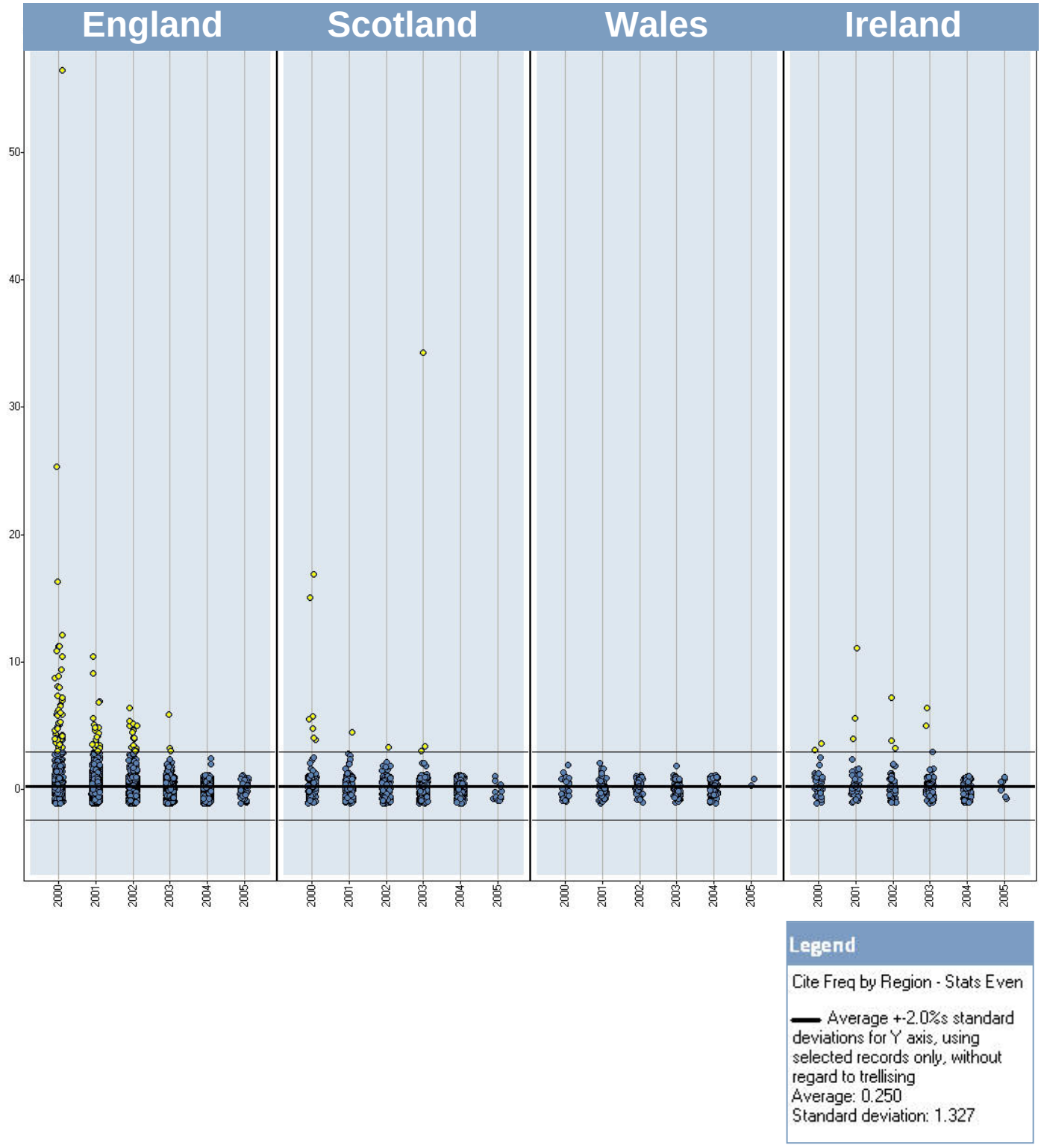
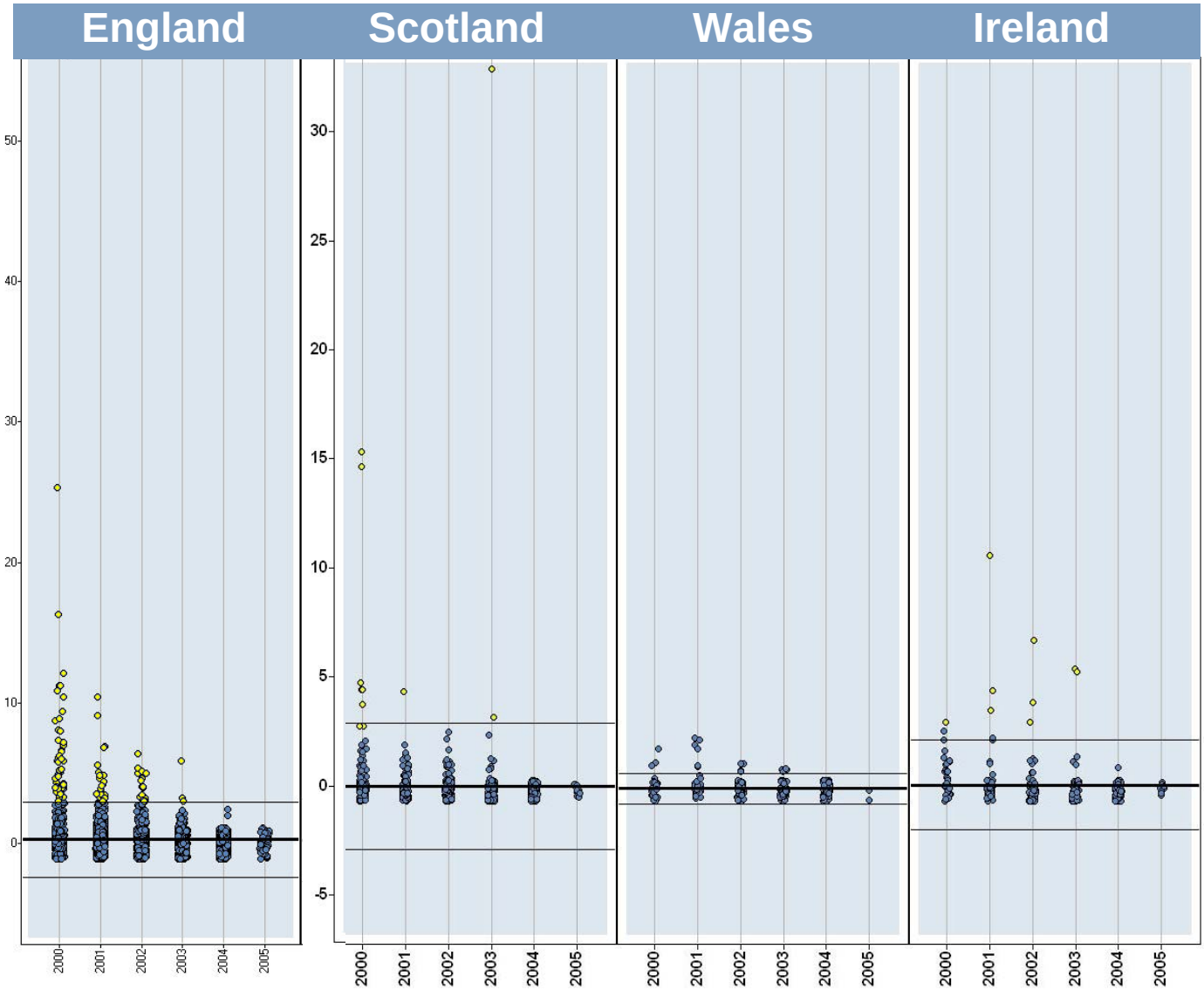


Figure 21. Adjusted criteria for selection of newer documents of emerging interest. In this chart, the calculations on frequency in the 2000's are adjusted to examine each region separately. This establishes a different 2 S.D. hurdle for each region. Though this exercise may be of doubtful value for relatively low numbers of documents, it is a way of separating cited from uncited work, and may be usable for limited purposes. Documents that exceed the criterion by the earlier standard established in Figure x3 are marked in yellow. The figure below shows the values for 2 S.D. calculated *inter se* in each region, and the only regions that add any documents based on the adjusted criteria are Wales and Ireland, both with relatively few documents in this category. At this low level of cite frequency on recently published documents, it would be quite important to recognise whether the citations were self cites or citations by others.



Region	n	2 S.D.
England	4140	2.7
Scotland	858	3.9
Wales	243	0.7
Ireland	323	2.1

PART II:

Table 9:

No. of Registered / Pending Trade Marks (Oct'04)	**Uk/Irish**	**CTM**	**US**	**Classes**
ABERYSTWYTH	1			42
BANGOR	2	7		9;16;21;25;26;28;29;30;31;32;36;41;42
CARDIFF	11	1		1;5;9;16;19;35;38;41;42
SWANSEA	6			16;35;36;41;42
GLAMORGAN	6			9;25;28;41;42
UWIC	3			10;35;42;44
NEWPORT	2			41
SIHE	4			35;41;42
RWCMD	2		1	41;
TOTAL WALES	***37***	***8***	***1***	
TOTAL SCOTLAND	***150***	***7***	***1***	
TOTAL IRELAND	***34***	***11***	***6***	

Classes 1 – 34 are used to protect Goods, Classes 35 - 45 are used to protect Services with 41 & 42 protecting Education and Research Services respectively. The Marks protected in Wales are provided below:

Figure 22

Registered/Pending Marks	Titles
ABERYSTWYTH	**FLUVIO.**
BANGOR (UK)	**LOGO; FTA.**
BANGOR (CTM)	**COLLOQUIA; JUNK FOOD JUNTA; JUNK PUNKS;GENERAL JUNK; JARVIS AND JESS; FOOD DUDES; FOOD DUDE ENERGY.**
CARDIFF (UK)	**TRIANA; HGMD; Ecommerce Wales(s); eCIC; CARDIFRC; CARDIFF BUSINESS SCHOOL; CARDIFF LAW SCHOOL; CARDIFF UNIVERSITY; Western Arc; p procure web.**
CARDIFF (CTM)	**ABCELLUTE.**
SWANSEA	**UNIVERSITY COLLEGE OF SWANSEA(s); UNIVERSITY OF WALES SWANSEA(s); SWANSEA UNIVERSITY; IP WALES; CYMRU PROSPER WALES; LOGO.**
GLAMORGAN	**TECHNOGEAR; AUTHENTIC WORD; UNIVERSITY OF GLAMORGAN(s); MEISTER TECHNICIAN(s); NETWORK75; UGCS.**
UWIC	**SOLETEK; Product Design & Development Research PDR; UWIC**
NEWPORT	**ST DAVID'S UNIVERSITY, NEWPORT; UNIVERSITY OF ST DAVID, NEWPORT.**
SIHE	**SWANSEA IPR CENTRE; SWANSEA BUSINESS SCHOOL; SWANSEA LAW SCHOOL; SWANSEA AND WEST WALES SCHOOL OF ART AND DESIGN**
RWCMD (UK)	**THE RICHARD BURTON THEATRE(s); The Pavillion in the Park(s).**
RWCMD (US)	**THE RICHARD BURTON THEATRE(s).**

(s) denotes a Mark in series.

Table 10:

No. of Registered/Pending UK Designs (October 2004)	
TOTAL WALES	**0**
TOTAL SCOTLAND **Dundee 2087963;S of Art (Glas.) 3013268, 3013267, 2102634; Heriot Watt 3012672; Strathclyde 3004112, 2008590.**	***7***
TOTAL IRELAND **Ulster 2094930.**	**1**
TOTAL ENGLAND (RUSSELL GROUP) **Cambridge 2094369; Imperial 2105441; 2100992; 2100991 Newcastle 3016623; Southampton 2052408.**	**6**

Welsh HEIs have no registered UK Designs, whereas Scottish HEI's have a similar number of registrations to the English (Russell Group) HEIs.

Table 11:

No. of Registered/Pending Domain Names (October 2004)	.org.uk	.co.uk.
ABERYSTWYTH	2	1
BANGOR	13	16
CARDIFF	22	24
SWANSEA	9	8
GLAMORGAN	3	18
LAMPETER		3
UWIC	3	4
NEWPORT		2
NEWI	1	2
SIHE	1	9
TRINTY	2	1
UNIVERSITY OF WALES	1	2
TOTAL WALES	***57***	***90***
TOTAL SCOTLAND	***111***	***144***
TOTAL IRELAND	***3***	***11***

Scottish HEI's are significantly more active in registering both org.uk and .co.uk Domain Names, although the figures for Ireland are only relevant to HEI's within Northern Ireland.

PART III:

Undertaking selective first named inventor searches using the names of academics either previously associated with Welsh University assigned patent families or otherwise resident in relevant RAE 5* & 5 rated Departments significantly expands Welsh patent interaction with commercial assignees, as illustrated in Figure 23 below:

Figure 23

Commercial Assignee - Aberystwyth Institutions	1st Inventor	Assignment Total
Aber Genomic Computing Limited	Kell, Douglas Bruce	2
Aber Instruments Limited	Davey, Christopher Lyndon	2
Abertec Limited	Kell, Douglas Bruce	6
Grand Total		10

Commercial Assignee - Bangor Institutions	1st Inventor	Assignment Total
Aura Biosystems	Lee, Richard, Stanley	1
BAE Systems Plc	Warsop, Clyde	5
British Technology Group Limited	Pethig, Ronald	12
	Talary, Mark, Stuart	1
Cambridge Biopolymers Limited	Fitchett, Colin, Stanley	2
	Khan, Mohammed Lokman	2
E.I. Du Pont De Nemours	Khan, Mohammed Lokman	6
Genera Technologies Limited	Parton, Adrian	2
Gyros Technology Limited	Pethig, Ronald	4
P & B (sciences) Limited	Pethig, Ronald	2
Scientific Generics Limited	Parton, Adrian	7
Grand Total		44

Commercial Assignee - Glamorgan Institutions	1st Inventor	Assignment Total
Critical Solutions Technology Limited	Ramsey, Edward	1
Grand Total		1

Commercial Assignee - North East Wales Institutions	1st Inventor	Assignment Total
Oceanbait	Williams, Peter Anthony	1
Grand Total		1

Commercial Assignee - Swansea Institutions	1st Inventor	Assignment Total
Analex Limited	Burnett, Kenneth Fairley	2
Battle Research And Development Associates	Parker, Dawood	1
Bord Na Mona Horticulture Limited	Prasad, Munoo	2
British Petroleum Company plc	Butters, Michael	1
Carri-Med Limited	Williams, Phylip Rhodri	3
Critikon Inc	Parker, Dawood	2
Eidawn Bias Limited	Danford, Natalie	1
Franklin Instruments Inc.	Parker, Dawood	1
G. D. Searle & Co.	Parker, Dawood	2
JNA Limited	Parker, Dawood	1
McNeilabs, Inc.	Parker, Dawood	1
Novametrix Medical Systems, Inc.	Parker, Dawood	3
Pfizer Inc.	Parker, Dawood	1
Polystan Limited	Parker, Dawood	1
Sapphire Research And Electronics Limited	Parker, Dennis Amerena	1
T A Instruments Limited	Williams, Phylip Rhodri	1
Vickers Limited	Parker, Dawood	1
Whitland Research Limited	Parker, Dawood	6
Grand Total		31

Commercial Assignee - Cardiff Institutions	1st Inventor	Assignment Total
A.H. Robins Company Limited	Hewlins, Michael John Edward	2
Amersham Life Science / Amersham Pharmacia Biotech	Heller, Harry George	2
An-ex Analytical Services Limited	Heard, Charles, Martin	1
Avanex Corporation	Cao, Simon	2
Biological Control Systems Ltd.	Wyatt, Tristram D.	1
Biostatus Limited	Smith, Paul James	4
British Gas Plc	Rowe, David Michael	3
British Nuclear Fuels Plc	Bull, David Roger	6
	Pham, Duc Truong	1
Coal Industry (Patents) Limited	Syred, Nicholas	11
Compton Developments Ltd	Bowen, Ivor Delme	1
Davy Mckee (Stockton) Limited	Pooley, Frederick David	1
De Sangosse UK s.a.	Bowen, Ivor Delme	4
GEC Alsthom Limited	Meydan, Turgut	2
Gen-Probe Incorporated	Batmanghelich, Shariar	2
	Nelson, Norman Charles	6
	Woodhead, James Stuart	2
Glass Mfrs Federation	Breakspeare, Robert James	1
	Heath, Philip James	1
Glaxo Group Limited	Daluge, Susan, Mary	4
Insect Investigations Limited	Symonson, William, Oliver, Christian	1
Kawasaki Steel Corp	Muraki, Mineo	2
Molecular Light Technology Limited	Ball, Raymond Lathan	5
	Brown, Richard Charles	1
	Herbert, Sian Aerona	2
	Rutter, Andrew James	4
	Weeks, Ian	6
Orb Electrical Steels Limited	Basak, Amitava	2
	Salmasi, Zareh, Soghomonian	5
Phairson Medical Inc.	De Faire, Johan R.	5
	Kay, John	5
Reliant Tooling Sales Limited	Ryan, Paul Anthony	2
Riker Laboratories, Inc.	Carman-meakin, Brian	2
Sirna Therapeutics, Inc. (aka Ribozyme)	Akhtar, Saghir	6
Smith & Nephew Plc	Thomson, Brian Mark	3
Smithkline Beecham Plc	Powell, David	5
Switched Reluctance Drives Ltd.	Bolton, Hugh Robert	3
Wellcome Foundation Limited	Franzmann, Karl Witold	3
	Miller, David Drysdale	5
Whitbread Plc	Lancashire, William Edward	3
Grand Total		127

It can be seen from Figure 24 below that these ‘new’ additional documents can be characterised as being relatively ‘highly cited’.

Figure 24:

Regional Institution	1st Inventor	Document Title	Document	Cited By Count
Aberystwyth	Kell, Douglas, Bruce	Analytical Method	WO9204630A1	8
		Analytical Or Monitoring Apparatus And Method	US5569591A	11
		Determination Of Biomass	WO8802114A1	7
			WO8802115A1	13
Bangor	Lock, Gary, Michael	Travelling Wave Dielectrophoretic Apparatus And	WO0105514A1	7
	Parton, Adrian	Methods Of Analysis	WO9316383A1	15
		Methods Of Analysis/separation	US5653859A	24
			US5993631A	10
			WO9416821A1	10
	Pethig, Ronald	Apparatus And Method For Testing Particles Using	WO9804355A1	9
		Apparatus For Separating By Dielectrophoresis	US5814200A	19
			WO9422583A1	13
		Apparatus With Electrode Arrays For Carrying Out Chemical, Physical Or Physico-chemical Reactions	EP0898493A1	7
			EP0898493B1	7
		Apparatus With Electrode Arrays For Carrying Out Chemical, Physical Or Physico-chemical Reactions	WO9734689A1	10
		Manipulation Of Solid, Semi-solid Or Liquid Materials	US5795457A	23
			WO9111262A1	38
Cardiff	Batmanghelich, Shariar	Detecting Or Quantifying Multiple Analytes Using Labelling Techniques	WO9100511A1	23
	Campbell, Anthony Keith	Chemiluminescent Acridinium Labelling Compounds	US4946958A	65
		Detecting Or Quantifying Substances Of Biological	GB2095830A	21
		Detecting Or Quantifying Substances Using Labelling	US4478817A	36
		Luminescent Labelling Materials And Procedures	EP0082636A1	61
			EP0082636B1	64
		Modified Bioluminescent Proteins And Their Use	WO9101305A1	55
	Carman-Meakin, Brian	A Liposomal Sustained-release Aerosol Delivery	WO8601714A1	22
	Evans, Richard M.	Aerosol Formulations Including Proteins And Peptides Solubilized In Reverse Micelles And Process For	US5230884A	67
		Method Of Preparing Medical Aerosol Formulations	US5292499A	31
	Mcguigan, Christopher	Chemical Compounds	WO9629336A1	27
	Nelson, Norman C.	Compositions And Methods For The Simultaneous Detection And Quantification Of Multiple Specific	EP0709466A2	24
	Pooley, Frederick D.	Extraction Of Metal Values From Ores Or	US4822413A	29
		Microbial Leaching Of Sulphide-containing Ores	US4497778A	27
	Price-Thomas, Martin	Electro-surgical Apparatus With Body Impedance	GB2213381A	61
	Simpson, John Stephen	Detecting Or Quantifying Substances Using Luminescent Reactions	GB2008247A	29
	Woodhead, James Stuart	Detecting Or Quantifying Multiple Analytes Using Labelling Techniques	US5656207A	24
Glamorgan	Barry, Thomas	Inflatable Supports	US5603690A	9
		Protective Article For Securing Around A Body Part	GB2265314A	8
Swansea	Butters, Michael	Compositions Suitable For Use As Electrophilic Halogenating Agents And Their Use In The Electrophilic Halogenation Of Organic Substrates	GB2155009A	10
	Jones, David Brian	Method And Apparatus For Assessing Particle	GB2160655A	8
	Parker, Dawood	Disposable Polarographic Gas Sensor System	US4269685A	14
		Non Invasive Blood Analyte Sensor	US5553613A	20
		Optical Device	WO0009004A2	8
		Optical Monitor (oximeter, Etc.) With Motion Artefact	WO9403102A1	21
		Process And Apparatus For Polarographic	US4452672A	8
	Parker, Dennis Amerena	A High Resolution Magnetometer For Sensing Metallic	GB2186978A	8
		Method And Apparatus For The Quantative And Qualitative Measurement Of Small Metal Particles	GB2165650A	9
	Williams, Phylip Rhodri	Rheometer	US5303578A	11

PART IV:

The major findings of this Report are listed below:

- The quantity of Cardiff patent filings compares well with other members of the Russell Group. The output surpasses both of the Scottish representatives within the Russell Group (Edinburgh & Glasgow) and the English HEIs of Birmingham; Bristol; Kings College London; Leeds; Liverpool; Newcastle; Nottingham and Warwick. Only Cambridge; Imperial College; Manchester; Oxford-Isis; Sheffield; Southampton and UCL have a higher volume of patent filings.

- Whereas patent filings from Cardiff rivals the highest output from a Scottish HEI (Strathclyde), the regional performance of Welsh HEIs is only one third that of Scotland, but marginally greater than Ireland.

- The prospect of patent applications from HEIs progressing to the issuance of a granted patent significantly improves (100% improvement for EP & 64% improvement for US) if the filing is undertaken in collaboration with a commercial first assignee.

- English Russell Group HEIs and Irish HEIs have a track record of co-assignment with commercial entities, accounting for over 25% of their granted patent portfolio. By comparison, Cardiff has significantly reduced patent co-assignments with commercial first assignees since the end of 2000.

- Unlike their English, Scottish and Irish counterparts there is no evidence of collegiate co-assignment between HEIs in Wales. Trade Mark and Domain Name registrations are predominantly protective in nature against other members of the Welsh HEI group.

- UK HEI technology specialisms cover: Human Necessities; Chemistry & Metallurgy; Physics and Electricity. Human Necessities focuses upon medicines & devices, notably pharmaceutical preparations. Chemistry focuses upon genetic engineering and microbe testing. Electricity focuses upon electronics, notably lasers and electric tubes.

- Welsh HEIs have particular technology strengths in the fields of Chem/Phys Analysis and Microbe Testing.

- Forward citation analysis of patents is a useful indicator of commercial interest in the technology and in this regard the performance of Welsh HEI patents has been notably poorer since the year 2000.

- The number of UK design registrations belonging to UK HEIs is only 14 in total. Welsh HEIs have no UK design registrations.

- Sufficient inventive capacity resides within Welsh HEIs in order to 'compete' within the HEI Technology Transfer market place. Individual first named inventor searches of academics either already associated with Welsh HEI patent assignments or otherwise residing in relevant RAE 5* & 5 rated Departments significantly expands Welsh patent interaction with commercial assignees. For example, Aberystwyth patent filings linked with commercial entities increases from 3 to 10; Bangor 7 to 44; Swansea 1 to 31 and Cardiff 45 to 127.