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## Bibliometric Analysis of INMHA-related Research, 1997-2008

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## INTRODUCTION

In 2000, the Canadian Institutes of Health Research (CIHR) was created by the Canadian federal government to replace the Medical Research Council (MRC) as the premier research agency for health research in the country.<sup>1</sup>

The Institute of Neurosciences, Mental Health and Addiction (INMHA) is one of the thirteen virtual institutes under the umbrella of CIHR. The mandate of INMHA is to support research that enhances knowledge of the brain – including mental health, neurological health, vision, hearing and other sensory systems, as well as cognitive sciences, spinal cord, and motor systems. The goal is to improve our understanding of human thought and emotion, behaviour, sensation, perception, learning, and memory. The hope is to reduce the burden of brain illness through prevention strategies, screening, diagnosis, treatment, support system and palliation.<sup>2</sup>

In addition to supporting research within its mandate, INMHA has co-led a number of cross-CIHR Strategic Initiatives. The goal of these initiatives is to support developing areas of health research that span the mandates of all of CIHR. Since 2003, the Regenerative Medicine and Nanomedicine Initiative (RMNI) has been providing funds for research into regenerative health approaches (including stem cells, tissue engineering, rehabilitation sciences, etc) and new and emerging technologies (i.e. Nanomedicine – nanotechnology applied to health, novel drug delivery approaches, etc.). More recently, under INMHA leadership, a Canadian Epigenetics, Environment and Health Research Network (CEEHRN) Initiative has been developed in partnership with many of the other CIHR Institutes.

This bibliometric report was commissioned by INMHA to analyze the scientific production of Canadian researchers within INMHA's main domains over the 1997-2008 period. A number of sub-domains of perceived research strength within INMHA's mandate are also examined. It is expected that these results will help inform INMHA's response to Second International Review of CIHR, and the renewal of INMHA's Strategic Plan. In addition, a number of cross-CIHR domains where INMHA has provided leadership have also been examined. These later domains are broader than just INMHA, and represent new and emerging areas of multi-disciplinary research for Canada. For all domains, this report compares the performance of Canadian researchers with that of researchers from other countries.

Throughout this report, domains are presented in the following order:

1. Neuroscience
  - a. Neuroimaging
  - b. Neural Stem Cells
2. Mental Health
3. Addiction
4. Senses and Communication Disorders
  - a. Pain
5. Regenerative Medicine
6. Nanomedicine
7. Epigenetics

Domains 1-4 represent the main domains of INMHA. Although overlap between domain 1 (Neuroscience) and the other main domains is unavoidable, care has been taken to clearly delineate search parameters among domains 2-4 (see Appendix 1). Sub-domains for a number of the main domains are indicated by the alphabetical sub-designations. In each case, these sub-domains represent a subset of the research of the larger domain they fall under.

Domains 5-7 represent areas of research that are broader than INMHA's mandate. These domains represent areas that span the mandate of CIHR, but where INMHA played a leading role in developing cross-cutting CIHR funding initiatives. It is also expected that INMHA-relevant researchers will play an important research role in these domains.

The first section of the report presents the methods and indicators used for compiling bibliometric data. The second section presents the evolution of Canada's scientific productivity, specialization and collaborative trends in each of the domains and sub-domains listed above. Finally, the last 5 sections compare Canada's productivity, specialization, scientific impact and collaboration with that of the 20 most productive countries of each of the 10 domains and sub-domains.

# 1 METHODS

## 1.1 Database

The bibliometric data presented here are drawn from the Canadian Bibliometric Database (CBD™) built by the *Observatoire des sciences et des technologies* (OST) using Thomson Reuters' Web of Science (WoS). The WoS includes three databases (the Science Citation Index Expanded™ [SCI Expanded], the Social Sciences Citation Index™, and the Arts & Humanities Citation Index™) covering, in 2008, more than 10,500 journals in all disciplines of knowledge. These databases do not include all documents likely to have been published by Canadian or foreign researchers, since some works are disseminated through other scientific media not indexed by the WoS (e.g., highly specialized journals, national journals, grey literature and particularly conference proceedings not published in journals). As such, the statistics presented here do not include all documents likely to have been published by Canadian or foreign researchers. What these statistics do measure, however, is the share of researchers' scientific output that is the most visible for Canadian and worldwide scientific communities, and therefore that is most likely to be cited.

Although OST's database includes several types of documents, only articles, research notes and review papers are typically selected in producing bibliometric studies as these are the primary means of disseminating new knowledge.

## 1.2 Retrieval of Papers in Each of the Domains

The OST's database uses a discipline classification developed by CHI Research and used by the National Science Foundation (NSF) in the U.S.<sup>3</sup> The primary advantage of this classification over the one provided by the WoS is that it categorizes each journal exclusively within a single discipline, which prevents duplicate counting when the data are presented by discipline. Unfortunately, this classification scheme does not have any subject category for any of the 10 research domains analyzed in this report. Hence, to retrieve papers in these areas, we used the U.S. National Library of Medicine Medical Subject Headings (MeSH), which relies on a controlled vocabulary to assign a medical domain to each paper indexed in the PubMed database<sup>4</sup>. MeSH headings chosen by CIHR-INMHA for each of the 10 domains are presented in the Appendix 1. Table 1 presents, for each of the 10 domains, the percentage of papers retrieved from PubMed using each of the MeSH terms, as well as the number of these papers recalled in the WoS. In addition to these MeSH terms, we also retrieved all papers published in specific 'core' journal(s) of each of the domains—chosen by CIHR-INMHA. The only exception is Neuroimaging where no such journal(s) could be found. Appendix 2 presents this list of journals for each of the 10 research domains.

**Table 1** Number of papers retrieved from PubMed and number and percentage of these papers recalled in the Web of Science

Domain	Papers retrieved from PubMed	Subset published in WoS-indexed journals	N. papers matched	% papers matched
Neuroscience	1 184 304	1 065 895	961 172	90,2%
Neuroimaging	223 751	207 635	190 413	91,7%
Neural Stem Cells	12 915	12 215	11 655	95,4%
Mental Health	275 936	242 564	215 383	88,8%
Addiction	77 290	66 902	59 339	88,7%
Senses	148 640	129 106	111 159	86,1%
Pain	113 953	97 534	81 742	83,8%
Regenerative Medicine	44 333	39 137	35 140	89,8%
Nanomedicine	31 692	29 511	27 516	93,2%
Epigenetics	35 084	32 795	30 972	94,4%

Many of these papers belong to more than one research domain (Table 2). As expected, the domain of Neuroscience has a high degree of overlap with the other main INMHA domains, with a large number of papers in the domains of Mental Health (88.8%), Addiction (76.2%) and the Senses and Communication Disorders (51.1%) also belonging to Neuroscience. Of course, Neuroscience is broader than any of the other domains, with only 5-20% of total Neuroscience papers captured to any one specific domain. These results are explained by the very broad MeSH search terms used for the Neuroscience domain compared to the narrower search terms for the other main domains (Appendix 1).

Where possible, overlap has been minimized among the main INMHA domains. For example, only 10.9% of Addictions papers also belong to Mental Health in this analysis. These results are explained by the mutually exclusive assignment of journals and MeSH search terms among the other main domains (see Appendices 1 & 2).

The INMHA sub-domains of Neuroimaging, Neural Stem Cells, and Pain are subsets of their parent main domains. As such, typically 100% of these papers belong to a main INMHA domain. Note that Neural Stem Cells refers to all papers that overlap the domains of Stem Cells and Neuroscience (Appendix 1).

The cross-CIHR domains of Regenerative Medicine, Nanomedicine and Epigenetics are broader than INMHA's mandate, and thus show little overlap to specific INMHA domains. However, both Epigenetics and Regenerative Medicine have measurable overlap with Neuroscience (10-12%), indicating the relative importance of Neuroscience to these fields. Note that Regenerative Medicine does not include all stem cell papers – only those that pertain to regenerative therapies (Appendix 2).

**Table 2** Overlap between the each of the domains

Domain	Neural		Neural	Mental	Addict	Senses	Pain	Reg		Epi.	All
	Neuro.	Imag	SC	Health				Med	Nano		
Neuroscience		19,5%	1,2%	20,4%	4,9%	10,3%	5,8%	0,5%	0,1%	0,3%	100%
Neuroimaging	100,0%		0,5%	13,3%	1,4%	14,1%	10,2%	0,3%	0,1%	0,1%	100%
Neural Stem Cells	100,0%	8,9%		4,0%	0,4%	1,9%	0,5%	20,9%	0,4%	1,8%	100%
Mental Health	88,8%	11,2%	0,2%		3,1%	2,8%	1,8%	0,1%	0,02%	0,2%	100%
Addiction	76,2%	4,4%	0,1%	10,9%		2,3%	1,6%	0,03%	0,01%	0,1%	100%
Senses	51,1%	13,6%	0,1%	3,2%	0,7%		43,3%	0,2%	0,0%	0,1%	100%
Pain	66,5%	22,6%	0,1%	4,8%	1,1%	99,9%		0,2%	0,01%	0,02%	100%
Regenerative Med.	12,1%	1,3%	6,2%	0,5%	0,05%	1,2%	0,4%		1,6%	1,2%	100%
Nanomedicine	2,5%	0,8%	0,1%	0,1%	0,02%	0,2%	0,04%	2,2%		0,3%	100%
Epigenetics	10,0%	0,6%	0,7%	1,7%	0,2%	0,5%	0,1%	1,5%	0,2%		100%

### 1.3 Indicators

**Number of publications:** The number of scientific papers with authors from a country, as found in authors' addresses. It should be noted that data for 2008 are incomplete because some journals published in 2008 were only indexed in by Thomson Reuters in 2009 and, hence, are not yet included in the current version of the CBD. This underestimates the global scientific production by a percentage between 5% and 10%. These *not yet indexed* publications, however, only have a marginal effect on statistics presented in this report, as most of the data are grouped into 6-year periods. Moreover, our experience shows that these publications are evenly distributed across disciplines and countries and, hence, do not affect the comparisons made in this report.

**Average of Relative Citations (ARC):** This indicator is based on the number of citations received by papers over a two-year period following publication year. Thus, for papers published in 2000, citations received between 2000 and 2002 are counted. This means that citations counts for papers published between 2007 and 2008 are incomplete. First author self-citations are excluded. The number of citations received by each paper is normalized by the average number of citations received by all papers of the same specialty—as defined by US National Science Foundation classification of journals<sup>5</sup>—hence taking into account the fact that citations practices are different for each specialty. When the ARC is greater than 1, it means that a paper or a group of papers scores better than the world average of its specialty; when it is below 1, those publications are not cited as often as the world average.

Given that the dataset of papers used in this study does not comprise all papers published in each of the NSF specialty of the database but, rather, a subset of the papers of some of these specialties which were retrieved using a MeSH term / journal approach, the world average for a given domain might not be equal to 1. Indeed, the normalization of citations per paper is performed at the level of the complete database using the NSF classification, for all papers of all specialties, irrespective of their retrieval in the study. Hence, the subset of papers retrieved in a specialty (e.g. cancer, cell biology, etc.) for a given domain (Addiction, Nanomedicine, etc.) might have citation characteristics that are different from those of all papers of the specialty, resulting in a 'world average' that can be above or below 1. In other words, world averages presented in the figures represent the average scientific impact of each domain relative to that of all papers published in the same specialty.

**Average relative impact factor (ARIF):** This indicator provides a measure of the scientific impact of the journals in which a country publishes. Each journal has an impact factor (IF), which is calculated annually based on the number of citations it receives relative to the number of papers it publishes. The value of a journal's IF is assigned to each paper it publishes. In order to account for different citation patterns across disciplines and specialities (e.g., there are more citations in biomedical research than mathematics), each paper's IF is then divided by the average IF of the papers in its particular speciality in order to obtain a Relative Impact Factor (RIF). The ARIF of a given country is computed using the average RIF of all papers belonging to it. When the ARIF is greater than 1, it means that that country's researchers score better than the world average; when it is below 1, they publish in journals that are not cited as often as the world average. In a manner similar to the ARC, the ARIF's world average can be below or above 1, depending on the domain's average impact per paper compared to that of its parent sub-field.

**Specialization index (SI):** This is an indicator of the intensity of publication of a country in a specific domain (stem cells, Neuroscience, etc.) relative to the intensity of the world in the same domain. A SI value above 1 means that a given group of researchers is specialized compared to the world average, while an index value below 1 means the opposite.

**International collaboration rate:** This is an indicator of the relative intensity of scientific collaboration between countries. The rate is calculated by dividing the number of papers with at least one author with a foreign country address by the country's total number of papers. A country's international collaboration rate is generally determined by its size, i.e. larger countries collaborate less than smaller ones. Hence, if Canada's international collaboration rate is greater than that of countries with a smaller research output, we can conclude that Canada is having stronger international partnerships than expected.

**Inter-institutional collaboration rate:** This is an indicator of the relative intensity of scientific collaboration between institutions. The rate is calculated by dividing the number of papers with at least two institutions by the entity's (e.g. country, state, province) total number of papers.

**Network analysis:** In order to visualize the collaborative ties between institutions active in the ten research domains a network analysis was performed using UCINET<sup>67</sup> (Borgatti, Everett and Freeman, 2002) and Netdraw<sup>8</sup> (Borgatti, 2002) softwares. These softwares allow the creation of 2-dimensional networks of co-authored papers. The size of the edges (lines) between each of the nodes is determined by the number of co-authored papers between the two entities. A threshold of numbers of papers written in collaboration is fixed in each of the figures in order for the network to be clearer. Nodes representing Canadian institutions are in dark blue and nodes representing foreign organizations are in light grey.

In addition to the graphical representation of the network, institutions' degree centrality (Freeman, 1979) was compiled in order to assess their individual importance in the network. The degree centrality is the sum of all edges (links) pointing to a node. Thus, in the case of inter-institutional collaboration, the degree centrality is the sum of all institutions with which a given institution has published.

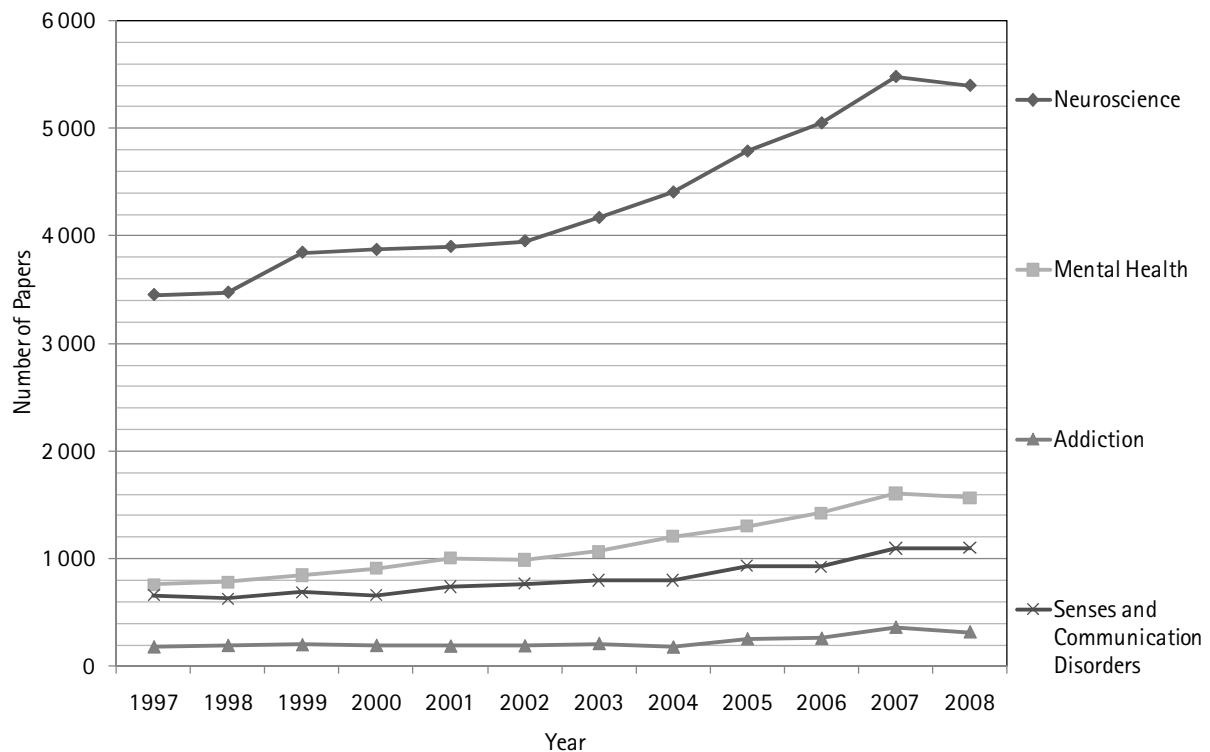
## 2 GLOBAL TRENDS

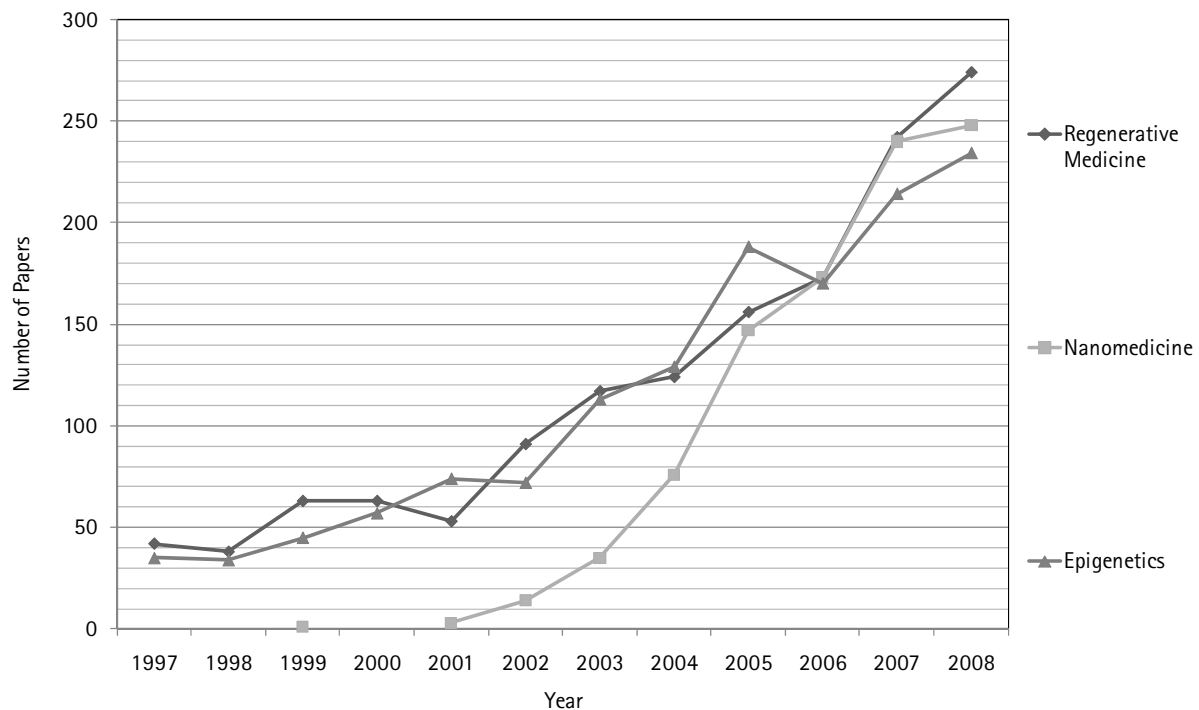
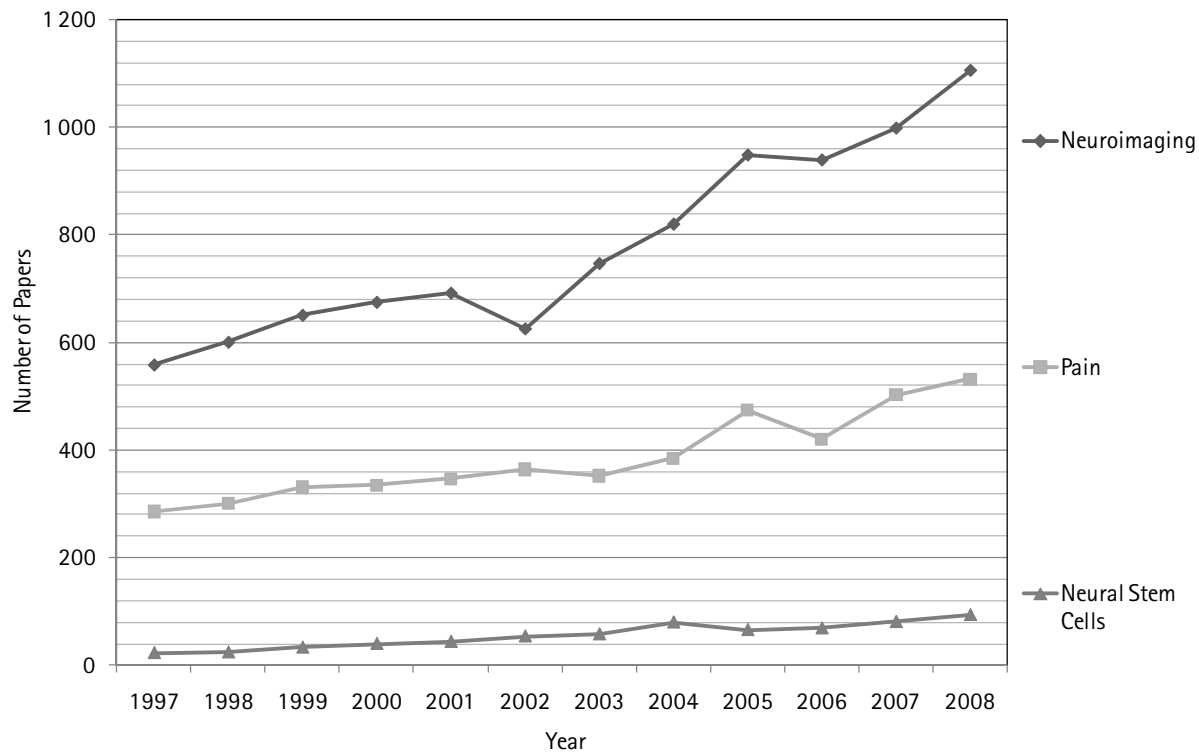
### 2.1 Number of Publications

Figure 1 presents the evolution of Canadian publications between 1997 and 2008, by domain. Data is presented on a logarithmic scale, as the number of Canadian (and world) publications varies significantly across these domains. The largest domain is by far Neuroscience with 5,481 publications authored by Canadian researchers in 2007 (data for 2008 is incomplete). The second largest is Mental Health with 1,606 publications, followed by Senses and Communication Disorders (1,096), Neuroimaging (998), Pain (503), Addiction (360), Regenerative Medicine (242), Nanomedicine (240), Epigenetics (214) and Neural Stem Cells (81). For all domains, the annual number of publications is on the rise. Not surprising, the fastest growing domains were the smallest ones. Indeed, while the growth rate for the 1997-2008 period is between 50% and 100% for the first six domains, it is above 500% for Regenerative Medicine, Epigenetics and Neural Stem Cells. Nanomedicine appeared as an emerging domain in Canada, with only one publication prior to 2000 to a yearly output of about 250 at the end of the period studied.

Note that the apparent drop in output in 2008 for some domains is due to an incomplete publication data set for that year and should not be interpreted as a relative drop in output.

Figure 1 Number of canadian papers, by domain, 1997-2008



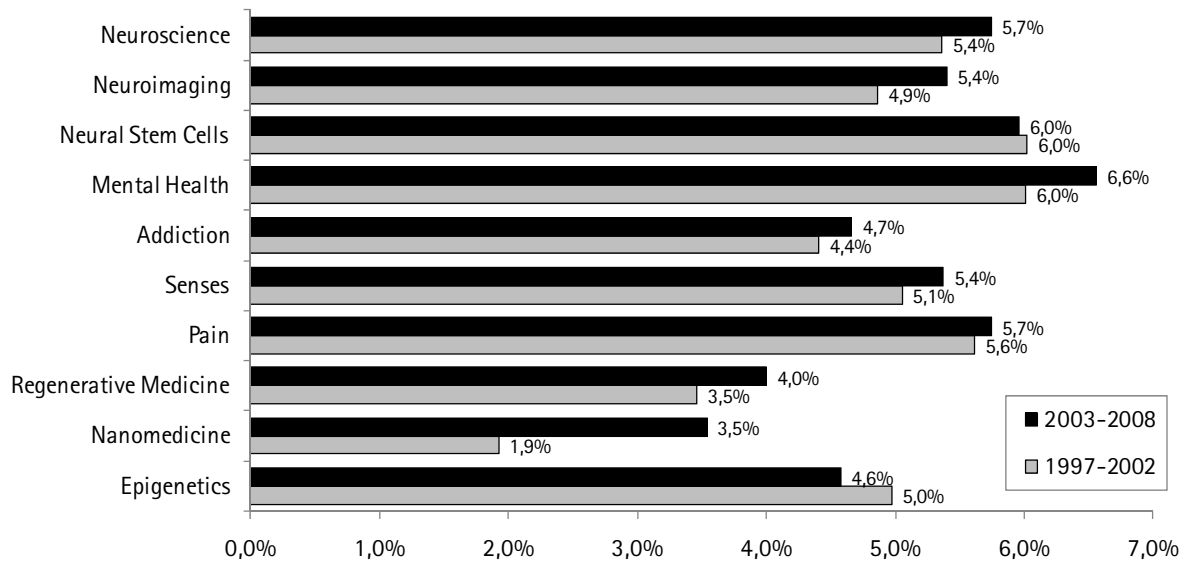


Source: Observatoire des sciences et des technologies, CBD (current as of July 2009), Web of Science and Medline databases.

In each of the domains under study, the proportion of world's papers authored by Canadian researchers varies over time. Figure 2 shows that, between 1997-2002 and 2003-2008, Canada increased its share of the world's papers in each of the domains but Neural Stem Cells and Epigenetics. For all disciplines

combined, Canadian authors contributed to 4.4% of all publications in 1997-2002 and to 4.6% in 2003-2008. Figure 22 shows that their contribution to the world's output is above these percentages in 8 of the 10 domains under study: Mental Health, Neural Stem Cells, Pain, Neuroscience, Neuroimaging, Senses and Communication Disorders and Addiction.

**Figure 2 Canadian papers' percentage of world papers, by domain, 1997-2002 and 2003-2008**



Source: *Observatoire des sciences et des technologies, CBD (current as of July 2009), Web of Science and Medline databases.*

For most disciplines covered in the WoS, Canada's rank in terms of numbers of papers was relatively unchanged between 1997-2002 and 2003-2008 (Table 3). Canada improved its ranking in Neuroscience (from 6<sup>th</sup> to 5<sup>th</sup> position), Pain (from 5<sup>th</sup> to 4<sup>th</sup>) and Nanomedicine (from 14<sup>th</sup> to 8<sup>th</sup>). It maintained its relative position in the other domains, except in Epigenetics where it dropped slightly (from 6<sup>th</sup> to 7<sup>th</sup>).

**Table 3** Canada's world rank in terms of number of papers, by domain, 1997-2002 and 2003-2008

Domain	1997-2002	2003-2008
Neuroscience	6	5
Neuroimaging	7	7
Neural Stem Cells	6	6
Mental Health	4	4
Addiction	5	5
Senses	5	5
Pain	5	4
Regenerative Medicine	8	8
Nanomedicine	14	8
Epigenetics	6	7

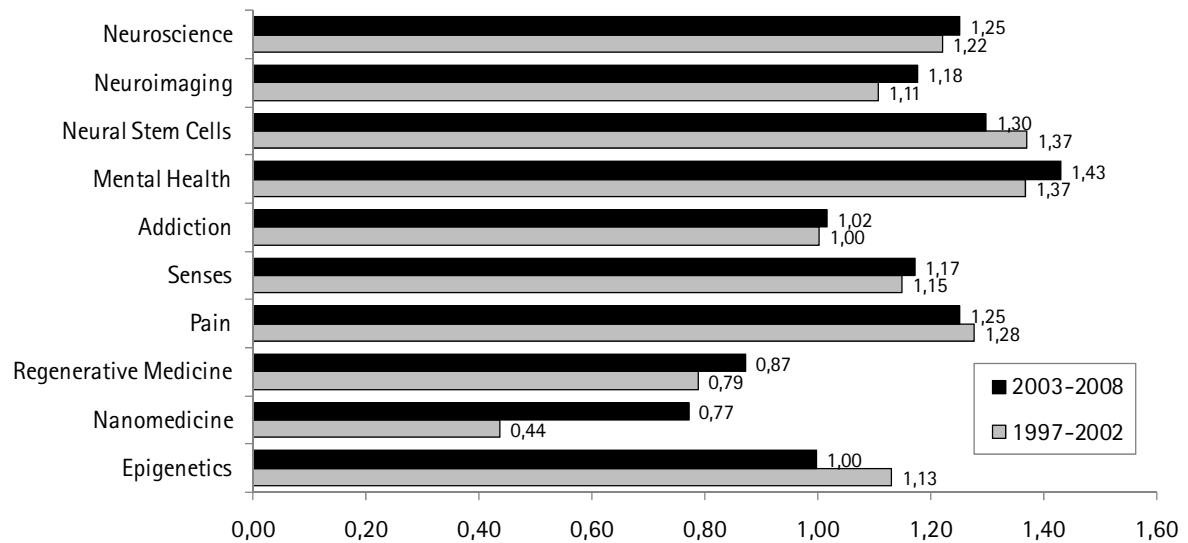
Source : Observatoire des sciences et des technologies (SCI

Expanded, SSCI and AHCI and Medline databases) - July 2009 update

## 2.2 Specialization

Figure 3 presents Canada's specialization index in each of the ten domains. It shows that Canada specialized in 7 of the 10 domains and more particularly in Mental Health (1.43 for 2003-2008), Neural Stem Cells (1.30), Pain (1.25) and Neuroscience (1.25). Between 1997-2002 and 2003-2008, Canada increased its specialization in seven domains.

Figure 3 Canada's specialization index, by domain, 1997-2002 and 2003-2008

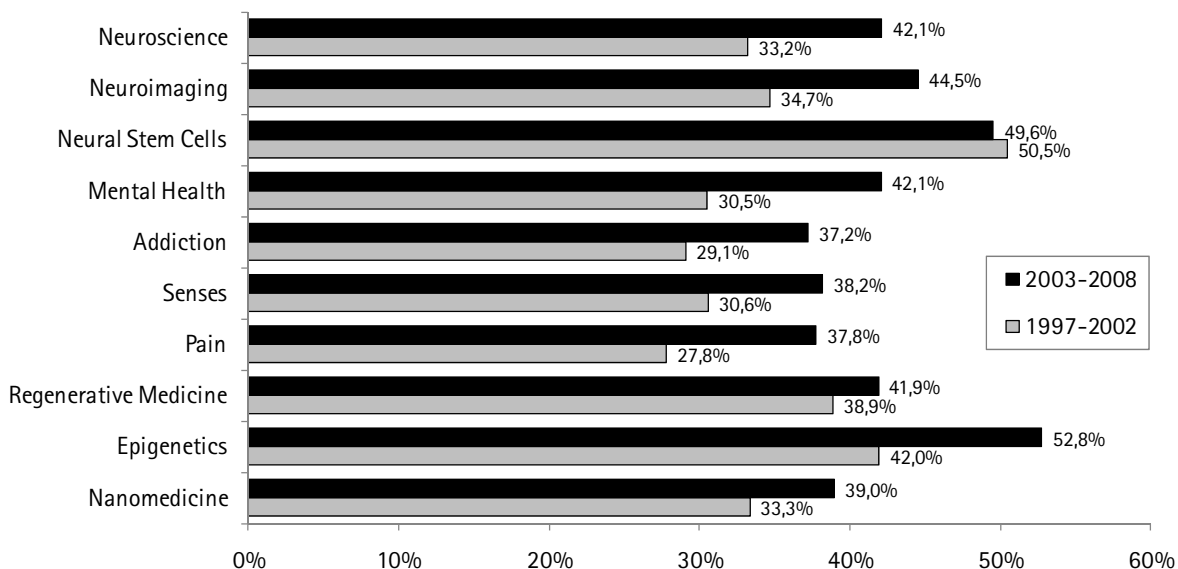


Source: Observatoire des sciences et des technologies, CBD (current as of July 2009), Web of Science and Medline databases.

### 2.3 Collaboration

Figure 4 shows that the percentage of Canadian publications co-authored with foreign researchers increased in all domains over the period, except in Neural Stem Cells where it remained stabled at about 50%. It should be noted, however, that the international collaboration rate of papers in this area was by far the highest among all domains in 1997-2002 and that it held the second place in 2003-2008, just behind Epigenetics. Between 1997-2002 and 2003-2008, international collaboration increased by 10 percentage points or more in three domains: Epigenetics (42.0% to 52.8%), Mental Health (30.5% to 42.1%) and Neuroimaging (from 34.7% to 44.5%). During the 2003-2008 period, between 40% and 50% of Canadian papers in Mental Health, Neuroimaging, Neural Stem Cells, Neuroscience and Regenerative Medicine were authored with foreign partners. This percentage was below 40% in Addiction, Nanomedicine, Pain and Senses and Communication Disorders.

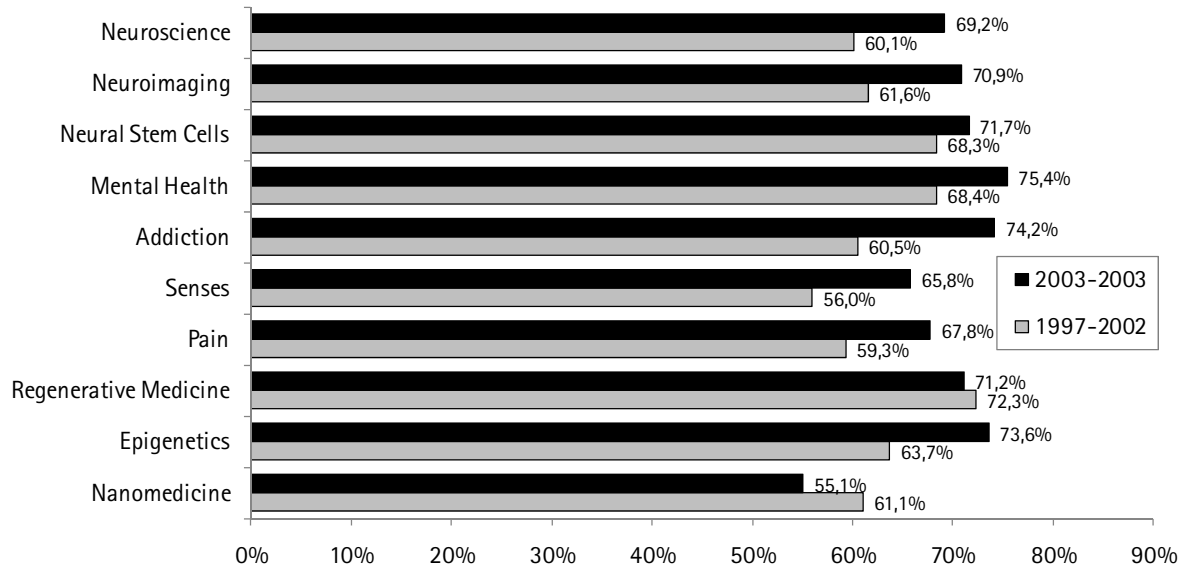
**Figure 4 International collaboration rate of Canadian papers, by domain, 1997-2002 and 2003-2008**



Source: Observatoire des sciences et des technologies, CBD (current as of July 2009), Web of Science and Medline databases.

Figure 5 provides evidence that inter-institutional collaboration rates increased between 1997-2002 and 2003-2008 in most domains. In six research domains, more than 70% of Canadian publications published between 2003 and 2008 are co-authored by researchers from different institutions. These domains are Mental Health (75.4%), Addiction (74.2%), Epigenetics (73.6%), Neural Stem Cells (71.7%), Regenerative Medicine (71.2%) and Neuroimaging (70.9%). Networks of inter-institutional collaboration presented in sections 3 to 7 will show the Canadian and foreign institutions involved in such collaborations.

**Figure 5 Inter-institutional collaboration rate of Canadian papers, by domain, 1997-2002 and 2003-2008**



Source: *Observatoire des sciences et des technologies, CBD (current as of July 2009), Web of Science and Medline databases.*

The five following sections (3 to 7) examine, for each of the domains and sub-domains, Canada's position among the top 20 most productive countries. In addition to the number of publications, specialization indexes, average of relative citations and average of relative impact factor are presented for two time periods: 1997-2002 and 2003-2008. For each research domain, a scatter plot also presents the relative position of countries regarding the specialization index, the average of relative citations and the number of papers for the 1997-2002 and 2003-2008 periods. Finally, networks of inter-institutional collaboration are presented and the most central institutions—as measured by their degree centrality (Freeman, 1979)—are highlighted.

### 3 NEUROSCIENCE

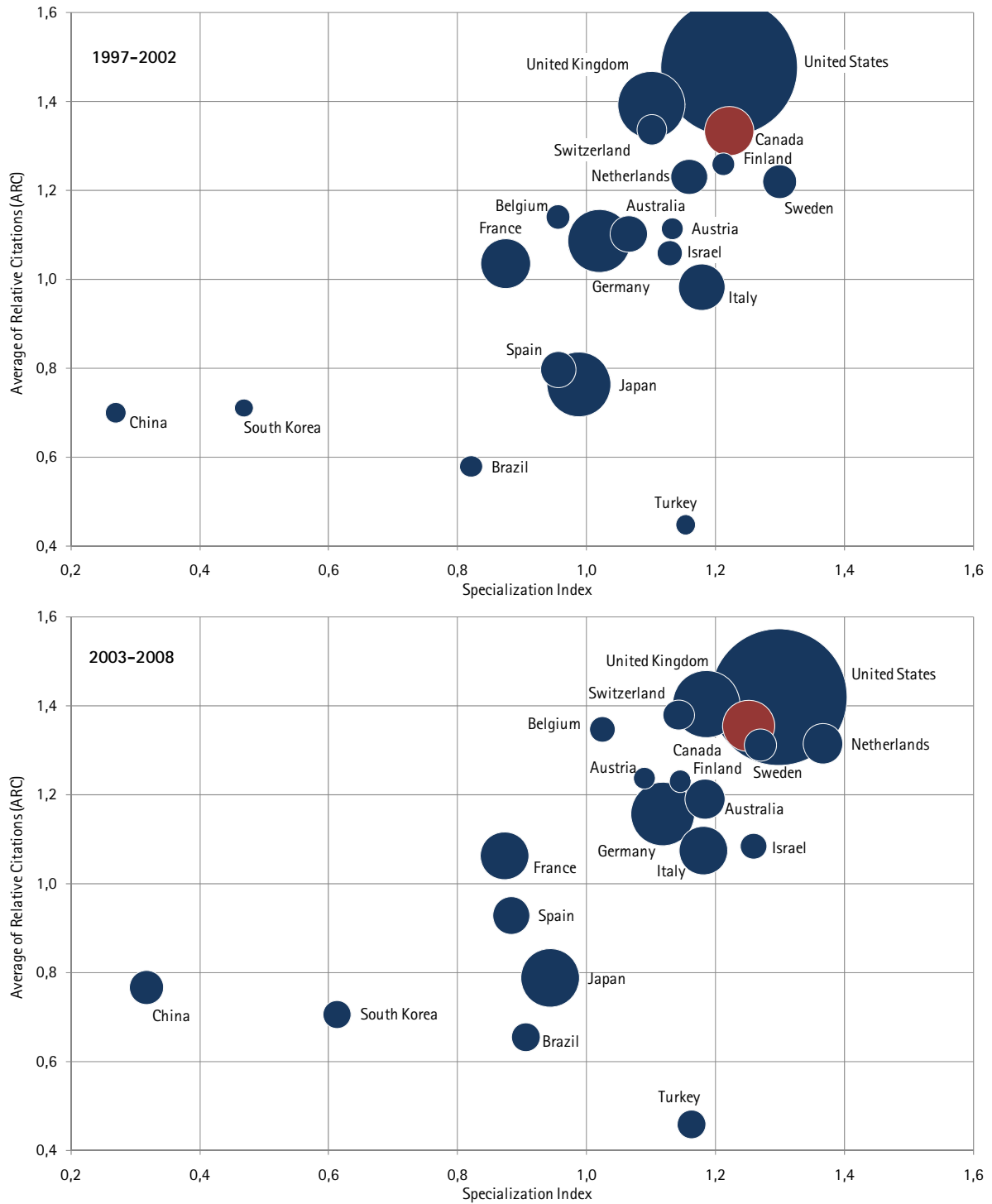
With an increase of 30% of its research output in Neuroscience between 1997-2002 and 2003-2008, Canada moved from the sixth to the fifth rank in number of publications, as its output surpassed that of France (Table 4). Its specialization index in this domain has also slightly increased from 1.22 to 1.25 between 1997-2002 and 2003-2008, placing Canada in the fourth rank among the 20 most productive countries. More significantly, Canadian researchers' scientific impact is well above world average both in terms of citations received (ARC) and journal impact (ARIF), with Canada ranking fourth for ARC and fifth for ARIF in 2003-2008 (see also Figure 6). The international collaboration rate of Canadian researchers is mildly above that of researchers from countries of the same size. Given the high number of papers published in the domain, the network of inter-institutional collaboration is quite dense (Figure 7) and a high threshold had to be used (50 papers or more). The most central Canadian institutions in the network are, in decreasing order, the University of Toronto, University of British Columbia, McGill University, The Hospital for Sick Children, University of Calgary, University of Alberta, McMaster University and the Montreal Neurological Institute and Hospital.

**Table 4** Number of papers, specialization index, international collaboration and scientific impact of the 20 most active countries in the domain of Neuroscience, 1997-2002 and 2003-2008

Country	1997-2002					2003-2008				
	Papers	% Internat			ARC	ARIF	Papers	% Internat		
		SI	Collabo					SI	Collabo	
United States	173 085	1,22	17,8%	1,48	1,29	207 593	1,30	23,4%	1,42	1,25
United Kingdom	41 782	1,10	29,3%	1,39	1,20	50 218	1,19	40,8%	1,40	1,21
Germany	36 936	1,02	30,4%	1,09	1,00	45 141	1,12	39,0%	1,16	1,03
Japan	37 962	0,99	16,3%	0,76	0,90	38 191	0,94	20,5%	0,79	0,92
<b>Canada</b>	<b>22 485</b>	<b>1,22</b>	<b>33,2%</b>	<b>1,33</b>	<b>1,17</b>	<b>29 287</b>	<b>1,25</b>	<b>42,1%</b>	<b>1,36</b>	<b>1,17</b>
Italy	20 102	1,18	30,9%	0,98	1,01	26 240	1,18	35,9%	1,07	1,02
France	23 051	0,87	31,5%	1,04	0,99	25 335	0,87	38,7%	1,06	1,01
Australia	12 332	1,07	26,7%	1,10	1,05	17 874	1,18	36,6%	1,19	1,08
Netherlands	11 992	1,16	36,2%	1,23	1,14	17 457	1,37	44,1%	1,31	1,19
Spain	11 552	0,95	25,4%	0,80	0,87	15 176	0,88	32,5%	0,93	0,92
China	3 956	0,27	34,5%	0,70	0,80	12 905	0,32	36,8%	0,77	0,89
Sweden	10 605	1,30	39,8%	1,22	1,07	11 537	1,27	48,2%	1,31	1,10
Switzerland	8 117	1,10	49,5%	1,34	1,15	10 523	1,14	60,2%	1,38	1,18
Brazil	4 572	0,82	28,3%	0,58	0,68	9 190	0,91	26,0%	0,65	0,76
Turkey	3 543	1,15	13,5%	0,45	0,61	9 156	1,16	12,2%	0,46	0,61
South Korea	3 303	0,47	26,1%	0,71	0,87	8 720	0,61	25,0%	0,71	0,86
Israel	5 864	1,13	32,2%	1,06	1,14	7 371	1,26	37,9%	1,08	1,09
Belgium	5 215	0,96	47,7%	1,14	1,01	7 286	1,02	55,6%	1,35	1,13
Austria	4 403	1,13	41,3%	1,11	0,95	5 290	1,09	52,6%	1,24	1,04
Finland	4 751	1,21	37,5%	1,26	1,13	5 221	1,14	45,4%	1,23	1,11
<b>World</b>	<b>419 215</b>	<b>1,00</b>	<b>-</b>	<b>1,11</b>	<b>1,07</b>	<b>509 873</b>	<b>1,00</b>	<b>-</b>	<b>1,08</b>	<b>1,05</b>

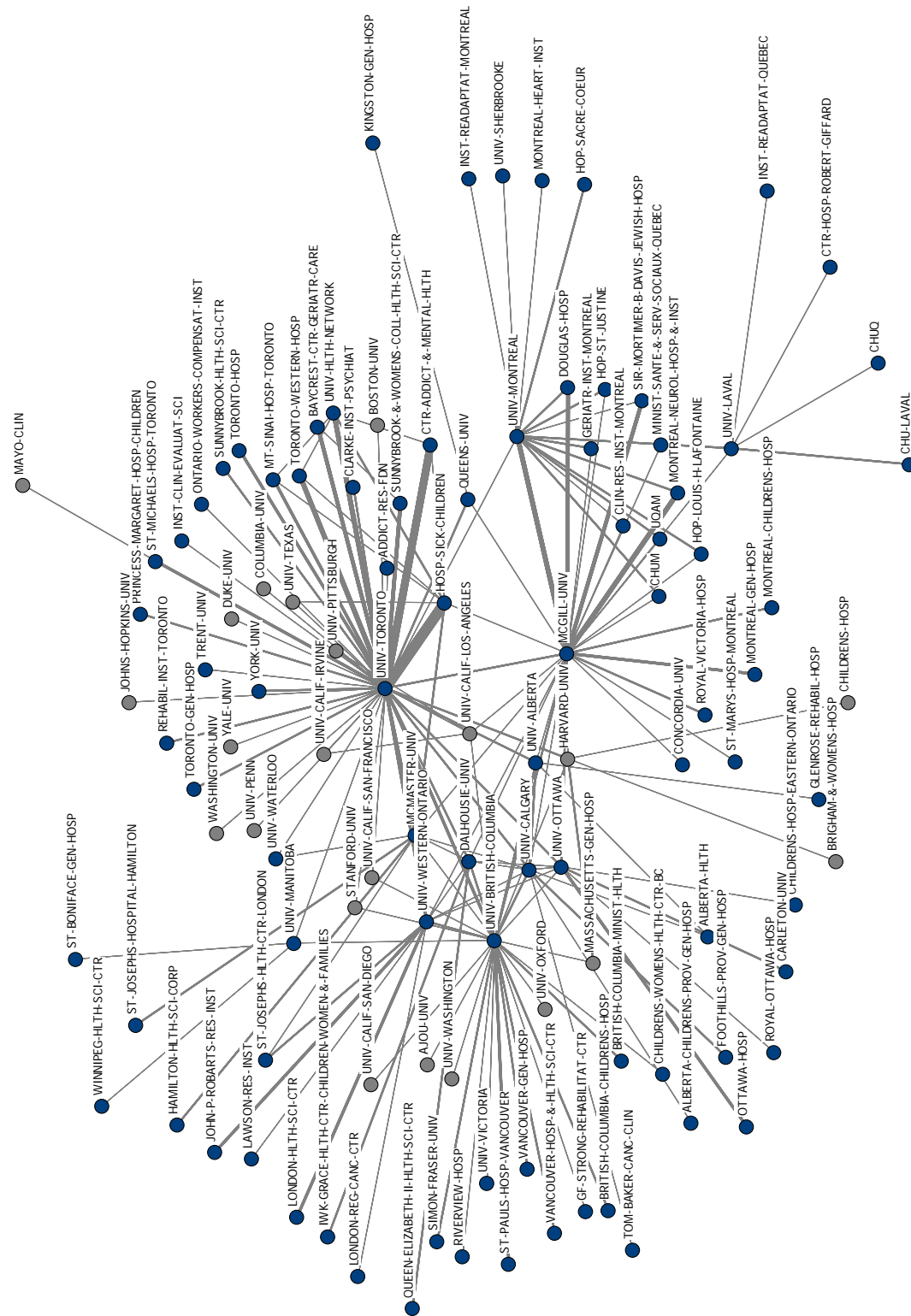
Source: Observatoire des sciences et des technologies, CBD (current as of July 2009), Web of Science and Medline databases.

Figure 6 Scatterplots of the average of relative citations and specialization index of top 20 most productive countries in the domain of Neuroscience, 1997-2002 and 2003-2008



Source: Observatoire des sciences et des technologies, CBD (current as of July 2009), Web of Science and Medline databases.

Figure 7 Network of collaboration of Canadian institutions in the domain of Neuroscience, 1997-2008 (50 joint publications or more)



Source: Observatoire des sciences et des technologies, CBD (current as of July 2009), Web of Science and Medline databases.

### 3.1 Neuroimaging

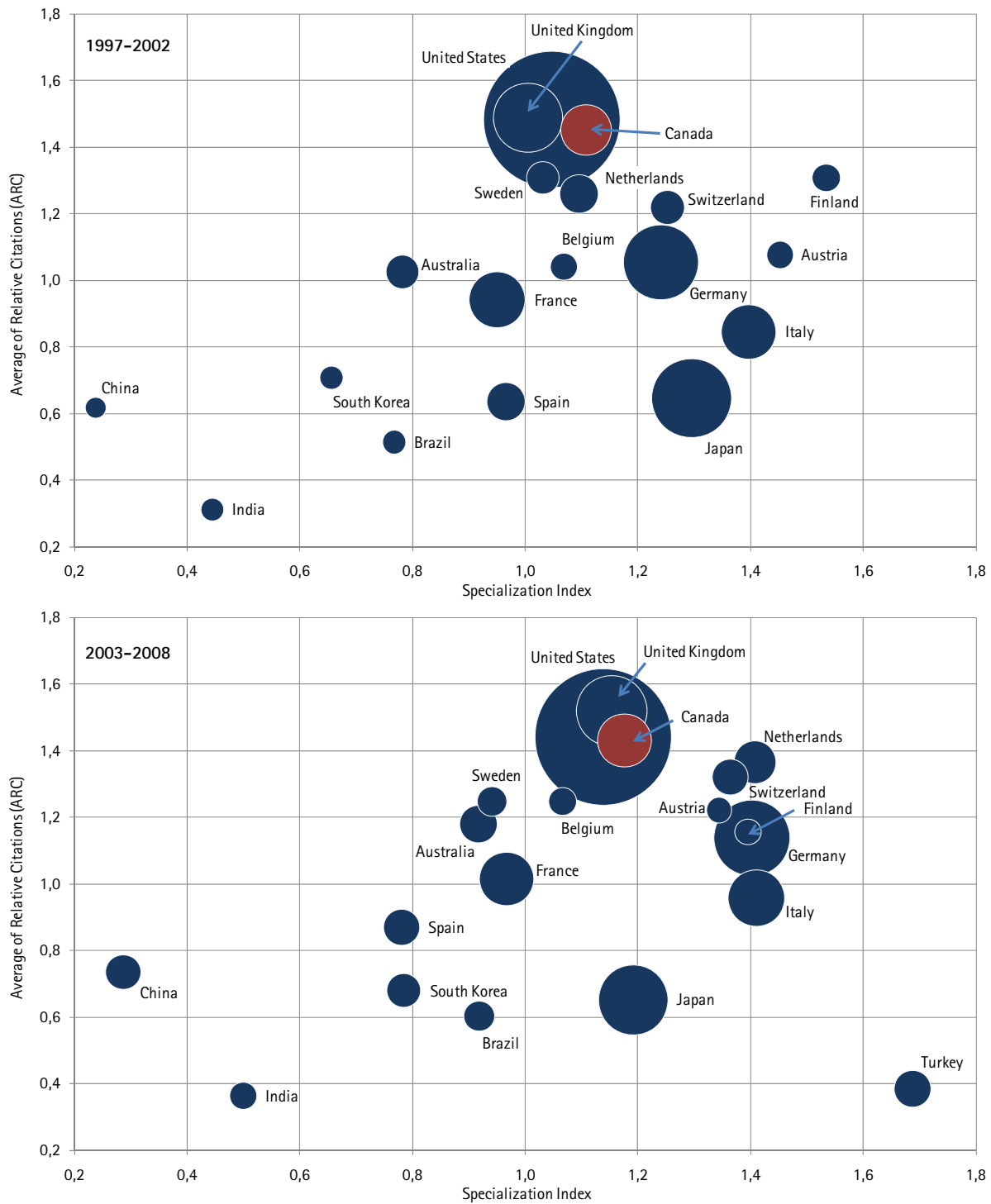
In terms of absolute number of papers, Canadian research in the field of Neuroimaging retained 7<sup>th</sup> place throughout the period (Table 5). However, its scientific impact remained well above the world average, and its specialization slightly increased from 1.11 to 1.18, between the two time periods. Among the 20 most productive countries, Canada ranks second—on a par with the United States—in terms of citations received (ARC) for the period 2003-2008, behind the United Kingdom. Other countries having relatively high impact and specialization – but lower ARC – between 2003 and 2008 are Germany, the Netherlands, Switzerland, Belgium, Austria and Finland (see also Figure 8). In terms of international collaboration, Canadian researchers are collaborating slightly more than their colleagues from countries of a similar size. The most central Canadian institutions are, in decreasing order of importance, University of Toronto, University of British Columbia, Montreal Neurological Institute and Hospital, McGill University and The Hospital for Sick Children (Figure 9).

**Table 5** Number of papers, specialization index, international collaboration and scientific impact of the 20 most active countries in the domain of Neuroimaging, 1997-2002 and 2003-2008

Country	1997-2002					2003-2008				
	Papers	SI	% Internat Collabo	ARC	ARIF	Papers	SI	% Internat Collabo	ARC	ARIF
United States	27 705	1,05	18,1%	1,48	1,27	36 753	1,14	25,4%	1,44	1,26
Germany	8 380	1,24	27,5%	1,06	0,99	11 427	1,40	37,6%	1,14	1,07
United Kingdom	7 121	1,00	28,0%	1,49	1,21	9 860	1,15	41,8%	1,52	1,25
Japan	9 292	1,30	11,6%	0,65	0,82	9 740	1,19	15,8%	0,65	0,85
Italy	4 443	1,40	26,3%	0,85	0,85	6 323	1,41	32,9%	0,96	0,96
France	4 676	0,95	24,6%	0,94	0,87	5 665	0,97	34,8%	1,01	0,96
<b>Canada</b>	<b>3 804</b>	<b>1,11</b>	<b>34,7%</b>	<b>1,45</b>	<b>1,22</b>	<b>5 557</b>	<b>1,18</b>	<b>44,5%</b>	<b>1,43</b>	<b>1,19</b>
Netherlands	2 114	1,09	35,3%	1,26	1,12	3 630	1,41	44,6%	1,37	1,24
Australia	1 686	0,78	28,2%	1,03	1,05	2 795	0,92	40,7%	1,18	1,07
Spain	2 179	0,97	19,7%	0,63	0,74	2 706	0,78	31,0%	0,87	0,89
Turkey	1 198	2,09	9,8%	0,39	0,59	2 685	1,69	10,1%	0,39	0,62
Switzerland	1 722	1,25	43,8%	1,22	1,09	2 534	1,36	57,1%	1,32	1,15
China	650	0,24	34,2%	0,62	0,80	2 357	0,29	36,2%	0,73	0,89
South Korea	864	0,66	17,1%	0,71	0,84	2 255	0,78	20,3%	0,68	0,85
Brazil	796	0,77	23,9%	0,52	0,59	1 879	0,92	26,5%	0,60	0,68
Sweden	1 570	1,03	41,0%	1,31	1,10	1 726	0,94	51,4%	1,25	1,10
Belgium	1 087	1,07	37,6%	1,04	0,99	1 531	1,07	49,7%	1,25	1,08
India	771	0,44	7,3%	0,31	0,52	1 457	0,50	12,8%	0,36	0,59
Austria	1 052	1,45	31,4%	1,08	0,87	1 318	1,34	50,1%	1,22	1,04
Finland	1 123	1,53	34,9%	1,31	1,23	1 285	1,40	45,9%	1,16	1,10
<b>World</b>	<b>78 207</b>	<b>1,00</b>	<b>-</b>	<b>1,05</b>	<b>1,01</b>	<b>102 947</b>	<b>1,00</b>	<b>-</b>	<b>1,04</b>	<b>1,03</b>

Source: *Observatoire des sciences et des technologies, CBD (current as of July 2009), Web of Science and Medline databases.*

**Figure 8** Scatterplots of the average of relative citations and specialization index of top 20 most productive countries in the domain of Neuroimaging, 1997-2002 and 2003-2008



Source: Observatoire des sciences et des technologies, CBD (current as of July 2009), Web of Science and Medline databases.



### 3.2 Neural Stem Cells

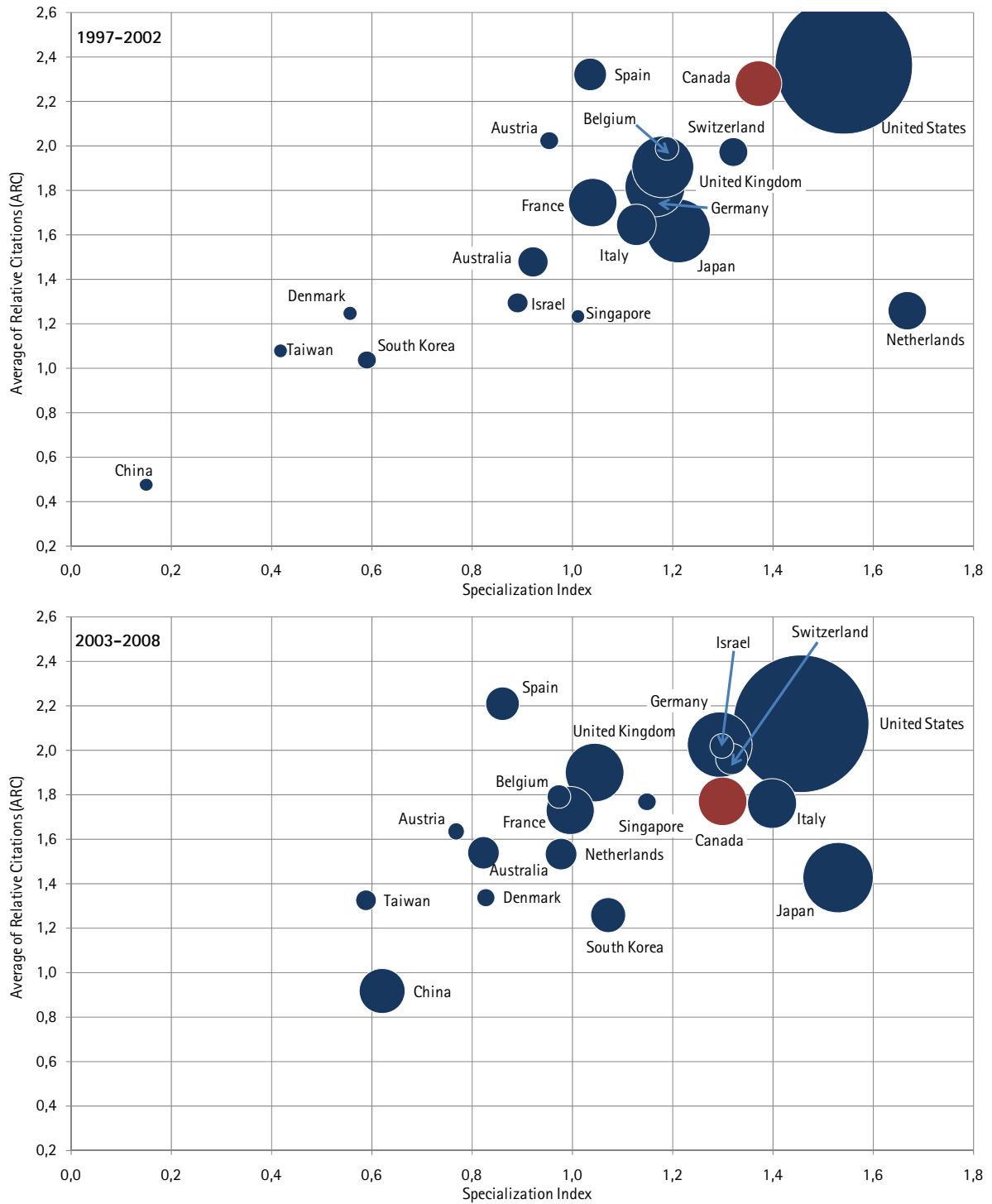
At the world level, the domain of Neural Stem Cells has increased by a factor of more than two between 1997-2002 and 2003-2008 (Table 6). Canada's publication rank (6<sup>th</sup>) remained unchanged during both time periods, although its specialization slightly decreased from 1.37 to 1.30. Its relative scientific impact (ARC) experienced a significant drop, from 2.28 to 1.77, however the world average has also decreased significantly from 1.94 to 1.70. As a consequence, Canadian researchers' scientific impact in Neural Stem Cells is now only slightly above the world average for the 2003-2008 period. During the same period, other countries with relatively high impact and specialization in this domain are the United States, Germany, United Kingdom, Italy, France, Israel and Switzerland (Figure 10). The table also shows that international collaboration activities of Canadian researchers are similar to those of comparable countries. The network of inter-institutional collaboration presented in Figure 11 shows that the most central Canadian institutions are University of Toronto, University of British Columbia, The Hospital for Sick Children and McGill University.

**Table 6** Number of papers, specialization index, international collaboration and scientific impact of the 20 most active countries in the domain of Neural Stem Cells, 1997-2002 and 2003-2008

Country	1997-2002					2003-2008				
	Papers	% Internat		ARC	ARIF	Papers	% Internat		ARC	ARIF
United States	1 888	1,54	27,4%	2,36	1,72	3 434	1,46	30,9%	2,12	1,53
Japan	402	1,21	30,1%	1,62	1,26	913	1,53	28,7%	1,43	1,18
Germany	364	1,16	55,2%	1,82	1,53	770	1,29	51,8%	2,03	1,48
United Kingdom	387	1,18	39,3%	1,90	1,61	652	1,04	47,4%	1,90	1,54
Italy	166	1,13	47,6%	1,65	1,28	458	1,40	40,4%	1,76	1,38
<b>Canada</b>	<b>218</b>	<b>1,37</b>	<b>50,5%</b>	<b>2,28</b>	<b>1,50</b>	<b>448</b>	<b>1,30</b>	<b>49,6%</b>	<b>1,77</b>	<b>1,44</b>
France	237	1,04	48,5%	1,74	1,65	426	1,00	56,1%	1,73	1,47
China	19	0,15	47,4%	0,47	0,90	373	0,62	37,8%	0,92	0,88
Sweden	133	1,89	58,6%	3,10	2,00	291	2,17	51,5%	1,62	1,40
South Korea	36	0,59	41,7%	1,03	1,14	225	1,07	39,6%	1,26	1,00
Spain	108	1,03	61,1%	2,32	1,48	218	0,86	52,8%	2,21	1,44
Netherlands	149	1,67	69,8%	1,26	1,29	184	0,98	65,8%	1,53	1,61
Australia	92	0,92	39,1%	1,48	1,39	183	0,82	49,2%	1,54	1,33
Switzerland	84	1,32	64,3%	1,97	1,65	179	1,32	67,6%	1,96	1,48
Israel	40	0,89	65,0%	1,29	1,67	112	1,30	51,8%	2,02	1,47
Belgium	56	1,19	67,9%	1,99	1,63	102	0,97	67,6%	1,79	1,40
Taiwan	19	0,42	36,8%	1,07	1,26	78	0,59	25,6%	1,32	1,16
Denmark	20	0,56	90,0%	1,25	1,11	60	0,83	73,3%	1,34	1,26
Singapore	16	1,01	43,8%	1,23	1,68	57	1,15	52,6%	1,77	1,33
Austria	32	0,95	65,6%	2,03	1,83	55	0,77	67,3%	1,63	1,58
<b>World</b>	<b>3 618</b>	<b>1,00</b>	<b>-</b>	<b>1,94</b>	<b>1,52</b>	<b>7 517</b>	<b>1,00</b>	<b>-</b>	<b>1,70</b>	<b>1,34</b>

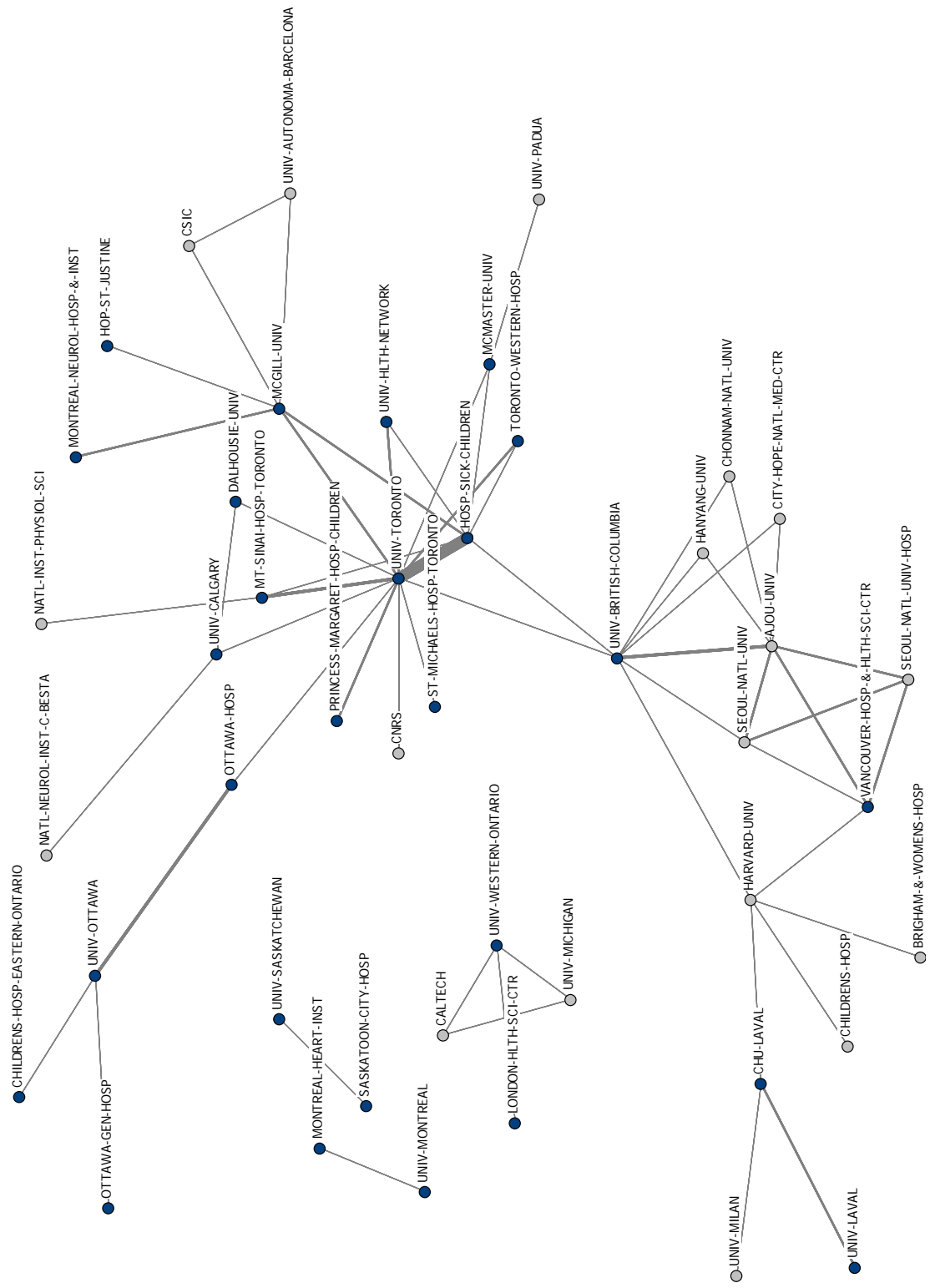
Source: Observatoire des sciences et des technologies, CBD (current as of July 2009), Web of Science and Medline databases.

Figure 10 Scatterplots of the average of relative citations and specialization index of top 20 most productive countries in the domain of Neural Stem Cells, 1997-2002 and 2003-2008



Source: Observatoire des sciences et des technologies, CBD (current as of July 2009), Web of Science and Medline databases.

Figure 11 Network of collaboration of Canadian institutions in the domain of Neural Stem Cells, 1997-2008 (3 joint publications or more)



Source: Observatoire des sciences et des technologies, CBD (current as of July 2009), Web of Science and Medline databases.

## 4 MENTAL HEALTH

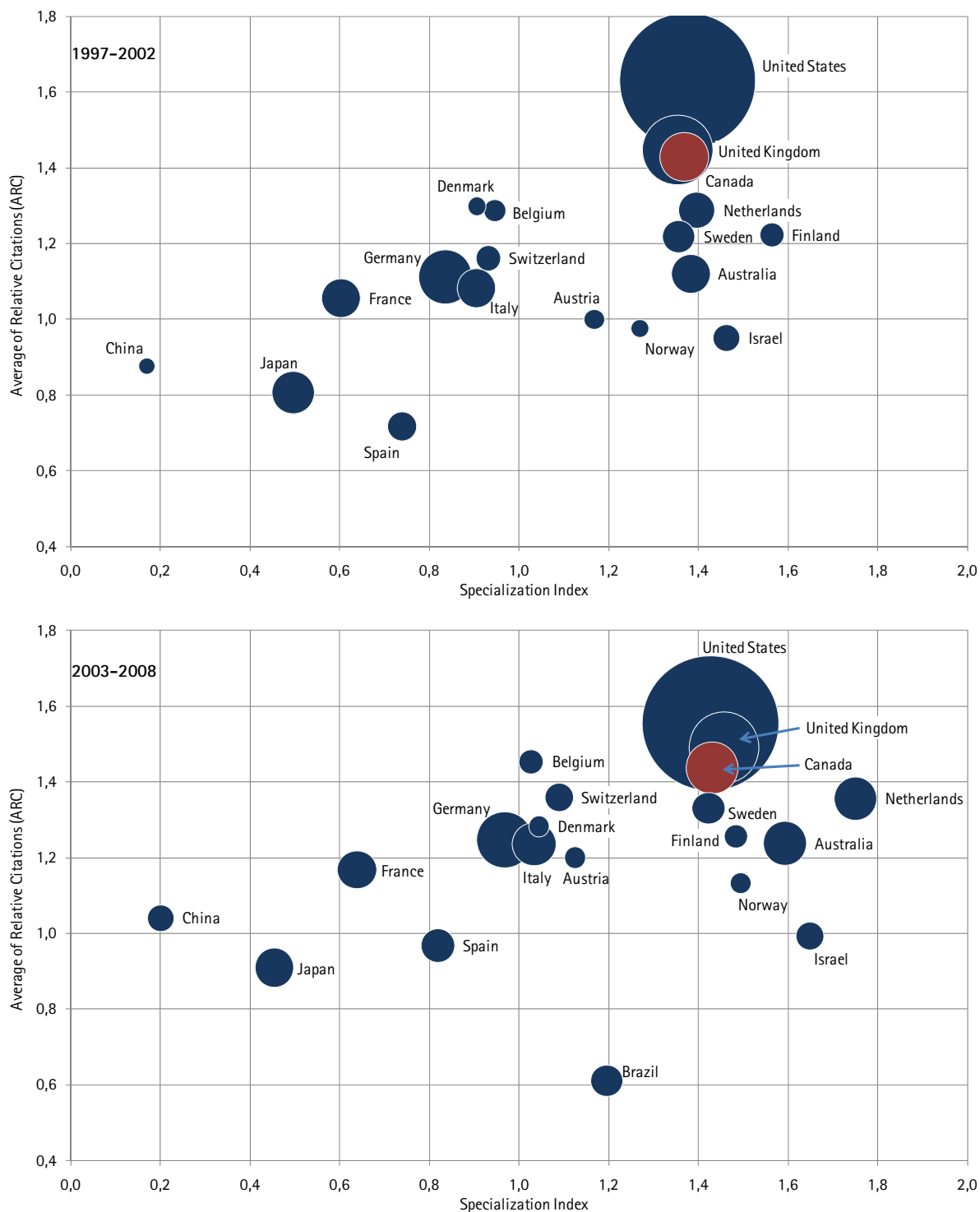
Mental Health is a domain where Canada is very active. For both time periods, it ranks fourth in terms of number of papers published, below the United States, the United Kingdom and Germany, but above countries with a larger population such as Italy, France and Japan (Table 7). Its specialization index in the domain also increased from 1.37 in 1997-2002 to 1.43 in 2003-2008. In terms of scientific impact, ARC and ARIF scores remained well above the world average during both time periods, with Canada ranking third – on par with Belgium – in ARC for 2003-2008, behind the United States and United Kingdom. In 2003-2008, other countries specialized in Mental Health with a scientific impact above average are the United States, the United Kingdom, Australia, the Netherlands, Switzerland, Belgium, Finland and Denmark (see also Figure 12). International collaborative ties of Canadian researchers are above those of countries with similar research output. Finally, the most central Canadian institutions in the network of collaboration (Figure 13) are University of Toronto, University of British Columbia, McGill University, Center for Addiction and Mental Health and McMaster University (in decreasing order).

**Table 7** Number of papers, specialization index, international collaboration and scientific impact of the 20 most active countries in the domain of Mental Health, 1997-2002 and 2003-2008

Country	1997-2002					2003-2008				
	Papers	SI	Collabo	ARC	ARIF	Papers	SI	Collabo	ARC	ARIF
United States	40 971	1,37	14,1%	1,63	1,32	55 845	1,43	21,2%	1,56	1,27
United Kingdom	10 807	1,35	24,7%	1,45	1,18	15 082	1,46	38,8%	1,49	1,21
Germany	6 348	0,83	26,2%	1,11	0,89	9 549	0,97	36,3%	1,25	0,97
<b>Canada</b>	<b>5 294</b>	<b>1,37</b>	<b>30,5%</b>	<b>1,43</b>	<b>1,16</b>	<b>8 181</b>	<b>1,43</b>	<b>42,1%</b>	<b>1,44</b>	<b>1,17</b>
Australia	3 359	1,38	24,1%	1,12	1,00	5 881	1,59	33,8%	1,24	1,11
Italy	3 241	0,90	32,8%	1,08	1,03	5 620	1,03	39,6%	1,23	1,05
Netherlands	3 033	1,40	32,4%	1,29	1,17	5 469	1,75	40,8%	1,36	1,19
France	3 333	0,60	28,9%	1,06	0,82	4 532	0,64	37,5%	1,17	0,90
Japan	4 003	0,50	19,5%	0,81	0,82	4 495	0,45	24,0%	0,91	0,93
Spain	1 877	0,74	22,9%	0,72	0,76	3 436	0,82	33,3%	0,97	0,87
Sweden	2 325	1,36	33,8%	1,22	1,03	3 162	1,42	44,2%	1,33	1,07
Brazil	1 480	1,26	17,4%	0,33	0,35	2 966	1,20	24,5%	0,61	0,57
Switzerland	1 441	0,93	45,2%	1,16	0,94	2 450	1,09	61,2%	1,36	1,12
Israel	1 596	1,46	24,2%	0,95	1,03	2 359	1,65	33,2%	0,99	1,03
China	527	0,17	44,4%	0,88	0,92	2 005	0,20	43,2%	1,04	1,02
Belgium	1 084	0,95	54,3%	1,29	0,97	1 786	1,03	60,8%	1,45	1,12
Finland	1 288	1,56	31,4%	1,22	1,10	1 654	1,48	41,6%	1,26	1,10
Austria	952	1,17	36,8%	1,00	0,82	1 337	1,13	49,2%	1,20	0,97
Norway	709	1,27	33,3%	0,98	0,90	1 316	1,49	43,4%	1,13	1,02
Denmark	792	0,91	36,5%	1,30	1,05	1 257	1,04	48,7%	1,28	1,16
<b>World</b>	<b>88 058</b>	<b>1,00</b>	<b>-</b>	<b>1,25</b>	<b>1,09</b>	<b>124 675</b>	<b>1,00</b>	<b>-</b>	<b>1,21</b>	<b>1,08</b>

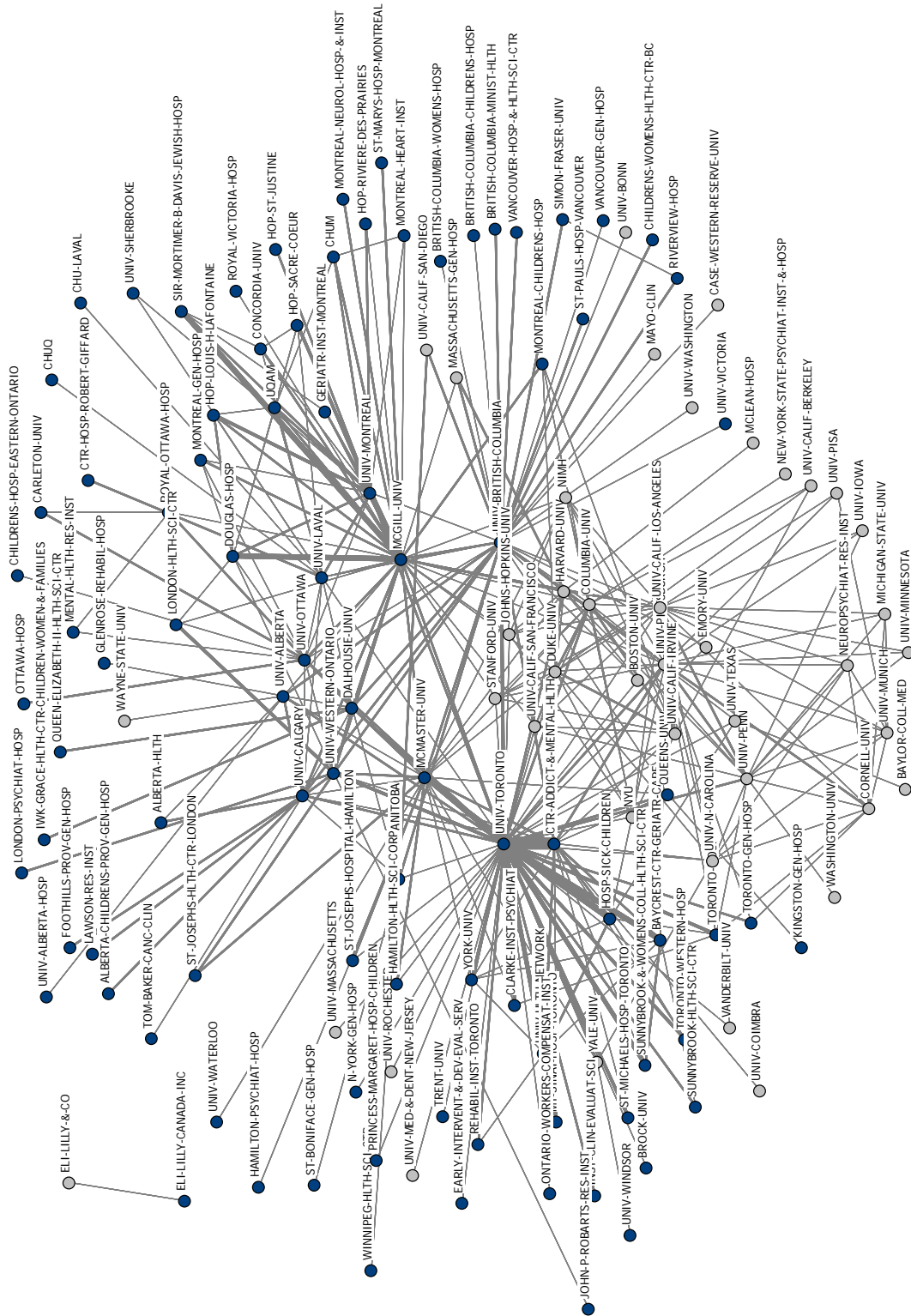
Source: *Observatoire des sciences et des technologies, CBD (current as of July 2009), Web of Science and Medline databases.*

Figure 12 Scatterplots of the average of relative citations and specialization index of top 20 most productive countries in the domain of Mental Health, 1997-2002 and 2003-2008



Source: Observatoire des sciences et des technologies, CBD (current as of July 2009), Web of Science and Medline databases.

Figure 13 Network of collaboration of Canadian institutions in the domain of Mental Health, 1997-2008 (15 joint publications or more)



Source: Observatoire des sciences et des technologies, CBD (current as of July 2009), Web of Science and Medline databases.

## 5 ADDICTION

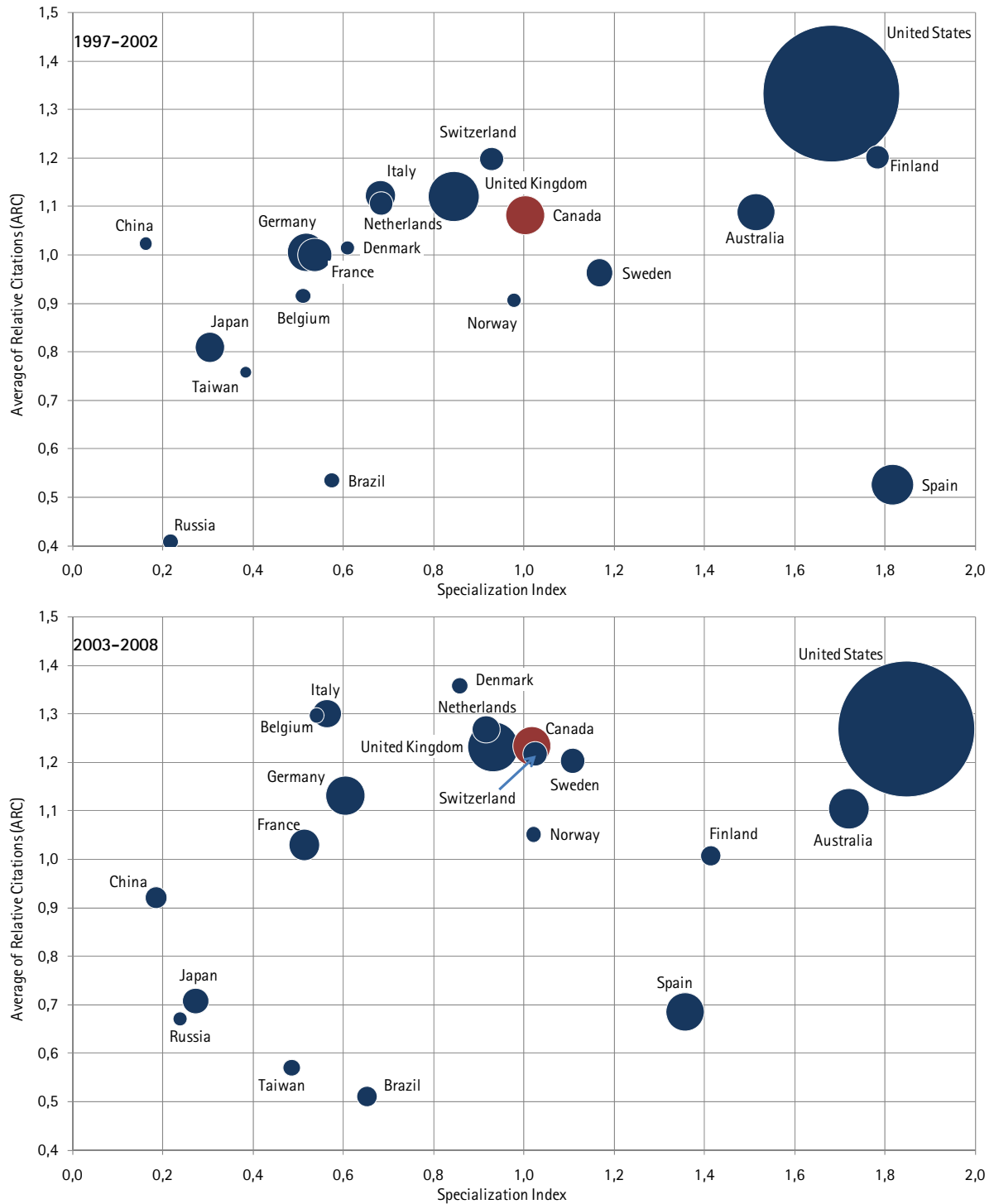
Table 8 shows that, for both time periods, Canada ranked fifth worldwide in terms of number of publications. Canada's specialization in Addiction research remained stable throughout the period, at around the world average. However, its scientific impact increased significantly, both in terms of journal impact (ARIF) and of citations received (ARC). More specifically, Canada went from being on a par with the world average to being among the top five countries with the highest scientific impact in 2003-2008. In 2003-2008, countries specialized in Addiction and having a scientific impact above average are the United States, Australia, Sweden and Switzerland (Figure 14). For both time periods, Canadian researchers are collaborating more intensively with foreign partners than their colleagues of other countries of a smaller size. The most central Canadian institutions in the network of inter-institutional collaboration (Figure 15) are, in decreasing order, the University of Toronto, the Center for Addiction and Mental Health, the University of British Columbia, McGill University and the Université de Montréal.

**Table 8** Number of papers, specialization index, international collaboration and scientific impact of the 20 most active countries in the domain of Addiction, 1997-2002 and 2003-2008

Country	1997-2002					2003-2008				
	Papers	% Internat			ARIF	Papers	% Internat			ARIF
		SI	Collabo	ARC			SI	Collabo	ARC	
United States	14 867	1,68	9,1%	1,33	1,22	19 690	1,85	13,8%	1,27	1,18
United Kingdom	2 001	0,84	20,3%	1,12	1,02	2 629	0,93	32,3%	1,23	1,10
Australia	1 092	1,51	17,4%	1,09	1,01	1 731	1,72	29,8%	1,10	1,07
Germany	1 167	0,52	23,1%	1,00	0,87	1 627	0,60	32,3%	1,13	0,95
<b>Canada</b>	<b>1 152</b>	<b>1,00</b>	<b>29,1%</b>	<b>1,08</b>	<b>1,08</b>	<b>1 585</b>	<b>1,02</b>	<b>37,2%</b>	<b>1,23</b>	<b>1,11</b>
Spain	1 370	1,82	12,7%	0,52	0,53	1 555	1,36	19,9%	0,69	0,65
France	882	0,54	23,7%	1,00	0,89	992	0,51	28,4%	1,03	0,92
Italy	724	0,68	26,0%	1,12	1,00	834	0,56	38,5%	1,30	1,07
Netherlands	440	0,68	27,5%	1,11	1,15	780	0,92	33,8%	1,27	1,15
Japan	727	0,30	19,4%	0,81	1,04	734	0,27	21,8%	0,71	0,94
Sweden	594	1,17	37,2%	0,96	1,12	671	1,11	44,6%	1,20	1,08
Switzerland	427	0,93	43,8%	1,20	1,09	629	1,02	55,6%	1,22	1,12
China	148	0,16	45,9%	1,02	0,88	500	0,18	48,8%	0,92	1,04
Brazil	199	0,57	30,2%	0,53	0,72	441	0,65	33,3%	0,51	0,84
Finland	436	1,78	43,1%	1,20	1,27	430	1,41	44,0%	1,01	1,05
Taiwan	126	0,38	24,6%	0,76	0,92	291	0,48	26,1%	0,57	0,90
Denmark	158	0,61	32,9%	1,01	1,20	281	0,86	42,0%	1,36	1,26
Belgium	174	0,51	43,7%	0,92	0,98	256	0,54	51,2%	1,30	1,10
Norway	162	0,98	42,0%	0,91	1,06	245	1,02	36,3%	1,05	1,05
Russia	196	0,22	30,6%	0,41	0,44	208	0,24	57,7%	0,67	0,72
<b>World</b>	<b>26 136</b>	<b>1,00</b>	<b>-</b>	<b>1,11</b>	<b>1,07</b>	<b>33 983</b>	<b>1,00</b>	<b>-</b>	<b>1,09</b>	<b>1,06</b>

Source: Observatoire des sciences et des technologies, CBD (current as of July 2009), Web of Science and Medline databases.

Figure 14 Scatterplots of the average of relative citations and specialization index of top 20 most productive countries in the domain of Addiction, 1997-2002 and 2003-2008



Source: Observatoire des sciences et des technologies, CBD (current as of July 2009), Web of Science and Medline databases.



## 6 SENSES AND COMMUNICATION DISORDERS

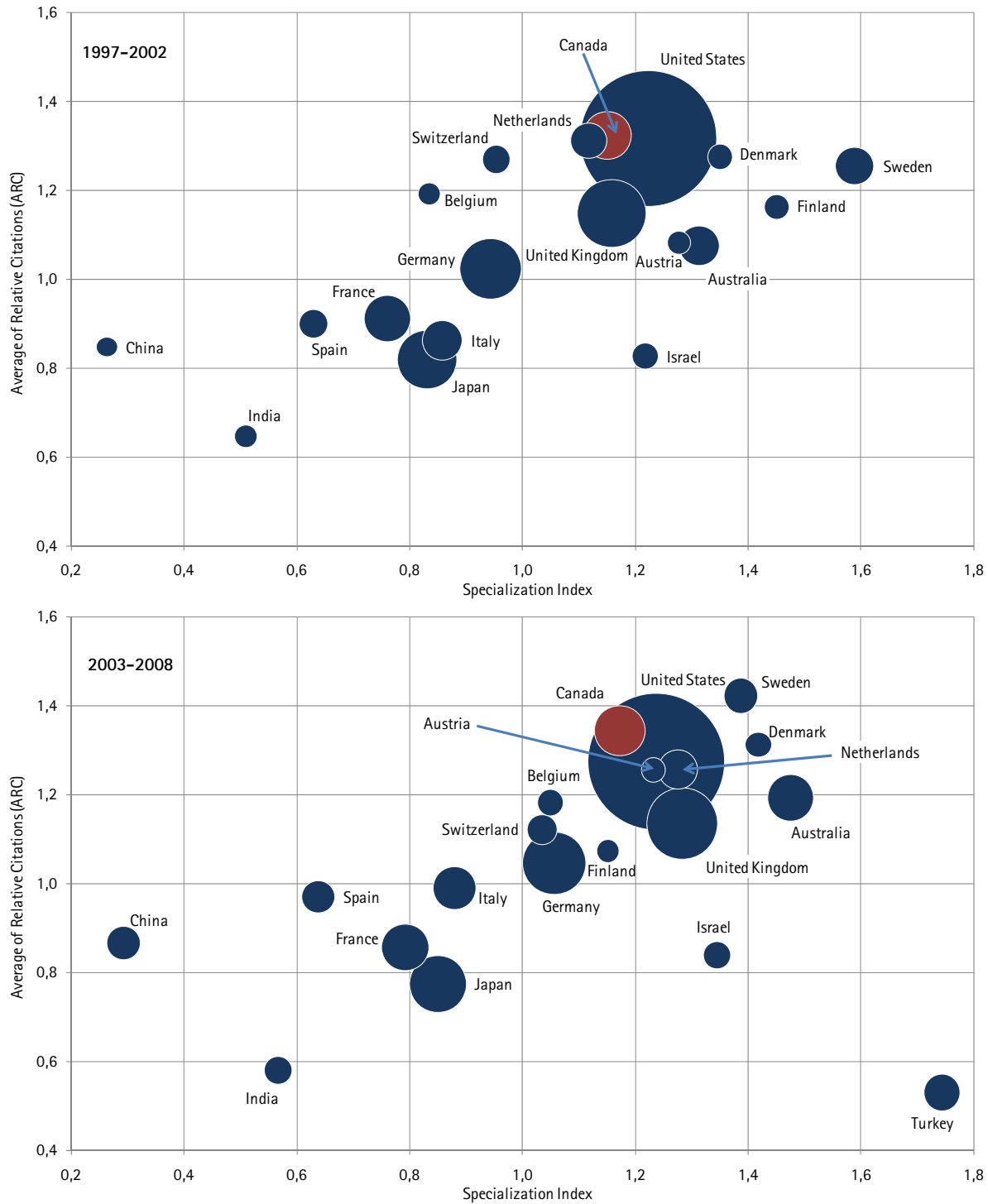
With an increase of 36% between 1997-2002 and 2003-2008, Canada's research output in Senses and Communication Disorders research maintained its fifth position among most productive countries (Table 9). Along the same lines, Canada remained specialized in this domain as its index increased slightly (from 1.15 to 1.17). For both time periods, Canada's scientific impact is well above world average and the country's ARC ranks second among countries presented in Table 9. In 2003-2008, other countries with high specialization and scientific impact in Senses and Communication Disorders research are the United States, United Kingdom, Australia, Netherlands, Sweden, Switzerland, Belgium, Denmark, Austria and Finland (see also Figure 16). International collaboration rates of Canadian papers are only slightly above that of countries of the same size. Given the high number of papers, the network of inter-institutional collaboration is relatively dense (Figure 17) and a high threshold had to be used (15 papers or more). The network shows that the most central Canadian institutions in the domain are University of Toronto, University of British Columbia, McGill University, University of Alberta and Université de Montréal.

**Table 9** Number of papers, specialization index, international collaboration and scientific impact of the 20 most active countries in the domain of the Senses and Communication Disorders, 1997-2002 and 2003-2008

Country	1997-2002					2003-2008				
	Papers	% Internat		ARC	ARIF	Papers	% Internat		ARC	ARIF
United States	33 977	1,22	15,5%	1,32	1,18	40 842	1,24	20,8%	1,27	1,14
United Kingdom	8 615	1,16	22,8%	1,15	1,05	11 211	1,28	33,3%	1,14	1,06
Germany	6 700	0,94	24,8%	1,02	0,94	8 797	1,06	33,8%	1,05	0,92
Japan	6 258	0,83	13,8%	0,82	0,99	7 094	0,85	16,9%	0,77	0,97
<b>Canada</b>	<b>4 150</b>	<b>1,15</b>	<b>30,6%</b>	<b>1,32</b>	<b>1,08</b>	<b>5 656</b>	<b>1,17</b>	<b>38,2%</b>	<b>1,34</b>	<b>1,07</b>
France	3 927	0,76	20,9%	0,91	0,83	4 743	0,79	28,1%	0,86	0,85
Australia	2 974	1,31	22,8%	1,07	0,98	4 598	1,48	35,6%	1,19	1,04
Italy	2 865	0,86	22,5%	0,86	0,94	4 031	0,88	29,9%	0,99	0,99
Netherlands	2 266	1,12	29,4%	1,31	1,10	3 362	1,27	35,9%	1,26	1,13
Turkey	1 206	2,00	6,1%	0,46	0,65	2 836	1,74	6,3%	0,53	0,66
Sweden	2 544	1,59	25,8%	1,25	0,99	2 602	1,39	38,9%	1,42	1,03
China	760	0,26	39,1%	0,85	0,97	2 455	0,29	38,2%	0,87	0,98
Spain	1 490	0,63	20,8%	0,90	0,90	2 265	0,64	31,3%	0,97	0,93
Switzerland	1 376	0,95	40,0%	1,27	1,07	1 965	1,03	54,0%	1,12	1,08
India	928	0,51	18,9%	0,65	0,83	1 689	0,57	18,5%	0,58	0,84
Israel	1 239	1,22	23,8%	0,83	1,04	1 624	1,34	27,8%	0,84	1,02
Belgium	892	0,83	41,0%	1,19	1,03	1 540	1,05	46,2%	1,18	1,06
Denmark	1 102	1,35	26,8%	1,28	0,96	1 441	1,42	41,6%	1,31	1,10
Austria	972	1,28	29,7%	1,08	1,04	1 235	1,23	41,6%	1,26	1,04
Finland	1 115	1,45	25,0%	1,16	1,01	1 083	1,15	32,5%	1,07	1,08
<b>World</b>	<b>82 155</b>	<b>1,00</b>	<b>-</b>	<b>1,04</b>	<b>1,02</b>	<b>105 218</b>	<b>1,00</b>	<b>-</b>	<b>1,00</b>	<b>1,00</b>

Source: *Observatoire des sciences et des technologies, CBD (current as of July 2009), Web of Science and Medline databases.*

**Figure 16** Scatterplots of the average of relative citations and specialization index of top 20 most productive countries in the domain of Senses and Communication Disorders, 1997-2002 and 2003-2008



Source: Observatoire des sciences et des technologies, CBD (current as of July 2009), Web of Science and Medline databases.



## 6.1 Pain

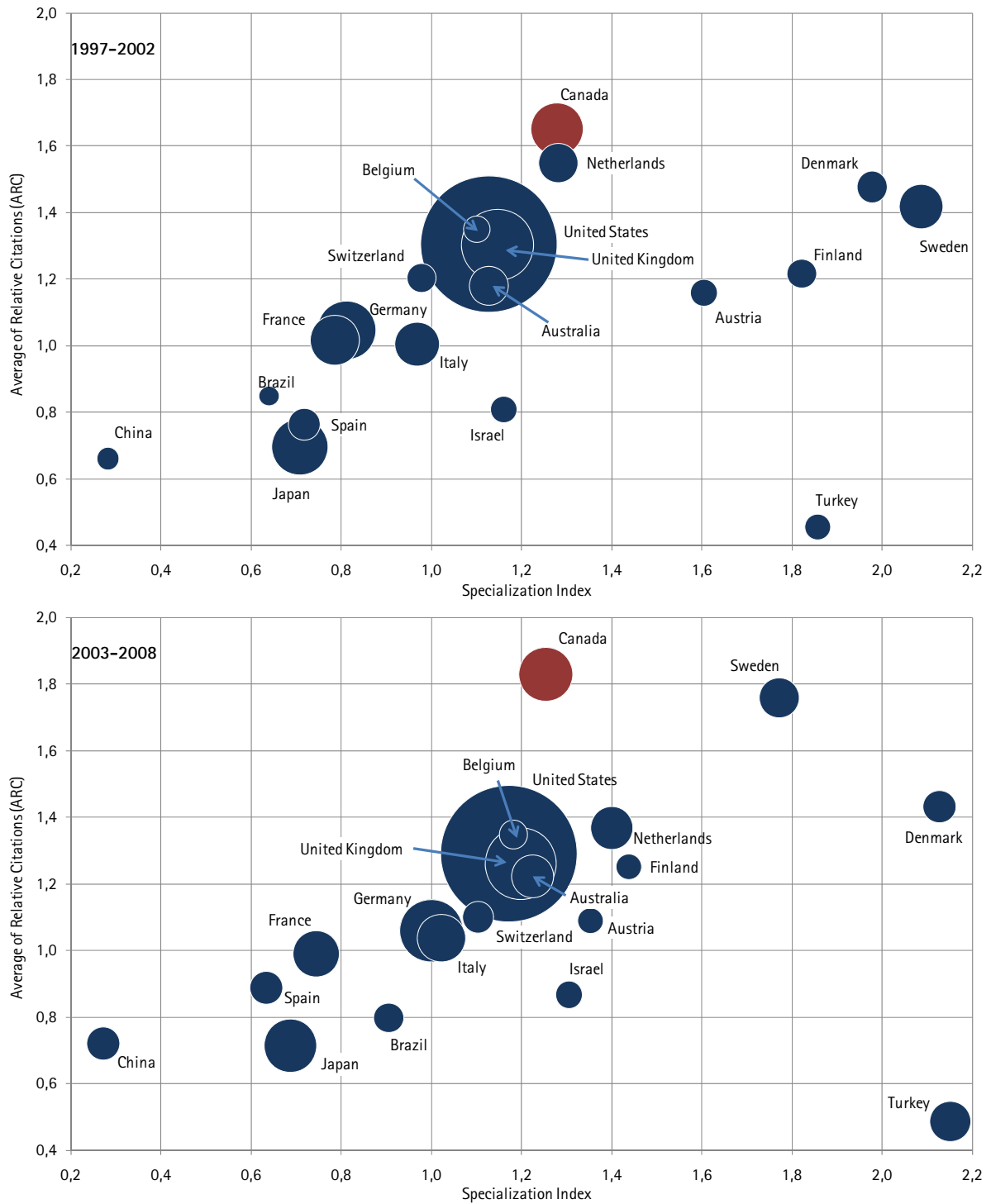
Between 1997-2002 and 2003-2008, Canada increased its rank among the most productive countries in Pain research from the fifth to the fourth rank, as its output surpassed that of Japan (Table 10). Canada also remained specialized in the domain, despite a very slight decrease of its index from 1.28 to 1.25 between 1997-2002 and 2003-2008. Significantly, the scientific impact of Canadian researchers leads the world both in terms of citations received (ARC) and journal impact (ARIF), and is the highest among top 20 countries for both time periods (i.e. ranked first). In 2003-2008, specialized countries having relatively high scientific impact in the domain are the United States, the United Kingdom, Australia, the Netherlands, Sweden, Denmark, Switzerland, Belgium and Finland (Figure 18). For both time periods, the international collaboration rate of Canadian researchers is above that of countries of the same size. The network of inter-institutional collaboration (Figure 19) shows that the most central Canadian institutions are University of Toronto, University of British Columbia, McGill University, University of Alberta and McMaster University.

**Table 10** Number of papers, specialization index, international collaboration and scientific impact of the 20 most active countries in the domain of Pain, 1997-2002 and 2003-2008

Country	1997-2002					2003-2008				
	Papers	% Internat		ARC	ARIF	Papers	% Internat		ARC	ARIF
United States	13 330	1,13	13,8%	1,31	1,13	17 049	1,17	18,6%	1,29	1,09
United Kingdom	3 637	1,15	19,7%	1,30	1,04	4 614	1,20	30,4%	1,26	1,08
Germany	2 450	0,81	23,0%	1,05	0,86	3 674	1,00	31,1%	1,06	0,91
<b>Canada</b>	<b>1 964</b>	<b>1,28</b>	<b>27,8%</b>	<b>1,65</b>	<b>1,17</b>	<b>2 666</b>	<b>1,25</b>	<b>37,8%</b>	<b>1,83</b>	<b>1,15</b>
Japan	2 268	0,71	9,7%	0,70	0,94	2 527	0,69	15,0%	0,72	0,91
Italy	1 378	0,97	22,3%	1,01	0,96	2 068	1,02	26,9%	1,04	0,98
France	1 726	0,78	15,8%	1,02	0,80	1 964	0,74	25,4%	0,99	0,88
Australia	1 087	1,13	22,4%	1,18	0,95	1 682	1,22	34,9%	1,22	1,02
Netherlands	1 106	1,28	27,1%	1,55	1,10	1 628	1,40	36,2%	1,37	1,18
Turkey	476	1,86	5,7%	0,45	0,65	1 543	2,15	4,3%	0,48	0,64
Sweden	1 421	2,09	23,2%	1,42	1,01	1 465	1,77	36,7%	1,76	1,05
China	346	0,28	28,0%	0,66	0,81	1 003	0,27	28,9%	0,72	0,89
Spain	724	0,72	17,0%	0,77	0,78	990	0,63	29,1%	0,89	0,84
Denmark	687	1,98	28,8%	1,48	1,03	953	2,13	42,9%	1,43	1,09
Switzerland	601	0,98	35,8%	1,20	1,01	924	1,10	52,1%	1,10	1,05
Brazil	297	0,64	21,5%	0,85	0,72	835	0,90	24,3%	0,80	0,84
Belgium	501	1,10	38,9%	1,35	1,01	765	1,18	50,1%	1,35	1,06
Israel	503	1,16	20,5%	0,81	0,96	695	1,30	25,8%	0,87	0,95
Austria	520	1,60	36,2%	1,16	1,06	598	1,35	44,6%	1,09	0,99
Finland	596	1,82	21,0%	1,22	1,04	597	1,44	32,0%	1,25	1,13
<b>World</b>	<b>34 974</b>	<b>1,00</b>	<b>-</b>	<b>1,06</b>	<b>0,97</b>	<b>46 410</b>	<b>1,00</b>	<b>-</b>	<b>1,00</b>	<b>0,96</b>

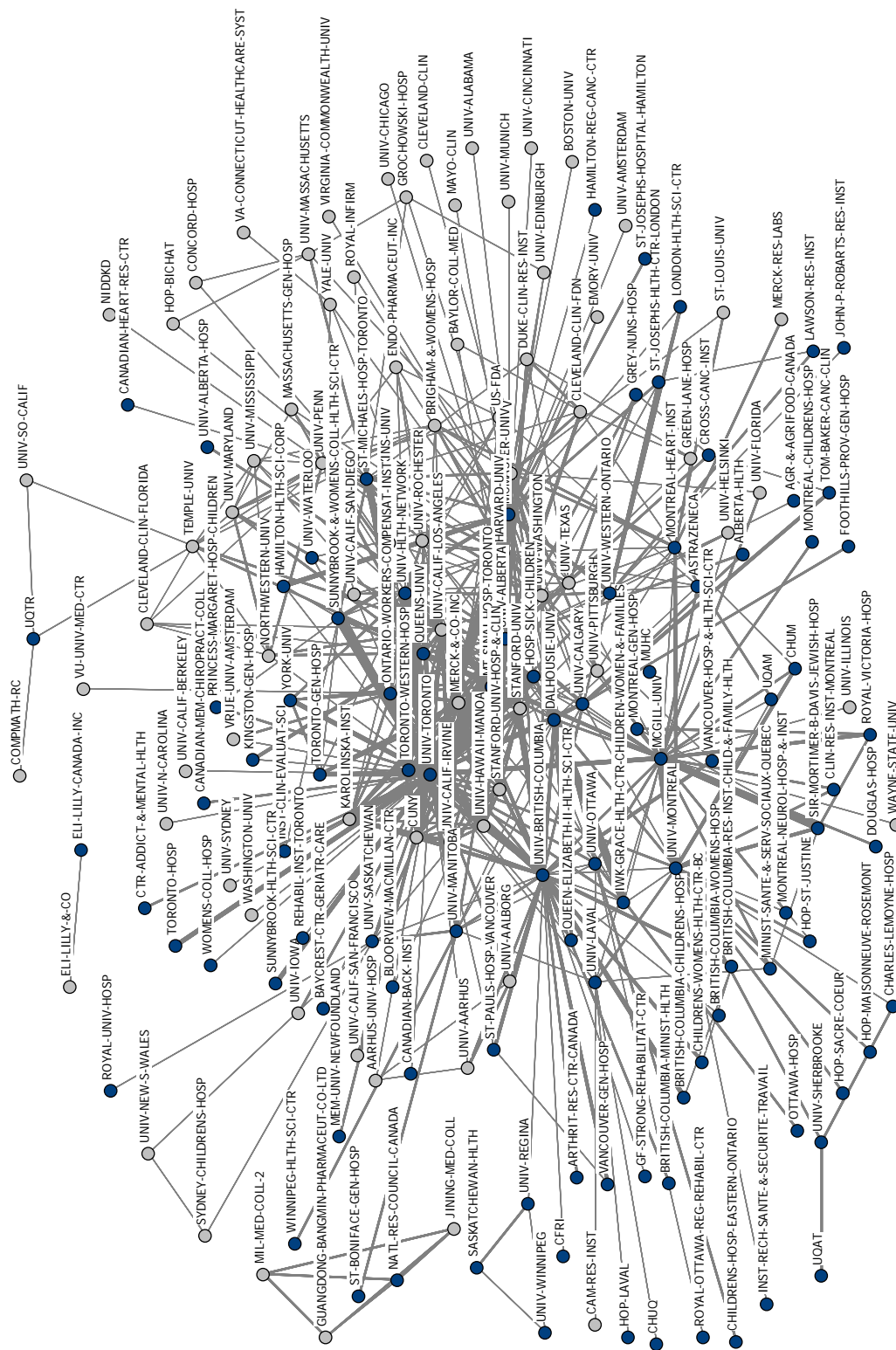
Source: Observatoire des sciences et des technologies, CBD (current as of July 2009), Web of Science and Medline databases.

Figure 18 Scatterplots of the average of relative citations and specialization index of top 20 most productive countries in the domain of Pain, 1997-2002 and 2003-2008



Source: Observatoire des sciences et des technologies, CBD (current as of July 2009), Web of Science and Medline databases.

Figure 19 Network of collaboration of Canadian institutions in the domain of Pain, 1997-2008 (5 joint publications or more)



Source: Observatoire des sciences et des technologies, CBD (current as of July 2009), Web of Science and Medline databases.

## 7 CROSS-CIHR STRATEGIC INITIATIVES

### 7.1 Regenerative Medicine

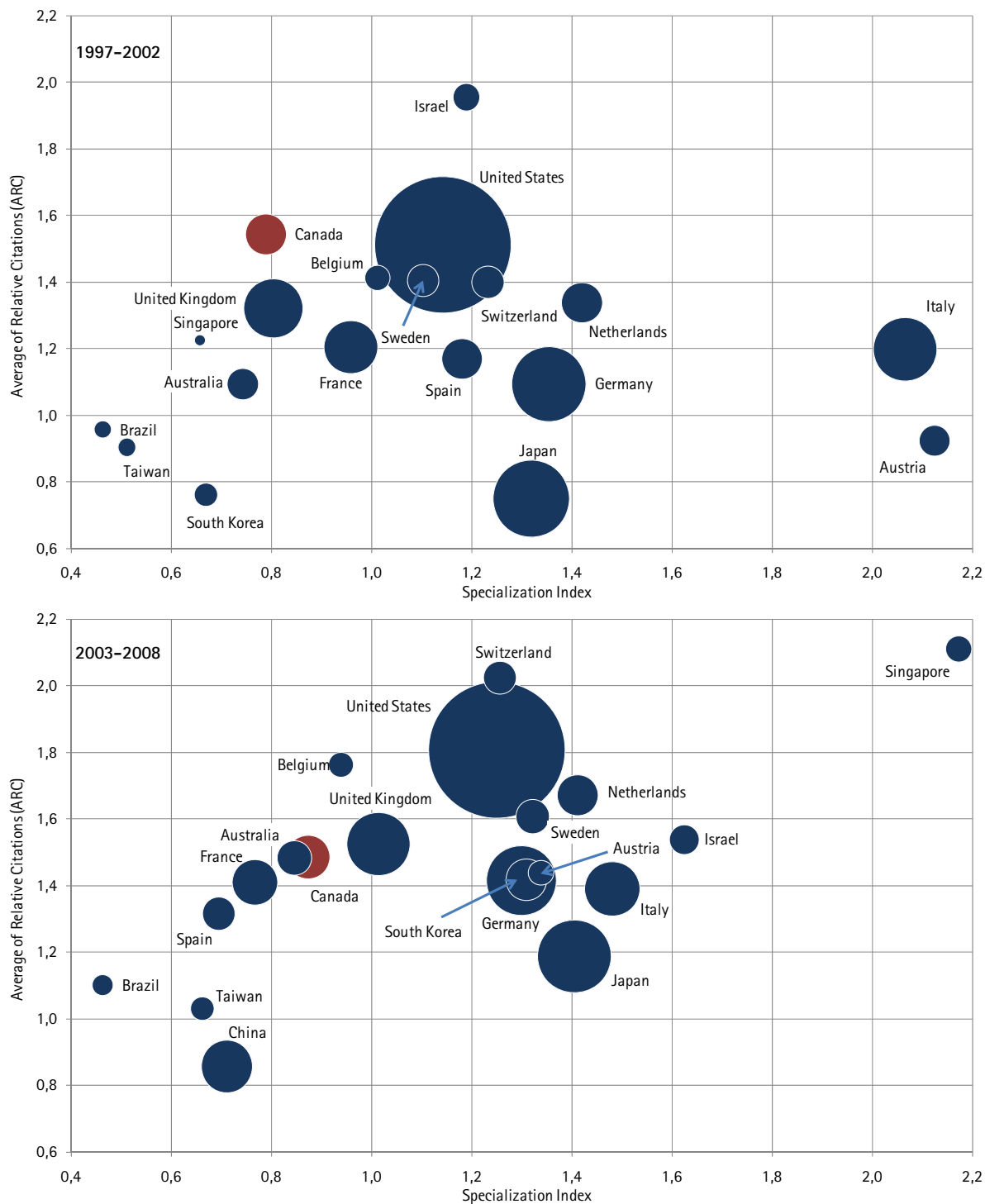
Despite the fact that Canada's research output in Regenerative Medicine increased almost threefold between 1997-2002 and 2003-2008, its rank remained stable (8<sup>th</sup>) as other countries' output grew at a comparable pace (Table 11). Canada's specialization index in the domain increased from 0.79 to 0.87, but its relative effort still remained below world average. Its scientific impact, on the other hand, is well above world average, both in terms of citations received (ARC) and journal impact (ARIF). In 2003-2008, countries with high impact and specialization in the domain are the United States, the United Kingdom, the Netherlands, Sweden, Switzerland, Israel, and Singapore (Figure 20). The international collaboration rate of Canada is one of the highest among countries mentioned in Table 11. Given the lower number of papers, the network of inter-institutional collaboration is less dense (Figure 21) than many of the other domains examined here. The most central Canadian institutions in the network are the Princess Margaret Hospital, University of Toronto, the Toronto General Hospital, University of British Columbia and University of Calgary (Figure 21).

**Table 11** Number of papers, specialization index, international collaboration and scientific impact of the 20 most active countries in the domain of Regenerative Medicine, 1997-2002 and 2003-2008

Country	1997-2002					2003-2008				
	Papers	SI	% Internat Collabo	ARC	ARIF	Papers	SI	% Internat Collabo	ARC	ARIF
United States	3 903	1,14	16,7%	1,51	1,12	10 636	1,25	24,5%	1,81	1,27
Japan	1 221	1,32	14,2%	0,75	0,75	3 029	1,41	17,0%	1,19	0,99
Germany	1 182	1,35	27,9%	1,09	0,85	2 792	1,30	37,5%	1,42	1,06
United Kingdom	735	0,80	29,1%	1,32	0,99	2 282	1,01	37,0%	1,53	1,21
Italy	849	2,06	25,9%	1,20	0,91	1 751	1,48	37,1%	1,39	1,04
China	106	0,30	25,5%	0,76	0,70	1 540	0,71	23,0%	0,86	0,87
France	609	0,96	26,4%	1,20	0,96	1 184	0,77	41,1%	1,41	1,14
<b>Canada</b>	<b>350</b>	<b>0,79</b>	<b>38,9%</b>	<b>1,54</b>	<b>1,13</b>	<b>1 086</b>	<b>0,87</b>	<b>41,9%</b>	<b>1,49</b>	<b>1,20</b>
South Korea	114	0,67	16,7%	0,76	0,70	992	1,31	23,9%	1,42	0,95
Netherlands	354	1,42	33,6%	1,34	1,06	959	1,41	43,7%	1,67	1,24
Australia	207	0,74	28,0%	1,09	0,89	679	0,84	42,4%	1,48	1,10
Sweden	217	1,10	41,9%	1,40	0,96	639	1,32	48,7%	1,61	1,15
Spain	344	1,18	22,4%	1,17	0,83	635	0,69	38,3%	1,32	1,06
Switzerland	219	1,23	50,2%	1,40	0,99	615	1,25	63,9%	2,02	1,29
Israel	149	1,19	40,9%	1,96	1,06	506	1,62	39,3%	1,54	1,11
Singapore	29	0,66	37,9%	1,22	0,71	389	2,17	40,1%	2,11	1,20
Belgium	133	1,01	42,1%	1,41	0,99	355	0,94	50,1%	1,76	1,17
Austria	199	2,12	35,2%	0,92	0,81	346	1,34	50,6%	1,44	1,00
Taiwan	65	0,51	10,8%	0,90	0,86	317	0,66	18,9%	1,03	1,06
Brazil	62	0,46	27,4%	0,96	0,79	250	0,46	34,0%	1,10	0,91
<b>World</b>	<b>10 105</b>	<b>1,00</b>	<b>-</b>	<b>1,11</b>	<b>0,90</b>	<b>27 135</b>	<b>1,00</b>	<b>-</b>	<b>1,38</b>	<b>1,09</b>

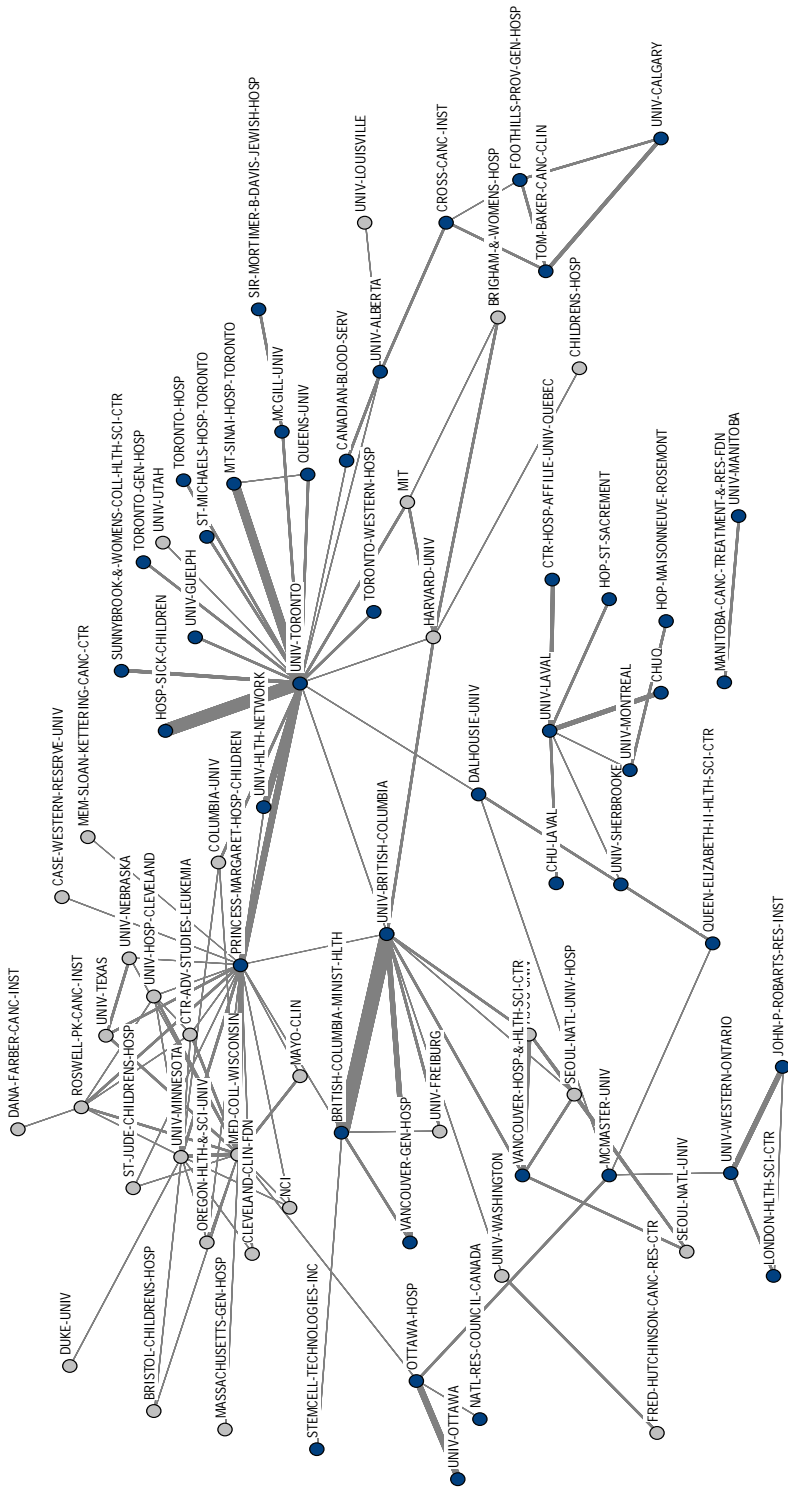
Source: *Observatoire des sciences et des technologies, CBD (current as of July 2009), Web of Science and Medline databases.*

Figure 20 Scatterplots of the average of relative citations and specialization index of top 20 most productive countries in the domain of Regenerative Medicine, 1997-2002 and 2003-2008



Source: Observatoire des sciences et des technologies, CBD (current as of July 2009), Web of Science and Medline databases.

Figure 21 Network of collaboration of Canadian institutions in the domain of Regenerative Medicine 1997-2008 (5 joint publications or more)



Source: Observatoire des sciences et des technologies, CBD (current as of July 2009), Web of Science and Medline databases.

## 7.2 Nanomedicine

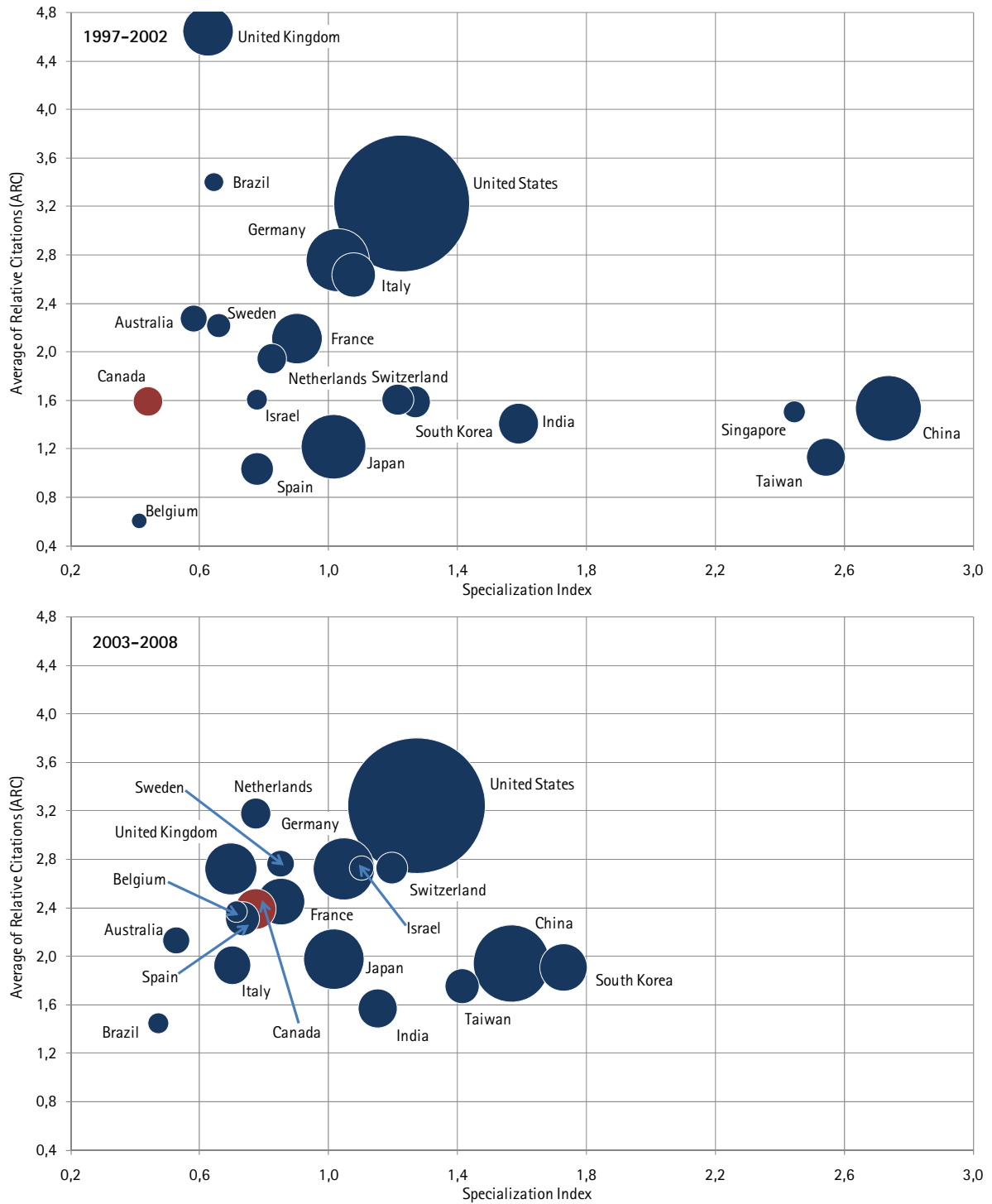
The domain of Nanomedicine has increased tremendously at the world level since the beginning of the period studied, from 936 papers published between 1997 and 2002 to 25,974 between 2003 and 2008 (Table 12). Although Canada's rank significantly increased from 14<sup>th</sup> to 8<sup>th</sup> between two time periods in terms of number of publications, it is still below most of the other domains examined here. Along the same lines, the country remained under specialized in this domain, even though its specialization index increased considerably from 0.44 in 1997-2002 to 0.77 in 2003-2008. Moreover, the scientific impact of Canadian papers in the domain increased even further, and now nears the world average of the domain. Worth mentioning is the high scientific impact and specialization of the United States, Germany, Switzerland and Israel, and the relatively low impact despite high specialization of China, South Korea and Taiwan (see also Figure 22). The table also shows that Canadian researchers' international collaboration activities are below those of bigger countries. Figure 23 shows that the most central Canadian institutions are, in decreasing order of importance, University of British Columbia, University of Toronto, University of Alberta, the National Research Council of Canada and McGill University.

**Table 12** Number of papers, specialization index, international collaboration and scientific impact of the 20 most active countries in the domain of Nanomedicine, 1997-2002 and 2003-2008

Country	1997-2002					2003-2008				
	Papers	% Internat				Papers	% Internat			
		SI	Collabo	ARC	ARIF		SI	Collabo	ARC	ARIF
United States	388	1,22	19,1%	3,23	1,63	10 375	1,27	20,5%	3,24	2,14
China	90	2,74	15,6%	1,53	0,83	3 252	1,57	22,0%	1,94	1,45
Germany	83	1,03	43,4%	2,76	1,43	2 151	1,05	50,0%	2,72	2,07
Japan	87	1,01	23,0%	1,22	1,18	2 093	1,01	25,6%	1,97	1,65
United Kingdom	53	0,62	35,8%	4,64	1,45	1 501	0,70	45,0%	2,72	1,99
France	53	0,90	47,2%	2,11	1,21	1 257	0,85	49,5%	2,45	1,89
South Korea	20	1,27	40,0%	1,59	1,45	1 254	1,73	27,0%	1,91	1,67
<b>Canada</b>	<b>18</b>	<b>0,44</b>	<b>33,3%</b>	<b>1,59</b>	<b>1,39</b>	<b>919</b>	<b>0,77</b>	<b>39,0%</b>	<b>2,39</b>	<b>1,83</b>
India	33	1,59	15,2%	1,41	1,62	848	1,15	19,3%	1,57	1,34
Italy	41	1,08	39,0%	2,63	1,37	792	0,70	48,4%	1,93	1,74
Taiwan	30	2,54	13,3%	1,13	1,09	648	1,41	15,6%	1,75	1,50
Spain	21	0,78	57,1%	1,04	1,94	640	0,73	48,4%	2,31	1,77
Switzerland	20	1,21	50,0%	1,60	1,02	560	1,19	49,8%	2,73	2,04
Singapore	10	2,44	40,0%	1,50	1,08	548	3,20	31,8%	2,44	1,64
Netherlands	19	0,82	42,1%	1,94	2,32	503	0,77	50,9%	3,18	2,23
Australia	15	0,58	46,7%	2,27	1,37	404	0,53	48,8%	2,13	1,71
Sweden	12	0,66	33,3%	2,22	1,58	394	0,85	48,0%	2,77	2,20
Israel	9	0,78	11,1%	1,60	1,83	328	1,10	33,8%	2,73	2,21
Belgium	5	0,41	80,0%	0,60	1,80	258	0,71	55,4%	2,37	1,96
Brazil	8	0,64	37,5%	3,40	1,45	243	0,47	37,0%	1,44	1,44
<b>World</b>	<b>936</b>	<b>1,00</b>	<b>-</b>	<b>2,43</b>	<b>1,42</b>	<b>25 974</b>	<b>1,00</b>	<b>-</b>	<b>2,51</b>	<b>1,83</b>

Source: Observatoire des sciences et des technologies, CBD (current as of July 2009), Web of Science and Medline databases.

Figure 22 Scatterplots of the average of relative citations and specialization index of top 20 most productive countries in the domain of Nanomedicine, 1997-2002 and 2003-2008



Source: Observatoire des sciences et des technologies, CBD (current as of July 2009), Web of Science and Medline databases.



### 7.3 Epigenetics

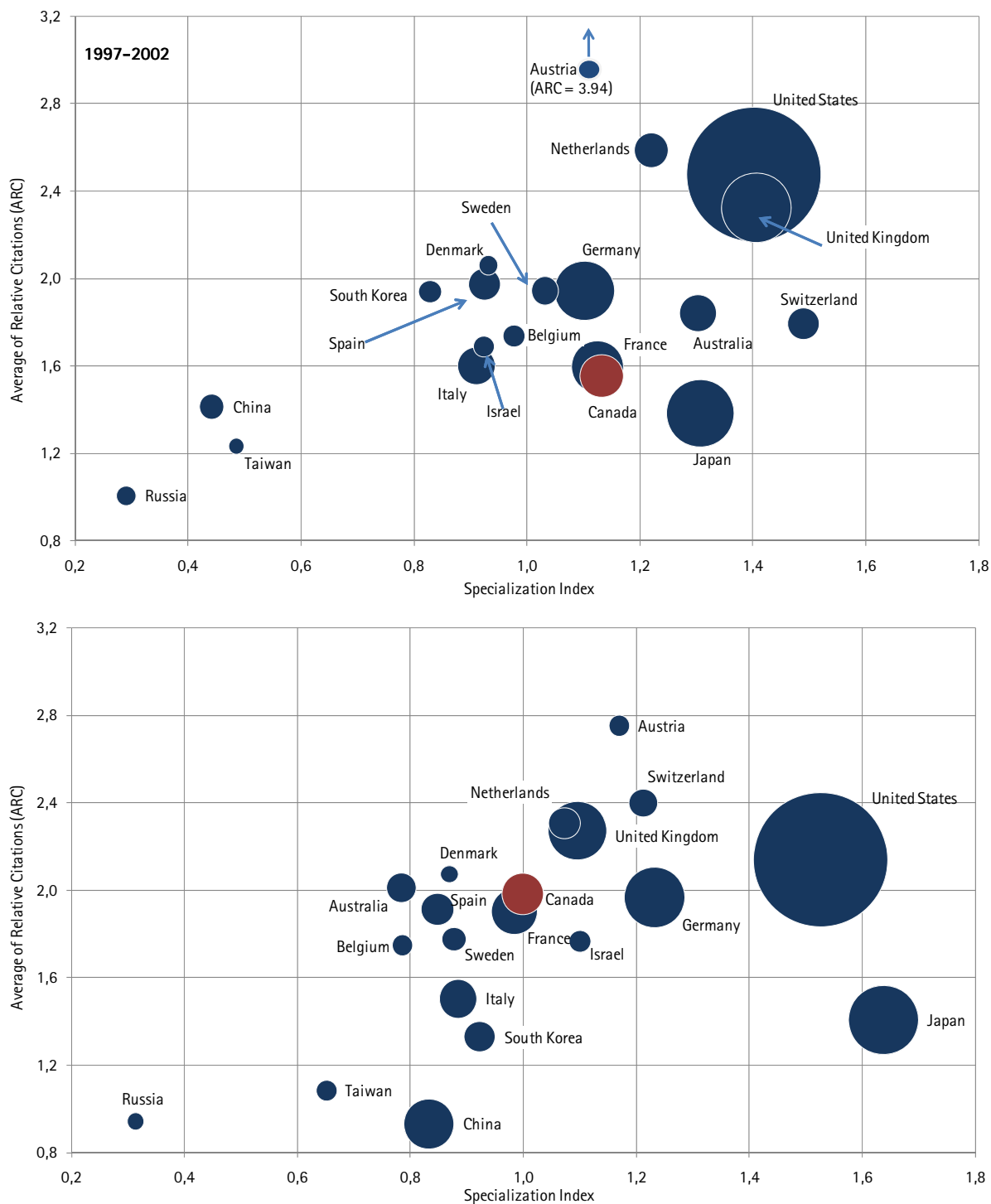
Even though Canada's research output in Epigenetics increased more than threefold between 1997-2002 and 2003-2008, its worldwide rank decreased from sixth to seventh as; 1) the number of papers published in the domain increased at the world level by a factor of almost four, and 2) China increased its output in the domain from 99 papers in 1997-2002 to 1,523 in 2002-2008 (Table 13). Along the same lines, Canada is no longer considered specialized in this domain as its specialization index decreased from 1.13 to 1.00. Scientific impact, on the other hand, followed a different path and increased from being below world average to being well above, in terms of citations received (ARC), and on a par in terms of journal impact (ARIF). In 2003-2008, countries with above average specialization and scientific impact in Epigenetics are the United States, Germany, the United Kingdom, the Netherlands, Switzerland and Austria (Figure 24). The international collaboration rate of Canadian researchers is similar to that of countries of the same size, and higher than most of the domains examined here. Given the lower number of papers, the network of inter-institutional collaboration is less dense (Figure 25) than many of the other domains examined here. The most central Canadian institutions in the network are, in decreasing order, McGill University, University of Toronto, and The Hospital for Sick Children, University of British Columbia and University of Western Ontario.

**Table 13** Number of papers, specialization index, international collaboration and scientific impact of the 20 most active countries in the domain of Epigenetics, 1997-2002 and 2003-2008

Country	1997-2002					2003-2008				
	Papers	SI	Collabo	ARC	ARIF	Papers	SI	Collabo	ARC	ARIF
United States	3 023	1,40	27,9%	2,48	1,83	10 958	1,52	30,5%	2,14	1,66
Japan	764	1,31	31,0%	1,38	1,31	2 976	1,64	28,8%	1,41	1,27
Germany	607	1,10	50,9%	1,94	1,49	2 232	1,23	46,5%	1,97	1,56
United Kingdom	812	1,41	45,7%	2,32	1,78	2 083	1,10	50,5%	2,27	1,70
China	99	0,44	32,3%	1,41	1,02	1 523	0,83	36,0%	0,93	1,05
France	451	1,12	43,9%	1,60	1,57	1 281	0,98	55,0%	1,91	1,61
<b>Canada</b>	<b>317</b>	<b>1,13</b>	<b>42,0%</b>	<b>1,55</b>	<b>1,38</b>	<b>1 048</b>	<b>1,00</b>	<b>52,8%</b>	<b>1,98</b>	<b>1,45</b>
Italy	236	0,91	55,1%	1,60	1,40	881	0,88	48,4%	1,50	1,40
Spain	170	0,92	39,4%	1,98	1,45	654	0,85	45,9%	1,91	1,47
Netherlands	192	1,22	55,2%	2,59	1,80	615	1,07	60,0%	2,31	1,84
South Korea	89	0,83	39,3%	1,94	1,40	590	0,92	31,7%	1,33	1,25
Australia	229	1,30	39,3%	1,84	1,38	531	0,78	51,2%	2,01	1,56
Switzerland	167	1,49	49,7%	1,79	1,62	501	1,21	58,5%	2,40	1,77
Sweden	128	1,03	65,6%	1,94	1,46	358	0,88	71,2%	1,77	1,52
Israel	73	0,92	56,2%	1,69	1,66	289	1,10	46,7%	1,77	1,65
Taiwan	39	0,49	35,9%	1,23	1,38	263	0,65	31,6%	1,08	1,22
Austria	65	1,10	53,8%	3,94	2,19	255	1,17	62,0%	2,75	1,86
Belgium	81	0,98	56,8%	1,74	1,36	251	0,79	61,4%	1,75	1,58
Denmark	59	0,93	62,7%	2,06	1,44	192	0,87	63,0%	2,07	1,53
Russia	64	0,29	65,6%	1,01	1,03	185	0,31	53,0%	0,94	0,89
<b>World</b>	<b>6 375</b>	<b>1,00</b>	<b>-</b>	<b>1,96</b>	<b>1,58</b>	<b>22 895</b>	<b>1,00</b>	<b>-</b>	<b>1,79</b>	<b>1,47</b>

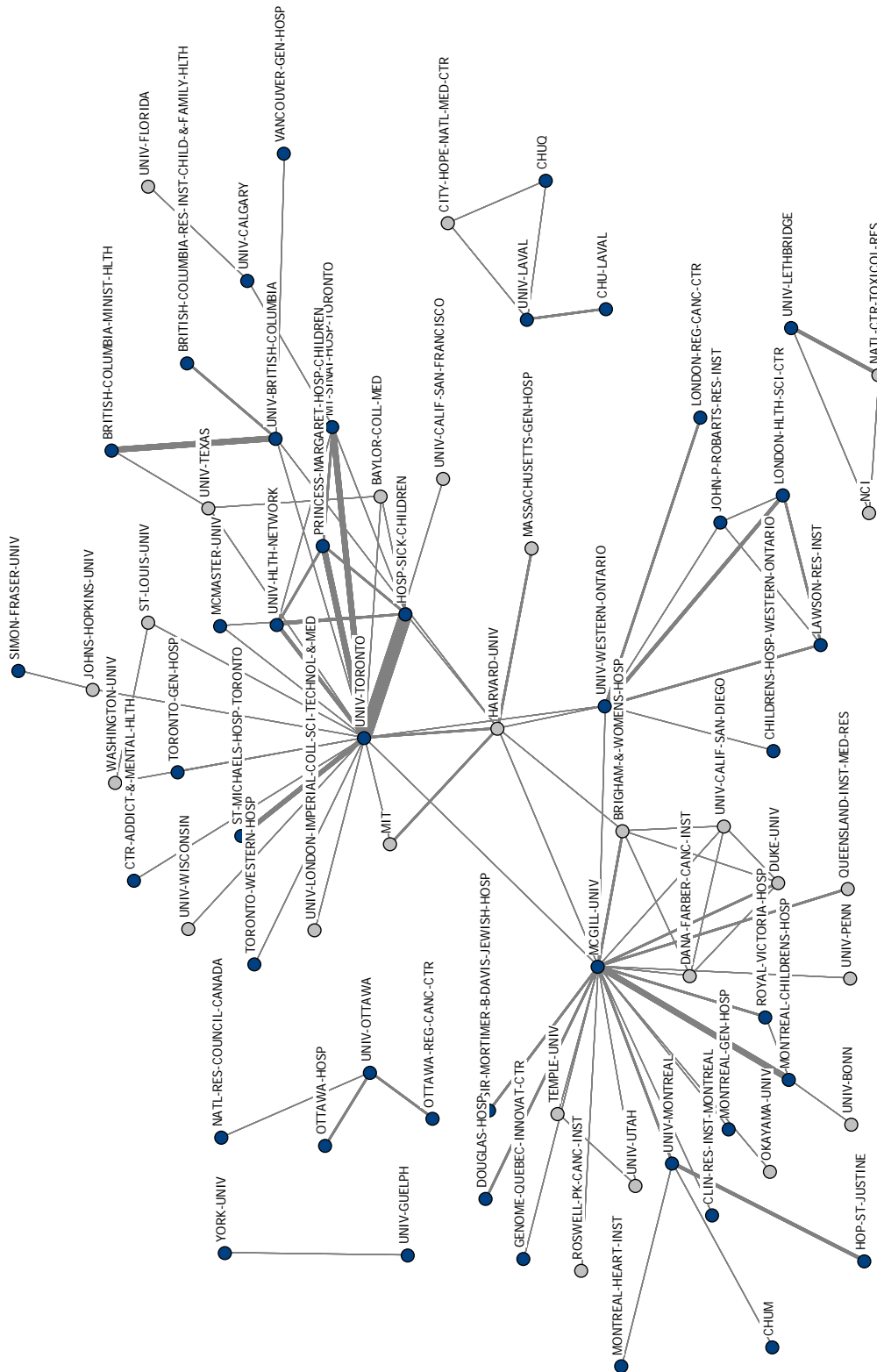
Source: Observatoire des sciences et des technologies, CBD (current as of July 2009), Web of Science and Medline databases.

Figure 24 Scatterplots of the average of relative citations and specialization index of top 20 most productive countries in the domain of Epigenetics, 1997-2002 and 2003-2008



Source: Observatoire des sciences et des technologies, CBD (current as of July 2009), Web of Science and Medline databases.

Figure 25 Network of collaboration of Canadian institutions in the domain of Epigenetics, 1997-2008 (4 joint publications or more)



Source: Observatoire des sciences et des technologies, CBD (current as of July 2009), Web of Science and Medline databases.

## CONCLUSION

Using a method based on the U.S. National Library of Medicine Medical Subject Headings (MeSH) and on the selection of "core" journals, the present bibliometric report analyzes the evolution, over the 1997-2008 period, of research trends relevant to CIHR INMHA. Specifically, research domains examined include the 4 main mandate areas of INMHA (Neurosciences, Mental Health, Addiction, and the Senses and Communication Disorders), as well as 3 focused research areas (Neuroimaging, Neural Stem Cells, and Pain), and 3 broader CIHR-wide domains where INMHA has a leadership role (Regenerative Medicine, Nanomedicine, and Epigenetics). The research output, specialization, scientific impact and collaboration of Canadian researchers are presented and compared, in each of these domains, with that of researchers of the 20 countries that are the most productive.

### **Main INMHA Mandate Domains - Neurosciences, Mental Health, Addiction, and the Senses and Communication Disorders**

This report provides evidence that Canada has a leadership position in all of the main domains relevant to INMHA.

In terms of research output (number of papers), all four domains show a relatively high and stable position among the world countries, with Canada ranking 4-6th across all domains and time periods. Although Canada's bibliometric output in other scientific domains was not directly measured in this study, this rank seems high relative to published R&D statistics from the Organization for Economic Cooperation and Development (OECD).<sup>9</sup> Comparing Canada's performance to the OECD statistical profiles of the top 20 countries identified for each of the domains in this report, Canada's relative rank is 11<sup>th</sup> in terms of R&D expenditure as a percentage of Gross Domestic Product (GDP), 9<sup>th</sup> in terms of number of researchers per employed population, and 11<sup>th</sup> in terms of triadic patent families.<sup>10</sup> Thus, the 4-6<sup>th</sup> place research output rank for the main INMHA domains observed here suggests these are areas of relative research intensity for Canada.

In terms of relative scientific impact, Canadian publications in three of these domains - Neurosciences, Mental Health and the Senses and Communication Disorders - were consistently well above the world average in terms of citations received (ARC) and journal impact (ARIF) over the entire 1997-2008 time period (e.g. 2<sup>nd</sup> to 4<sup>th</sup> rank for ARC). In the domain of Addictions research, scientific impact of Canadian publications was in line with the world average in 1997-2002, but increased in the 2003-2008 time period. These results suggest an increasing or stably high level of research excellence in Canada for the main INMHA domains.

Analysis of collaboration data reveals that Canadian researchers are well networked in the main INMHA domains studied in this report, with increasing levels of international collaborators for all four domains in 2003-2008.

### **Sub-domains of INMHA Mandate - Neuroimaging, Neural Stem Cells, and Pain**

Overall research output (number of papers) for these sub-domains was consistent with the relatively high rank of the main INMHA domains noted above. However, scientific impact (ARC and ARIF) was generally even higher than that observed for the broader main domains. Both Pain and Neuroimaging consistently maintained very high impact rankings over time, with ARC ranks of 1<sup>st</sup> and 3<sup>rd</sup> overall in the world, respectively, over both 1997-2002 and 2003-2008 time periods. For Neural Stem Cells, despite an early relative lead in citations in 1997-2002 (4<sup>th</sup> rank for ARC), citations have dropped in the more recent 2003-2008 period (8<sup>th</sup> rank for ARC). However, this later result needs to be interpreted with caution, given the

low relative number of publications in the Neural Stem Cell sub-domain compared to others examined here.

Canadian researchers are well networked in these sub-domains, with Neural Stem Cells showing a relatively high level of international collaboration (i.e. 50% of Canadian publications have international authors). As with the main INMHA domains, Neuroimaging and Pain both increased international collaborations over time, while Neural Stem Cells remained stable at its relatively high level.

### **Cross-CIHR Domains – Regenerative Medicine, Nanomedicine and Epigenetics**

Consistent with the nascent and emerging nature of these multi-disciplinary and cross-themed research domains, overall research output is low compared to the well established INMHA domains. As a result, interpretation of bibliometric findings needs to be done with care. With the exception of the domain of Nanomedicine in 1997-2002 (where the low number of publications potentially invalidates relative comparisons), Canada's overall research output was consistently in the 6<sup>th</sup> to 8<sup>th</sup> rank for top 20 world countries for all three domains and both time periods. Nevertheless, Canada's Specialization Index (SI) typically remained below the world average for Regenerative Medicine and Nanomedicine and at the world average for Epigenetics.

For Regenerative Medicine, Canada's scientific impact (ARC and ARIF) was consistently above the world average for both 1997-2002 and 2003-2008 time periods, despite a below average specialization (SI). However, its relative rank among top world countries decreased over time, as a number of other countries significantly increased their scientific impact while Canada remained stable.

For Nanomedicine, comparisons over time are difficult, due to the low number of papers published in 1997-2002. However, Canada appears to have increased from a below-world average in research output, impact (ARC and ARIF) and SI in 1997-2002, to an average impact despite a below-average specialization in 2003-2008.

For Epigenetics, Canada's relative specialization has dropped slightly over time, to the world average in 2003-2008. Nevertheless, Canada has increased its relative scientific impact from a below-world average in 1997-2002, to an above-world average in 2003-2008. International collaboration rates are relatively high for Epigenetics (i.e. >50% of papers have international collaborators).

### **SUMMARY**

This report provides bibliometric evidence that Canadian researchers excel on the world stage, for the four domains (Neurosciences, Mental Health, Addiction, and the Senses and Communication Disorders) and three sub-domains (Neuroimaging, Neural Stem Cells, and Pain) relevant to INMHA's mandate. Canada's relative research output and scientific impact in these domains exceeded what would be expected based on Canada's overall R&D research spending, relative to other countries (OECD Country Statistical Profiles, 2010). Research output and impact either remained stable over the 1997-2002 and 2003-2008 time periods, or increased in all INMHA-relevant domains.

For emerging cross-CIHR domains where INMHA plays a leadership role (Regenerative Medicine, Nanomedicine, Epigenetics), Canada's research output is typically lower than in the established INMHA domains, as expected. Canada is at or below the world average for specialization in all three domains, but still has above average scientific impact in Regenerative Medicine and Epigenetics. Nanomedicine research output, specialization and impact have increased considerably in recent years, and now approach the world average.

## ENDNOTES

<sup>1</sup> CIHR Act – Bill C13 : <http://www2.parl.gc.ca/HousePublications/Publication.aspx?pub=bill&doc=C-13&parl=36&ses=2&file=28&language=E>

<sup>2</sup> Institute of Neurosciences, Mental Health and Addiction (INMHA):  
<http://www.cihr-irsc.gc.ca/e/8602.html>

<sup>3</sup> <http://www.nsf.gov/statistics/seind06/>

<sup>4</sup> <http://www.ncbi.nlm.nih.gov/pubmed>

<sup>5</sup> More details on the classification scheme can be found at:  
<http://www.nsf.gov/statistics/seind06/c5/c5s3.htm#sb1>

<sup>6</sup> Freeman, L. C. (1979). Centrality in social networks: Conceptual clarification. *Social Networks*, 1(3): 215-239.

<sup>7</sup> Borgatti, S.P., Everett, M.G. et L.C Freeman (2002) *Ucinet for Windows: Software for Social Network Analysis*. Harvard: Analytic Technologies.

<sup>8</sup> Borgatti, S. P. (2002) *NetDraw: Graph Visualization Software*. Harvard: Analytic Technologies.

<sup>9</sup> OECD Factbook 2010: Economic, Environmental and Social Statistics – ISBN 92-64-08356-1 – © OECD 2010.

<sup>10</sup> OECD Country Statistical Profiles 2010: <http://stats.oecd.org/Index.aspx?DataSetCode=CSP2010>

## APPENDIX 1. MESH TERMS, BY DOMAIN

### Neuroscience

Mental Disorders  
Nervous System  
Nervous System Diseases  
Neurology  
Neuropharmacology  
Neurosciences  
Psychopharmacology

### Neuroimaging

Brain Mapping  
Diagnostic Imaging  
Diagnostic Techniques, Neurological  
Electroencephalography  
Magnetoencephalography  
Neuroradiography  
Transcranial Magnetic Stimulation

### Neural Stem Cells

Stem Cells (limited by "Neuroscience" MeSH—see above)

### Mental Health

Mental Disorders  
Mental Health  
Mental Health Services

### Addiction

Substance-Related Disorders  
Tobacco Use Cessation

### Senses and Communication Disorders

Gravity Sensing  
Sensation (except the "pleasure" subheading)  
Hearing  
Pain  
Proprioception  
Smell  
Taste  
Temperature Sense  
Touch  
Vision, Ocular

## **Pain**

Pain

## **Regenerative Medicine**

Adult Stem Cells

Bioartificial Organs

Embryonic Stem Cells

Fetal Stem Cells

Liver, Artificial

Multipotent Stem Cells

Organoids

Pancreas, Artificial

Pluripotent Stem Cells

Regenerative Medicine

Skin, Artificial

Stem Cell Transplantation

Tissue Engineering

Tissue Scaffolds

Tissue Therapy

Totipotent Stem Cells

## **Nanomedicine**

Fullerenes

Lab-On-A-Chip Devices

Microfluidic Analytical Techniques

Microfluidics

Nanocapsules

Nanomedicine

Nanostructures

Nanotechnology

## **Epigenetics**

Epigenesis, Genetic

DNA Methylation

## APPENDIX 2. JOURNALS INCLUDED, BY DOMAIN

### Neuroscience

ACTA NEUROBIOLOGIAE EXPERIMENTALIS  
ACTA NEUROLOGICA  
ACTA NEUROLOGICA BELGICA  
ACTA NEUROLOGICA SCANDINAVICA  
ACTA NEUROPATHOLOGICA  
ACTA NEUROPSYCHIATRICA  
ACTAS LUSO-ESPANOLAS DE NEUROLOGIA PSIQUIATRIA Y CIENCIAS AFINES  
ACTIVITAS NERVOSA SUPERIOR  
ACUPUNCTURE & ELECTRO-THERAPEUTICS RESEARCH  
ADVANCES IN BEHAVIORAL PHARMACOLOGY  
ADVANCES IN BIOCHEMICAL PSYCHOPHARMACOLOGY  
ADVANCES IN NEUROLOGY  
AGING NEUROPSYCHOLOGY AND COGNITION  
AKTUELLE NEUROLOGIE  
ALZHEIMER DISEASE & ASSOCIATED DISORDERS  
ALZHEIMERS & DEMENTIA  
ALZHEIMERS REPORTS  
AMA ARCHIVES OF NEUROLOGY AND PSYCHIATRY  
AMERICAN JOURNAL OF EEG TECHNOLOGY  
AMERICAN JOURNAL OF ELECTRONEURODIAGNOSTIC TECHNOLOGY  
AMERICAN JOURNAL OF MEDICAL GENETICS PART B-NEUROPSYCHIATRIC GENETICS  
AMERICAN JOURNAL OF NEURORADIOLOGY  
AMYOTROPHIC LATERAL SCLEROSIS AND OTHER MOTOR NEURON DISORDERS  
ANNALS OF INDIAN ACADEMY OF NEUROLOGY  
ANNALS OF NEUROLOGY  
ANNUAL REVIEW OF NEUROSCIENCE  
APHASIOLOGY  
APPLIED NEUROPHYSIOLOGY  
APS JOURNAL  
ARCHIVES ITALIENNES DE BIOLOGIE  
ARCHIVES OF NEUROLOGY  
ARCHIVES OF NEUROLOGY AND PSYCHIATRY  
ARCHIVOS DE NEUROBIOLOGIA  
ARQUIVOS DE NEURO-PSIQUIATRIA  
AUTONOMIC NEUROSCIENCE-BASIC & CLINICAL  
BAILLIERES CLINICAL NEUROLOGY  
BEHAVIORAL AND BRAIN FUNCTIONS  
BEHAVIORAL AND NEURAL BIOLOGY  
BEHAVIORAL NEUROSCIENCE  
BEHAVIOURAL BRAIN RESEARCH  
BEHAVIOURAL NEUROLOGY  
BEHAVIOURAL PHARMACOLOGY  
BIOLOGICAL CYBERNETICS  
BMC NEUROLOGY  
BMC NEUROSCIENCE  
BRAIN  
BRAIN & DEVELOPMENT

BRAIN AND COGNITION  
BRAIN AND LANGUAGE  
BRAIN BEHAVIOR AND EVOLUTION  
BRAIN CELL BIOLOGY  
BRAIN DYSFUNCTION  
BRAIN IMPAIRMENT  
BRAIN INJURY  
BRAIN PATHOLOGY  
BRAIN RESEARCH  
BRAIN RESEARCH BULLETIN  
BRAIN RESEARCH PROTOCOLS  
BRAIN RESEARCH REVIEWS  
BRAIN STRUCTURE & FUNCTION  
BRAIN TOPOGRAPHY  
BRITISH JOURNAL OF NEUROSURGERY  
CANADIAN JOURNAL OF NEUROLOGICAL SCIENCES  
CELL TRANSPLANTATION  
CELLULAR AND MOLECULAR NEUROBIOLOGY  
CEPHALALGIA  
CEREBELLUM  
CEREBRAL CORTEX  
CEREBROVASCULAR AND BRAIN METABOLISM REVIEWS  
CEREBROVASCULAR DISEASES  
CHILD NEUROPSYCHOLOGY  
CHILDS BRAIN  
CHILDS NERVOUS SYSTEM  
CHRONOBIOLOGY INTERNATIONAL  
CIRCULATION ET METABOLISME DU CERVEAU  
CLINICAL AUTONOMIC RESEARCH  
CLINICAL EEG AND NEUROSCIENCE  
CLINICAL ELECTROENCEPHALOGRAPHY  
CLINICAL JOURNAL OF PAIN  
CLINICAL NEUROLOGY AND NEUROSURGERY  
CLINICAL NEUROPATHOLOGY  
CLINICAL NEUROPHYSIOLOGY  
CLINICAL NEUROPSYCHOLOGY  
CLINICAL NEUROSCIENCE  
CLINICAL NEUROSCIENCE RESEARCH  
CLINICAL NEUROSURGERY  
CNS DRUG REVIEWS  
CNS DRUGS  
CNS NEUROSCIENCE & THERAPEUTICS  
COGNITIVE AFFECTIVE & BEHAVIORAL NEUROSCIENCE  
COGNITIVE AND BEHAVIORAL NEUROLOGY  
COGNITIVE BRAIN RESEARCH  
COMMUNICATIONS IN PSYCHOPHARMACOLOGY  
CONCEPTS IN NEUROSCIENCE  
CONFINIA CEPHALALGICA  
CRC CRITICAL REVIEWS IN CLINICAL NEUROBIOLOGY  
CRITICAL REVIEWS IN NEUROBIOLOGY  
CRITICAL REVIEWS IN NEUROSURGERY

CURRENT ALZHEIMER RESEARCH  
CURRENT NEUROLOGY AND NEUROSCIENCE REPORTS  
CURRENT NEUROPHARMACOLOGY  
CURRENT NEUROVASCULAR RESEARCH  
CURRENT OPINION IN NEUROBIOLOGY  
CURRENT OPINION IN NEUROLOGY  
CURRENT OPINION IN NEUROLOGY AND NEUROSURGERY  
CURRENT PAIN AND HEADACHE REPORTS  
CURRENT TREATMENT OPTIONS IN NEUROLOGY  
DEMENTIA  
DEMENTIA AND GERIATRIC COGNITIVE DISORDERS  
DEVELOPMENTAL BRAIN DYSFUNCTION  
DEVELOPMENTAL BRAIN RESEARCH  
DEVELOPMENTAL MEDICINE AND CHILD NEUROLOGY  
DEVELOPMENTAL NEUROBIOLOGY  
DEVELOPMENTAL NEUROPSYCHOLOGY  
DEVELOPMENTAL NEUROSCIENCE  
DISCUSSIONS IN NEUROSCIENCE  
DISEASES OF THE NERVOUS SYSTEM  
DOULEUR ET ANALGESIE  
ELECTROENCEPHALOGRAPHY AND CLINICAL NEUROPHYSIOLOGY  
ELECTROMYOGRAPHY AND CLINICAL NEUROPHYSIOLOGY  
ELECTROMYOGRAPHY AND MOTOR CONTROL-ELECTROENCEPHALOGRAPHY AND CLINICAL  
NEUROPHYSIOLOGY  
EPILEPSIA  
EPILEPSIES  
EPILEPSY RESEARCH  
EPILEPTIC DISORDERS  
EUROPEAN ARCHIVES OF PSYCHIATRY AND CLINICAL NEUROSCIENCE  
EUROPEAN JOURNAL OF NEUROLOGY  
EUROPEAN JOURNAL OF NEUROSCIENCE  
EUROPEAN JOURNAL OF PAEDIATRIC NEUROLOGY  
EUROPEAN JOURNAL OF PAIN  
EUROPEAN JOURNAL OF PAIN-LONDON  
EUROPEAN NEUROLOGY  
EUROPEAN NEUROPSYCHOPHARMACOLOGY  
EVOKED POTENTIALS-ELECTROENCEPHALOGRAPHY AND CLINICAL NEUROPHYSIOLOGY  
EXPERIMENTAL BRAIN RESEARCH  
EXPERIMENTAL NEUROLOGY  
FOCUS ON DEPRESSION AND ANXIETY  
FOLIA NEUROPATHOLOGICA  
FOLIA PSYCHIATRICA ET NEUROLOGICA JAPONICA  
FRONTIERS IN NEUROENDOCRINOLOGY  
FUNCTIONAL NEUROLOGY  
GENES BRAIN AND BEHAVIOR  
GIORNALE DI NEUROPSICHIATRIA DELL ETA EVOLUTIVA  
GLIA  
HEADACHE  
HEADACHE QUARTERLY-CURRENT TREATMENT AND RESEARCH  
HIPPOCAMPUS  
HOMEOSTASIS IN HEALTH AND DISEASE

HUMAN BRAIN MAPPING  
HUMAN NEUROBIOLOGY  
IDEGGYOGYASZATI SZEMLE-CLINICAL NEUROSCIENCE  
IEEE TRANSACTIONS ON NEURAL SYSTEMS AND REHABILITATION ENGINEERING  
INTELLECTUAL AND DEVELOPMENTAL DISABILITIES  
INTERNATIONAL JOURNAL OF DEVELOPMENTAL NEUROSCIENCE  
INTERNATIONAL JOURNAL OF NEURAL SYSTEMS  
INTERNATIONAL JOURNAL OF NEUROPSYCHOPHARMACOLOGY  
INTERNATIONAL JOURNAL OF NEURORADIOLOGY  
INTERNATIONAL JOURNAL OF NEUROSCIENCE  
INTERNATIONAL PHARMACOPSYCHIATRY  
INTERNATIONAL REVIEW OF NEUROBIOLOGY  
INTERNATIONAL REVIEW OF RESEARCH IN MENTAL RETARDATION  
INTERVENTIONAL NEURORADIOLOGY  
INVERTEBRATE NEUROSCIENCE  
ITALIAN JOURNAL OF NEUROLOGICAL SCIENCES  
JAPANESE JOURNAL OF NEUROPSYCHOPHARMACOLOGY  
JAPANESE JOURNAL OF PSYCHIATRY AND NEUROLOGY  
JOURNAL DE PHYSIOLOGIE  
JOURNAL OF ALZHEIMERS DISEASE  
JOURNAL OF APPLIED RESEARCH IN INTELLECTUAL DISABILITIES  
JOURNAL OF BIOLOGICAL RHYTHMS  
JOURNAL OF BRAIN RESEARCH-JOURNAL FUR HIRNFORSCHUNG  
JOURNAL OF BRAIN SCIENCE  
JOURNAL OF CEREBRAL BLOOD FLOW AND METABOLISM  
JOURNAL OF CHEMICAL NEUROANATOMY  
JOURNAL OF CHILD AND ADOLESCENT PSYCHOPHARMACOLOGY  
JOURNAL OF CHILD NEUROLOGY  
JOURNAL OF CLINICAL AND EXPERIMENTAL NEUROPSYCHOLOGY  
JOURNAL OF CLINICAL NEUROLOGY  
JOURNAL OF CLINICAL NEUROPHYSIOLOGY  
JOURNAL OF CLINICAL NEUROPSYCHOLOGY  
JOURNAL OF CLINICAL NEUROSCIENCE  
JOURNAL OF CLINICAL PSYCHOPHARMACOLOGY  
JOURNAL OF COGNITIVE NEUROSCIENCE  
JOURNAL OF COMPARATIVE NEUROLOGY  
JOURNAL OF COMPUTATIONAL NEUROSCIENCE  
JOURNAL OF EPILEPSY  
JOURNAL OF HEADACHE AND PAIN  
JOURNAL OF INTELLECTUAL DISABILITY RESEARCH  
JOURNAL OF KOREAN NEUROSURGICAL SOCIETY  
JOURNAL OF MENTAL DEFICIENCY RESEARCH  
JOURNAL OF MOLECULAR NEUROSCIENCE  
JOURNAL OF NERVOUS AND MENTAL DISEASE  
JOURNAL OF NEURAL ENGINEERING  
JOURNAL OF NEURAL TRANSMISSION  
JOURNAL OF NEURAL TRANSMISSION-GENERAL SECTION  
JOURNAL OF NEURAL TRANSMISSION-PARKINSONS DISEASE AND DEMENTIA SECTION  
JOURNAL OF NEURAL TRANSMISSION-SUPPLEMENTUM  
JOURNAL OF NEURAL TRANSPLANTATION & PLASTICITY  
JOURNAL OF NEUROBIOLOGY

JOURNAL OF NEUROCHEMISTRY  
JOURNAL OF NEUROCYTOLOGY  
JOURNAL OF NEUROENDOCRINOLOGY  
JOURNAL OF NEUROGENETICS  
JOURNAL OF NEUROIMAGING  
JOURNAL OF NEUROIMMUNE PHARMACOLOGY  
JOURNAL OF NEUROIMMUNOLOGY  
JOURNAL OF NEUROINFLAMMATION  
JOURNAL OF NEUROLINGUISTICS  
JOURNAL OF NEUROLOGICAL AND ORTHOPAEDIC MEDICINE AND SURGERY  
JOURNAL OF NEUROLOGICAL SCIENCES-TURKISH  
JOURNAL OF NEUROLOGY  
JOURNAL OF NEUROLOGY NEUROSURGERY AND PSYCHIATRY  
JOURNAL OF NEURO-ONCOLOGY  
JOURNAL OF NEUROPATHOLOGY AND EXPERIMENTAL NEUROLOGY  
JOURNAL OF NEUROPHYSIOLOGY  
JOURNAL OF NEUROPSYCHIATRY AND CLINICAL NEUROSCIENCES  
JOURNAL OF NEURORADIOLOGY  
JOURNAL OF NEUROSCIENCE  
JOURNAL OF NEUROSCIENCE METHODS  
JOURNAL OF NEUROSCIENCE NURSING  
JOURNAL OF NEUROSCIENCE RESEARCH  
JOURNAL OF NEUROSURGERY  
JOURNAL OF NEUROSURGERY-PEDIATRICS  
JOURNAL OF NEUROSURGERY-SPINE  
JOURNAL OF NEUROSURGICAL SCIENCES  
JOURNAL OF NEUROTRAUMA  
JOURNAL OF NEUROVIROLOGY  
JOURNAL OF PAIN  
JOURNAL OF PAIN AND SYMPTOM MANAGEMENT  
JOURNAL OF PHYSIOLOGY-PARIS  
JOURNAL OF PSYCHIATRY & NEUROSCIENCE  
JOURNAL OF SLEEP RESEARCH  
JOURNAL OF SPINAL CORD MEDICINE  
JOURNAL OF THE AUTONOMIC NERVOUS SYSTEM  
JOURNAL OF THE HISTORY OF THE NEUROSCIENCES  
JOURNAL OF THE INTERNATIONAL NEUROPSYCHOLOGICAL SOCIETY  
JOURNAL OF THE NEUROLOGICAL SCIENCES  
JOURNAL OF THE PERIPHERAL NERVOUS SYSTEM  
JOURNAL OF THEORETICAL NEUROBIOLOGY  
KLINISCHE NEUROPHYSIOLOGIE  
KLINISCHE NEURORADIOLOGIE  
LANCET NEUROLOGY  
MENTAL HANDICAP RESEARCH  
MENTAL RETARDATION  
MENTAL RETARDATION AND DEVELOPMENTAL DISABILITIES RESEARCH REVIEWS  
METABOLIC BRAIN DISEASE  
MINIMALLY INVASIVE NEUROSURGERY  
MOLECULAR AND CELLULAR NEUROSCIENCES  
MOLECULAR AND CHEMICAL NEUROPATHOLOGY  
MOLECULAR BRAIN RESEARCH

MOLECULAR NEUROBIOLOGY  
MOLECULAR PAIN  
NATURE REVIEWS NEUROSCIENCE  
NERVENHEILKUNDE  
NEURAL COMPUTATION  
NEURAL NETWORK WORLD  
NEURAL PLASTICITY  
NEUROBEHAVIORAL TOXICOLOGY  
NEUROBEHAVIORAL TOXICOLOGY AND TERATOLOGY  
NEUROBIOLOGY  
NEUROBIOLOGY OF AGING  
NEUROBIOLOGY OF DISEASE  
NEUROBIOLOGY OF LEARNING AND MEMORY  
NEUROBIOLOGY-BUDAPEST  
NEUROCASE  
NEUROCHEMICAL JOURNAL  
NEUROCHEMICAL PATHOLOGY  
NEUROCHEMICAL RESEARCH  
NEUROCHEMISTRY INTERNATIONAL  
NEUROCIROGIA  
NEUROCOMPUTING  
NEUROCRITICAL CARE  
NEURODEGENERATION  
NEURODEGENERATIVE DISEASES  
NEUROENDOCRINOLOGY  
NEUROENDOCRINOLOGY LETTERS  
NEUROEPIDEMIOLOGY  
NEUROFORUM  
NEUROGASTROENTEROLOGY AND MOTILITY  
NEUROGENETICS  
NEUROIMAGE  
NEUROIMAGING CLINICS OF NORTH AMERICA  
NEUROIMMUNOMODULATION  
NEUROINFORMATICS  
NEUROLOGIA  
NEUROLOGIA CROATICA  
NEUROLOGIA MEDICO-CHIRURGICA  
NEUROLOGIC CLINICS  
NEUROLOGICAL RESEARCH  
NEUROLOGICAL SCIENCES  
NEUROLOGICAL SURGERY  
NEUROLOGIST  
NEUROLOGY  
NEUROLOGY ASIA  
NEUROLOGY INDIA  
NEUROLOGY PSYCHIATRY AND BRAIN RESEARCH  
NEUROMODULATION  
NEUROMOLECULAR MEDICINE  
NEUROMUSCULAR DISORDERS  
NEURON  
NEURON GLIA BIOLOGY

NEURO-ONCOLOGY  
NEURO-OPHTHALMOLOGY  
NEURO-ORTHOPEDECS  
NEUROPADIATRIE  
NEUROPATHOLOGY AND APPLIED NEUROBIOLOGY  
NEUROPEDIATRICS  
NEUROPEPTIDES  
NEUROPHARMACOLOGY  
NEUROPHYSIOLOGIE CLINIQUE-CLINICAL NEUROPHYSIOLOGY  
NEUROPHYSIOLOGY  
NEUROPROTOCOLS-A COMPANION TO METHODS IN NEUROSCIENCES  
NEUROPSYCHIATRIE  
NEUROPSYCHIATRIE DE L ENFANCE ET DE L ADOLESCENCE  
NEUROPSYCHIATRY NEUROPSYCHOLOGY AND BEHAVIORAL NEUROLOGY  
NEUROPSYCHOBIOLOGY  
NEUROPSYCHOLOGIA  
NEUROPSYCHOLOGICAL REHABILITATION  
NEUROPSYCHOLOGY  
NEUROPSYCHOLOGY REVIEW  
NEUROPSYCHOPHARMACOLOGY  
NEUROQUANTOLOGY  
NEURORADIOLOGY  
NEUOREHABILITATION  
NEUOREHABILITATION AND NEURAL REPAIR  
NEUOREPORT  
NEUROSCIENCE  
NEUROSCIENCE AND BIOBEHAVIORAL REVIEWS  
NEUROSCIENCE LETTERS  
NEUROSCIENCE RESEARCH  
NEUROSCIENCE RESEARCH COMMUNICATIONS  
NEUROSCIENCES  
NEUROSCIENCES RESEARCH PROGRAM BULLETIN  
NEUROSCIENCES-JAPAN  
NEUROSCIENTIST  
NEURO SIGNALS  
NEUROSURGERY  
NEUROSURGERY CLINICS OF NORTH AMERICA  
NEUROSURGERY QUARTERLY  
NEUROSURGICAL FOCUS  
NEUROSURGICAL REVIEW  
NEURO THERAPEUTICS  
NEUROTOXICITY RESEARCH  
NEUROTOXICOLOGY  
NEUROTOXICOLOGY AND TERATOLOGY  
NEUROUROLOGY AND URODYNAMICS  
NIMHANS JOURNAL  
NUTRITIONAL NEUROSCIENCE  
PAIN  
PAIN CLINIC  
PAIN FORUM  
PAIN PHYSICIAN

PAIN REVIEWS  
PARAPLEGIA  
PARKINSONISM & RELATED DISORDERS  
PEDIATRIC NEUROLOGY  
PEDIATRIC NEUROSCIENCE  
PEDIATRIC NEUROSURGERY  
PERSPECTIVES IN NEUROLOGICAL SURGERY  
PERSPECTIVES ON DEVELOPMENTAL NEUROBIOLOGY  
PHARMACOPSYCHIATRIA  
PHARMACOPSYCHIATRY  
PHARMAKOPSYCHIATRIE NEURO-PSYCHOPHARMAKOLOGIE  
PHYSIOLOGIA BOHEMOSLOVACA  
PROGRESS IN BRAIN RESEARCH  
PROGRESS IN CLINICAL NEUROPHYSIOLOGY  
PROGRESS IN NEUROBIOLOGY  
PROGRESS IN NEUROENDOCRINIMMUNOLOGY  
PROGRESS IN NEUROPATHOLOGY  
PROGRESS IN NEURO-PSYCHOPHARMACOLOGY  
PROGRESS IN NEURO-PSYCHOPHARMACOLOGY & BIOLOGICAL PSYCHIATRY  
PROGRESS IN PSYCHOBIOLOGY AND PHYSIOLOGICAL PSYCHOLOGY  
PSN-PSYCHIATRIE SCIENCES HUMAINES NEUROSCIENCES  
PSYCHIATRIC GENETICS  
PSYCHIATRY AND CLINICAL NEUROSCIENCES  
PSYCHIATRY RESEARCH-NEUROIMAGING  
PSYCHOLOGIE & NEUROPSYCHIATRIE DU VIEILLISSEMENT  
PSYCHONEUROENDOCRINOLOGY  
PSYCHOPHARMACOLOGY  
PSYCHOPHARMACOLOGY BULLETIN  
PURINERGIC SIGNALLING  
RESEARCH IN DEVELOPMENTAL DISABILITIES  
RESTORATIVE NEUROLOGY AND NEUROSCIENCE  
REVIEWS IN THE NEUROSCIENCES  
REVISTA DE NEUROLOGIA  
REVISTA ECUATORIANA DE NEUROLOGIA  
REVUE D ELECTROENCEPHALOGRAPHIE ET DE NEUROPHYSIOLOGIE CLINIQUE  
REVUE DE NEUROPSYCHIATRIE INFANTILE ET D HYGIENE MENTALE DE L ENFANCE  
REVUE NEUROLOGIQUE  
RIVISTA DI NEURORADIOLOGIA  
SEIZURE  
SEIZURE-EUROPEAN JOURNAL OF EPILEPSY  
SEMINARS IN NEUROLOGY  
SEMINARS IN THE NEUROSCIENCES  
SLEEP  
SLEEP AND BIOLOGICAL RHYTHMS  
SLEEP MEDICINE  
SLEEP MEDICINE REVIEWS  
SOCIAL COGNITIVE AND AFFECTIVE NEUROSCIENCE  
SOCIAL NEUROSCIENCE  
SOMATOSENSORY AND MOTOR RESEARCH  
SOMATOSENSORY RESEARCH  
STEREOTACTIC AND FUNCTIONAL NEUROSURGERY

STROKE  
SURGICAL NEUROLOGY  
SYNAPSE  
TECHNIQUES IN NEUROSURGERY  
TOPICS IN STROKE REHABILITATION  
TRANSACTIONS OF THE AMERICAN NEUROLOGICAL ASSOCIATION  
TRENDS IN NEUROSCIENCES  
TURKISH NEUROSURGERY  
VISION RESEARCH  
VISUAL NEUROSCIENCE  
ZEITSCHRIFT FUR DIE GESAMTE NEUROLOGIE UND PSYCHIATRIE  
ZENTRALBLATT FUR NEUROCHIRURGIE

### **Neuroimaging**

AMERICAN JOURNAL OF NEURORADIOLOGY  
INTERNATIONAL JOURNAL OF NEURORADIOLOGY  
INTERVENTIONAL NEURORADIOLOGY  
JOURNAL OF NEUROIMAGING  
JOURNAL OF NEURORADIOLOGY  
KLINISCHE NEURORADIOLOGIE  
KLINISCHE NEURORADIOLOGIE  
NEUROIMAGING CLINICS OF NORTH AMERICA  
NEURORADIOLOGY  
PSYCHIATRY RESEARCH-NEUROIMAGING  
RIVISTA DI NEURORADIOLOGIA

### **Mental Health**

ACTA PSYCHIATRICA SCANDINAVICA  
ACTAS ESPANOLAS DE PSIQUIATRIA  
ACTAS LUSO-ESPANOLAS DE NEUROLOGIA PSIQUIATRIA Y CIENCIAS AFINES  
ADVANCES IN PSYCHOSOMATIC MEDICINE  
ALZHEIMER DISEASE & ASSOCIATED DISORDERS  
AMERICAN JOURNAL OF ALZHEIMERS DISEASE AND OTHER DEMENTIAS  
AMERICAN JOURNAL OF GERIATRIC PSYCHIATRY  
AMERICAN JOURNAL OF ORTHOPSYCHIATRY  
AMERICAN JOURNAL OF PSYCHIATRY  
AMERICAN JOURNAL OF PSYCHOTHERAPY  
AMERICAN JOURNAL ON MENTAL RETARDATION  
ANXIETY STRESS AND COPING  
ARCHIVES OF GENERAL PSYCHIATRY  
ARCHIVES OF PSYCHIATRIC NURSING  
ARCHIVES OF WOMENS MENTAL HEALTH  
ARQUIVOS DE NEURO-PSIQUIATRIA  
AUSTRALASIAN PSYCHIATRY  
AUSTRALIAN AND NEW ZEALAND JOURNAL OF PSYCHIATRY  
AUTISM  
BEHAVIORAL MEDICINE  
BIOLOGICAL PSYCHIATRY  
BIPOLAR DISORDERS  
BRITISH JOURNAL OF MEDICAL PSYCHOLOGY

BRITISH JOURNAL OF PSYCHIATRY  
BULLETIN OF THE MENNINGER CLINIC  
CANADIAN JOURNAL OF PSYCHIATRY-REVUE CANADIENNE DE PSYCHIATRIE  
CHILD AND ADOLESCENT PSYCHIATRIC CLINICS OF NORTH AMERICA  
CNS SPECTRUMS  
COMMUNITY MENTAL HEALTH JOURNAL  
COMPREHENSIVE PSYCHIATRY  
CONVULSIVE THERAPY  
CORTEX  
CURRENT OPINION IN PSYCHIATRY  
DEMENTIA AND GERIATRIC COGNITIVE DISORDERS  
DEPRESSION AND ANXIETY  
DEVELOPMENTAL DISABILITIES RESEARCH REVIEWS  
DYSLEXIA  
EATING AND WEIGHT DISORDERS-STUDIES ON ANOREXIA BULIMIA AND OBESITY  
ENCEPHALE-REVUE DE PSYCHIATRIE CLINIQUE BIOLOGIQUE ET THERAPEUTIQUE  
EPIDEMIOLOGIA E PSICHIATRIA SOCIALE-AN INTERNATIONAL JOURNAL FOR EPIDEMIOLOGY AND PSYCHIATRIC SCIENCES  
EPILEPSY & BEHAVIOR  
EUROPEAN CHILD & ADOLESCENT PSYCHIATRY  
EUROPEAN PSYCHIATRY  
GENERAL HOSPITAL PSYCHIATRY  
HARVARD REVIEW OF PSYCHIATRY  
INTELLECTUAL AND DEVELOPMENTAL DISABILITIES  
INTERNATIONAL CLINICAL PSYCHOPHARMACOLOGY  
INTERNATIONAL JOURNAL OF CLINICAL AND EXPERIMENTAL HYPNOSIS  
INTERNATIONAL JOURNAL OF EATING DISORDERS  
INTERNATIONAL JOURNAL OF GERIATRIC PSYCHIATRY  
INTERNATIONAL JOURNAL OF MENTAL HEALTH  
INTERNATIONAL JOURNAL OF METHODS IN PSYCHIATRIC RESEARCH  
INTERNATIONAL JOURNAL OF PSYCHIATRY IN MEDICINE  
INTERNATIONAL JOURNAL OF PSYCHOANALYSIS  
INTERNATIONAL JOURNAL OF SOCIAL PSYCHIATRY  
INTERNATIONAL PSYCHOGERIATRICS  
INTERNATIONAL REVIEW OF PSYCHIATRY  
IRISH JOURNAL OF PSYCHOLOGICAL MEDICINE  
ISRAEL JOURNAL OF PSYCHIATRY AND RELATED SCIENCES  
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JOURNAL OF ALZHEIMERS DISEASE  
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JOURNAL OF PSYCHIATRIC RESEARCH  
JOURNAL OF PSYCHIATRY & NEUROSCIENCE  
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JOURNAL OF THE AMERICAN PSYCHOANALYTIC ASSOCIATION  
JOURNAL OF TRAUMATIC STRESS  
MENTAL RETARDATION  
MOLECULAR PSYCHIATRY  
MOOD DISORDERS  
NEUROPSYCHIATRIE  
NEUROPSYCHIATRY NEUROPSYCHOLOGY AND BEHAVIORAL NEUROLOGY  
NEUROPSYCHOBIOLOGY  
NORDIC JOURNAL OF PSYCHIATRY  
PHARMACOPSYCHIATRY  
PRAXIS DER KINDERPSYCHOLOGIE UND KINDERPSYCHIATRIE  
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PSYCHIATRIC ANNALS  
PSYCHIATRIC CLINICS OF NORTH AMERICA  
PSYCHIATRIC QUARTERLY  
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PSYCHIATRY AND CLINICAL NEUROSCIENCES  
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PSYCHIATRY RESEARCH-NEUROIMAGING  
PSYCHIATRY-INTERPERSONAL AND BIOLOGICAL PROCESSES  
PSYCHOLOGICAL MEDICINE  
PSYCHOLOGIE & NEUROPSYCHIATRIE DU VIEILLISSEMENT  
PSYCHOLOGY AND PSYCHOTHERAPY-THEORY RESEARCH AND PRACTICE  
PSYCHOPATHOLOGY  
PSYCHOPHARMACOLOGY BULLETIN  
PSYCHOSOMATIC MEDICINE  
PSYCHOSOMATICS  
PSYCHOTHERAPY AND PSYCHOSOMATICS  
RESEARCH IN DEVELOPMENTAL DISABILITIES  
REVISTA BRASILEIRA DE PSIQUIATRIA  
SCHIZOPHRENIA BULLETIN  
SCHIZOPHRENIA RESEARCH  
SOCIAL PSYCHIATRY AND PSYCHIATRIC EPIDEMIOLOGY  
STRESS MEDICINE  
SUICIDE AND LIFE-THREATENING BEHAVIOR  
TRANSCULTURAL PSYCHIATRY  
TURK PSIKIYATRI DERGISI  
WORLD JOURNAL OF BIOLOGICAL PSYCHIATRY  
ZEITSCHRIFT FUR KINDER-UND JUGENDPSYCHIATRIE UND PSYCHOTHERAPIE  
ZEITSCHRIFT FUR PSYCHOSOMATISCHE MEDIZIN UND PSYCHOANALYSE  
ZHURNAL NEVROLOGII I PSIKHIATRII IMENI S S KORSAKOVA

## **Addiction**

ADDICTION  
ADDICTION BIOLOGY  
ADDICTION RESEARCH  
ADDICTION RESEARCH & THEORY  
ADDICTIVE BEHAVIORS  
ADDICTIVE DISEASES  
ADICCIONES  
ALCOHOL  
ALCOHOL AND ALCOHOLISM  
ALCOHOL AND DRUG RESEARCH  
ALCOHOL HEALTH & RESEARCH WORLD  
ALCOHOL RESEARCH & HEALTH  
ALCOHOLISM-CLINICAL AND EXPERIMENTAL RESEARCH  
AMERICAN INDIAN AND ALASKA NATIVE MENTAL HEALTH RESEARCH  
AMERICAN JOURNAL OF DRUG AND ALCOHOL ABUSE  
AMERICAN JOURNAL ON ADDICTIONS  
BRITISH JOURNAL OF ADDICTION  
BRITISH JOURNAL ON ALCOHOL AND ALCOHOLISM  
BULLETIN ON NARCOTICS  
CONTEMPORARY DRUG PROBLEMS  
DRUG AND ALCOHOL DEPENDENCE  
DRUG AND ALCOHOL REVIEW  
DRUGS-EDUCATION PREVENTION AND POLICY  
EUROPEAN ADDICTION RESEARCH  
INTERNATIONAL JOURNAL OF THE ADDICTIONS  
JOURNAL OF ADDICTION MEDICINE  
JOURNAL OF ADDICTIONS NURSING  
JOURNAL OF ADDICTIVE DISEASES  
JOURNAL OF ALCOHOL AND DRUG EDUCATION  
JOURNAL OF CHILD & ADOLESCENT SUBSTANCE ABUSE  
JOURNAL OF DRUG EDUCATION  
JOURNAL OF DRUG ISSUES  
JOURNAL OF GAMBLING STUDIES  
JOURNAL OF PSYCHEDELIC DRUGS  
JOURNAL OF PSYCHOACTIVE DRUGS  
JOURNAL OF STUDIES ON ALCOHOL  
JOURNAL OF STUDIES ON ALCOHOL AND DRUGS  
JOURNAL OF SUBSTANCE ABUSE  
JOURNAL OF SUBSTANCE ABUSE TREATMENT  
PSICOTHEMA  
RESEARCH ADVANCES IN ALCOHOL AND DRUG PROBLEMS  
RESEARCH COMMUNICATIONS IN ALCOHOL AND SUBSTANCES OF ABUSE  
RESEARCH COMMUNICATIONS IN SUBSTANCES OF ABUSE  
REVUE DE L'ALCOOLISME  
SUBSTANCE USE & MISUSE  
TOXICOMANIES

## **Senses and Communication Disorders**

ACTA OPHTHALMOLOGICA  
ACTA OPHTHALMOLOGICA SCANDINAVICA  
ADVANCES IN PAIN RESEARCH AND THERAPY  
AMERICAN ANNALS OF THE DEAF  
AMERICAN JOURNAL OF OPHTHALMOLOGY  
AMERICAN JOURNAL OF OPTOMETRY AND PHYSIOLOGICAL OPTICS

AMERICAN JOURNAL OF SPEECH-LANGUAGE PATHOLOGY  
ANESTHESIA AND ANALGESIA  
ANNALS OF OPHTHALMOLOGY  
ANNALS OF OPHTHALMOLOGY & GLAUCOMA  
ANNALS OF OPHTHALMOLOGY-GLAUCOMA  
APHASIOLOGY  
APPLIED PSYCHOLINGUISTICS  
ARCHIVES D OPHTALMOLOGIE  
ARCHIVES OF OPHTHALMOLOGY  
AUDIOLOGY  
AUDIOLOGY AND NEURO-OTOLOGY  
AUDITORY NEUROSCIENCE  
AUGMENTATIVE AND ALTERNATIVE COMMUNICATION  
AUSTRALIAN AND NEW ZEALAND JOURNAL OF OPHTHALMOLOGY  
AUSTRALIAN JOURNAL OF OPHTHALMOLOGY  
B-ENT  
BRITISH JOURNAL OF AUDIOLOGY  
BRITISH JOURNAL OF DISORDERS OF COMMUNICATION  
BRITISH JOURNAL OF OPHTHALMOLOGY  
CANADIAN JOURNAL OF OPHTHALMOLOGY-JOURNAL CANADIEN D OPHTALMOLOGIE  
CHEMICAL SENSES  
CHEMICAL SENSES & FLAVOUR  
CLINICAL AND EXPERIMENTAL OPHTHALMOLOGY  
CLINICAL AND EXPERIMENTAL OPTOMETRY  
CLINICAL JOURNAL OF PAIN  
CLINICAL LINGUISTICS & PHONETICS  
CLINICAL VISION SCIENCES  
COMMUNICATION AND COGNITION  
CORNEA  
CURRENT EYE RESEARCH  
CURRENT OPINION IN OPHTHALMOLOGY  
CURRENT PAIN AND HEADACHE REPORTS  
DEAFNESS AND EDUCATION  
DEVELOPMENTS IN OPHTHALMOLOGY  
DOCUMENTA OPHTHALMOLOGICA  
DOULEUR ET ANALGESIE  
EAR AND HEARING  
EAR NOSE & THROAT JOURNAL  
ENT-EAR NOSE & THROAT JOURNAL  
EUROPEAN JOURNAL OF DISORDERS OF COMMUNICATION  
EUROPEAN JOURNAL OF OPHTHALMOLOGY  
EUROPEAN JOURNAL OF PAIN  
EUROPEAN JOURNAL OF PAIN-LONDON  
EXPERIMENTAL EYE RESEARCH  
EYE  
EYE & CONTACT LENS-SCIENCE AND CLINICAL PRACTICE  
EYE EAR NOSE AND THROAT MONTHLY  
EYE-TRANSACTIONS OF THE OPHTHALMOLOGICAL SOCIETIES OF THE UNITED KINGDOM  
FOLIA OPHTHALMOLOGICA JAPONICA  
GERMAN JOURNAL OF OPHTHALMOLOGY  
GRAEFES ARCHIVE FOR CLINICAL AND EXPERIMENTAL OPHTHALMOLOGY

HEADACHE  
HEADACHE QUARTERLY-CURRENT TREATMENT AND RESEARCH  
HEARING RESEARCH  
INDIAN JOURNAL OF OPHTHALMOLOGY  
INTERNATIONAL JOURNAL OF AUDIOLOGY  
INTERNATIONAL JOURNAL OF LANGUAGE & COMMUNICATION DISORDERS  
INTERNATIONAL OPHTHALMOLOGY  
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IRANIAN JOURNAL OF OPHTHALMOLOGY  
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JOURNAL OF MUSCULOSKELETAL PAIN  
JOURNAL OF NEUROLINGUISTICS  
JOURNAL OF NEURO-OPHTHALMOLOGY  
JOURNAL OF OROFACIAL PAIN  
JOURNAL OF PAIN  
JOURNAL OF PAIN AND SYMPTOM MANAGEMENT  
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JOURNAL OF VOICE  
LOGOPEDICS PHONIATRICES VOICOLOGY  
METABOLIC AND PEDIATRIC OPHTHALMOLOGY  
METABOLIC PEDIATRIC AND SYSTEMIC OPHTHALMOLOGY  
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OCULAR IMMUNOLOGY AND INFLAMMATION  
OCULAR SURFACE  
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OPHTHALMIC EPIDEMIOLOGY

OPHTHALMIC GENETICS  
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OPHTHALMIC SURGERY AND LASERS  
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REGIONAL ANESTHESIA AND PAIN MEDICINE  
RETINA-THE JOURNAL OF RETINAL AND VITREOUS DISEASES  
SCANDINAVIAN AUDIOLOGY  
SPATIAL VISION  
SPEECH COMMUNICATION  
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TRANSACTIONS OF THE OPHTHALMOLOGICAL SOCIETIES OF THE UNITED KINGDOM  
VISION RESEARCH  
VISUAL COGNITION  
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VOLTA REVIEW

## **Pain**

ADVANCES IN PAIN RESEARCH AND THERAPY  
ANESTHESIA AND ANALGESIA  
CLINICAL JOURNAL OF PAIN  
CURRENT PAIN AND HEADACHE REPORTS  
DOULEUR ET ANALGESIE  
EUROPEAN JOURNAL OF PAIN  
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HEADACHE QUARTERLY-CURRENT TREATMENT AND RESEARCH  
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JOURNAL OF MUSCULOSKELETAL PAIN  
JOURNAL OF OROFACIAL PAIN  
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JOURNAL OF PAIN AND SYMPTOM MANAGEMENT  
MOLECULAR PAIN  
PAIN  
PAIN CLINIC

PAIN FORUM  
PAIN MANAGEMENT NURSING  
PAIN MEDICINE  
PAIN PHYSICIAN  
PAIN REVIEWS  
REGIONAL ANESTHESIA AND PAIN MEDICINE

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TISSUE ENGINEERING PART C-METHODS  
TRANSACTIONS AMERICAN SOCIETY FOR ARTIFICIAL INTERNAL ORGANS  
WOUND REPAIR AND REGENERATION

## **Nanomedicine**

DIGEST JOURNAL OF NANOMATERIALS AND BIOSTRUCTURES  
IEE PROCEEDINGS-NANOBIOLOGY  
IEEE TRANSACTIONS ON NANOBIOLOGY  
IET NANOBIOLOGY  
INTERNATIONAL JOURNAL OF NANOMEDICINE  
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MICROFLUIDICS AND NANOFUIDICS  
NANOBIOLGY  
NANOMEDICINE  
NANOMEDICINE-NANOTECHNOLOGY BIOLOGY AND MEDICINE  
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NATURE NANOTECHNOLOGY

## **Epigenetics**

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