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RTTA1 Nanotechnology Research Publication Databases: Updated to 2008

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This document presents summary results from the updating processes for the nanotechnology research publication databases developed at Georgia Tech as part of the Real Time Technology Assessment (RTTA1) component of the Center for Nanotechnology and Society (CNS-ASU). The source databases comprise Science Citation Index (SCI), INSPEC, and COMPENDEX. These records are cleaned and analyzed using VantagePoint textmining software.[1] In this document, nanotechnology is abbreviated as nano. Further details of the nano search strategy for developing the dataset are contained in Porter et al.[2] For more information, contact:

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[1] http://www.thevantagepoint.com/

[2] More information on the search strategy on which the information presented herein is based can be found in Porter, A.L., Youtie, J., Shapira, P., and Schoeneck, D.J., Refining Search Terms for Nanotechnology, Journal of Nanoparticle Research 2008, 10(5), 715-728.

Overview

This document presents summary results of the updating processes for the nanotechnology research publication databases developed at Georgia Tech as part of the Real Time Technology Assessment (RTTA1) component of the Center for Nanotechnology and Society (CNS-ASU).

In this document, we also provide an overview of changes in publication trends for the U.S. and China also using data from INSPEC and COMPENDEX. We add this focus because China has emerged as one of the fastest growing sources of new research and engineering publications, and we sought to check changes in the relative positions of the U.S. and China in engineering-focused domains.

SCI Updating

We have updated our database of nanotechnology publications using Science Citation Index (SCI) records from the Wedb of Science (WOS). The initial database was developed in 2006 (see Porter, et al., 2008) and contained records published from 1990 through to mid-2006. In the Fall of 2008, we updated the database with SCI records for the period 2006 through to June 2008.

We note one technical issue in updating the data from the 2006 base. Our SCI update encountered unexpected changes in the interface which influence the results of the search process. In the most recent iteration of the WOS interface, we discovered the inclusion of an "OR" operator between search terms. For example, while previous searches for the string "quantum dot*" would return all documents containing the terms "quantum" and "dot*," the most recent search for this string returned all documents containing either "quantum" or "dot*," producing a larger list of search results. We could not adjust the basic mechanics of the search process in a way that avoided this outcome. To correct for this, we manually searched all downloaded files using a search tool in Vantage Point (VP) and extracted all files containing the correct search strings. With the exception of this issue, the update process was a relatively smooth one. The search results appear in Table 1.

We note that for nanotechnology publications identified by our nano search terms, there has been growth in absolute annual publication numbers for every year from 1990 through to 2007. (Full data for 2008 will not be available until 2009.) However, there have been fluctuations in the rate of growth, with two "booms" observable. The first boom was in the early period, 1990-1996. The second boom appears in the period 2001-2005. In 2006-2007, the rate of nano publication growth slowed. However, as a percentage of all SCI publications, the nano share increased in every year from 1990 through to 2006. There was a slight turndown in this measure in 2007.

Table 2 shows a summary of these results. Again, we see that the percentage of nano publications compared with all SCI publications is larger in the most recent period.

It should be noted that these results may be influenced not only by “real” publication trends, but also by (a) changes over time in the number and mix of journals captured by SCI, although we have no reason to unduly suspect that this is biased for or against nanotechnology particularly given the interdisciplinary nature of this domain; (b) evolutions in the field which may mean that our nanotechnology search terms are less reliable now than in earlier years. However, since our search term is very comprehensive, such evolutions are likely to be gradual and result in a “drift” rather than the significant differences seen between 2006-2007 and 2005; and (c) yet to be added prior-year publication records in SCI (which might have an influence on the 2007 numbers, although this could affect both nano and total publications).

*Table 1. SCI nano publications compared with the total SCI data base, by year, 1990-2008**

Year	SCI Nano Publications			
	Annual	Change from Prior Year	SCI Total Publications	% Nano Publications
1990	1,881	--	685,171	0.27%
1991	7,584	303.2%	706,087	1.07%
1992	9,664	27.4%	720,452	1.34%
1993	11,418	18.1%	761,459	1.50%
1994	13,473	18.0%	799,848	1.68%
1995	14,990	11.3%	858,970	1.75%
1996	17,726	18.3%	900,495	1.97%
1997	20,058	13.2%	939,123	2.14%
1998	22,122	10.3%	946,046	2.34%
1999	24,842	12.3%	977,449	2.54%
2000	26,777	7.8%	989,467	2.71%
2001	30,462	13.8%	981,038	3.11%
2002	34,972	14.8%	1,030,367	3.39%
2003	40,813	16.7%	1,074,160	3.80%
2004	48,961	20.0%	1,137,183	4.31%
2005	58,739	20.0%	1,193,063	4.92%
2006	62,351	6.1%	1,258,742	4.95%
2007	63,283	1.5%	1,321,465	4.79%
2008*	27,860	--	512,717	5.43%

*2008 = mid-year figure covering 1/1/08 to 6/30/08. Source: Web of Science, using refined nano search terms detailed in Porter et al. (2008).

Table 2. Summary of nano publication share of all SCI publication records, 1990-2008

	1990-2005	2006-2008*	Total
Nano Records	384,482	153,494	537,976
Total Records	14,700,378	3,092,924	17,793,302
% Nano Records	2.62%	4.96%	3.02%

Source and definitions: See Table 1.

U.S. and China Nano Publications in INSPEC and COMPENDEX

The WOS SCI publication database is a multidisciplinary index based on about 150 scientific disciplines. INSPEC is an an additional publication database which focus on literature published in physics, electrical engineering, electronics, and communications, while COMPENDEX is a comprehensive database of publications in engineering disciplines.

Table 3 lists the most up to date figures for U.S. and Chinese INSPEC publications. These were obtained via a fee-based computer program called Dialog at the university library.

Table 3. All publications in INSPEC for China and the US

Year	INSPEC China	INSPEC U.S.	Ratio China / U.S.
1990	7,419	140,511	0.05
1991	7,369	141,420	0.05
1992	7,860	141,376	0.06
1993	8,696	150,465	0.06
1994	9,639	159,367	0.06
1995	10,229	166,511	0.06
1996	13,414	179,434	0.07
1997	14,020	179,118	0.08
1998	16,810	185,188	0.09
1999	18,506	187,433	0.10
2000	26,790	187,348	0.14
2001	29,290	187,596	0.16
2002	40,327	210,983	0.19
2003	46,125	214,774	0.21
2004	58,727	228,968	0.26
2005	71,277	248,579	0.29
2006	90,423	273,039	0.33
2007	119,887	284,804	0.42
2008*	56,355	172,168	--

*2008 = mid-year figure

Source: INSPEC. Based on country of origin of first author. Data for 2008 is incomplete.

Table 4 lists the most up to date figures for Chinese and U.S. COMPENDEX publications. These were also obtained using a Dialog search.

Table 4. All publications in INSPEC for China and the US

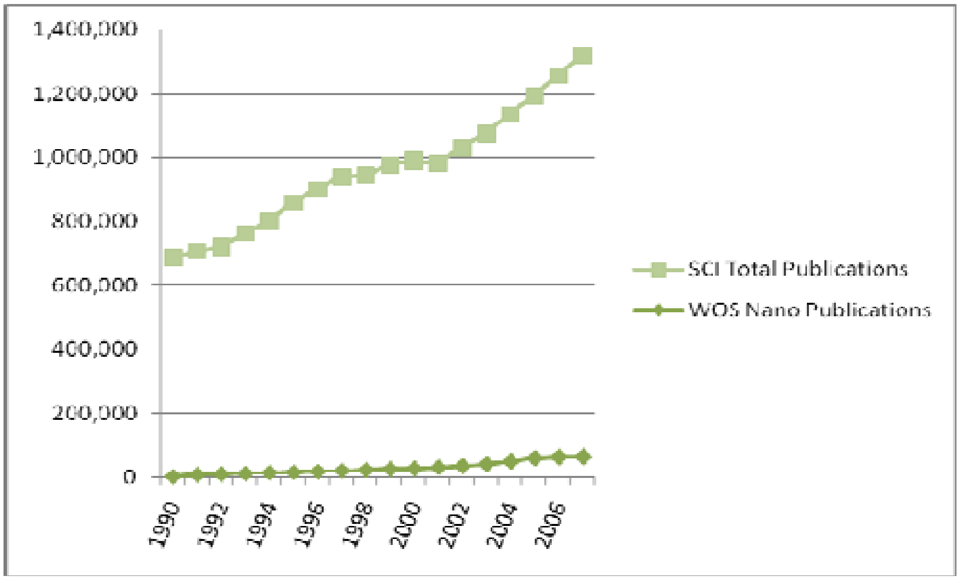
Year	Compendex: China	Compendex: U.S.	
1990	4,703	58,942	0.08
1991	5,765	53,853	0.11
1992	5,544	41,249	0.13
1993	11,656	61,398	0.19
1994	11,063	65,798	0.17
1995	12,106	65,669	0.18
1996	16,155	75,066	0.22
1997	18,259	76,807	0.24
1998	20,695	74,669	0.28
1999	18,551	72,271	0.26
2000	22,671	90,037	0.25
2001	31,443	177,019	0.18
2002	36,559	209,107	0.17
2003	45,191	240,482	0.19
2004	70,434	313,567	0.22
2005	88,466	345,790	0.26
2006	101,279	331,382	0.31
2007	122,868	337,347	0.36
2008*	92,915	204,372	--

*2008 = mid-year figure

Source: COMPENDEX. Based on country of origin of first author. Data for 2008 is incomplete.

The following figures graphically illustrate Tables 1, 3 and 4:

<u>Figure 1</u> (graph of Table 1)



<u>Figure 2</u> (graph of Table 3)

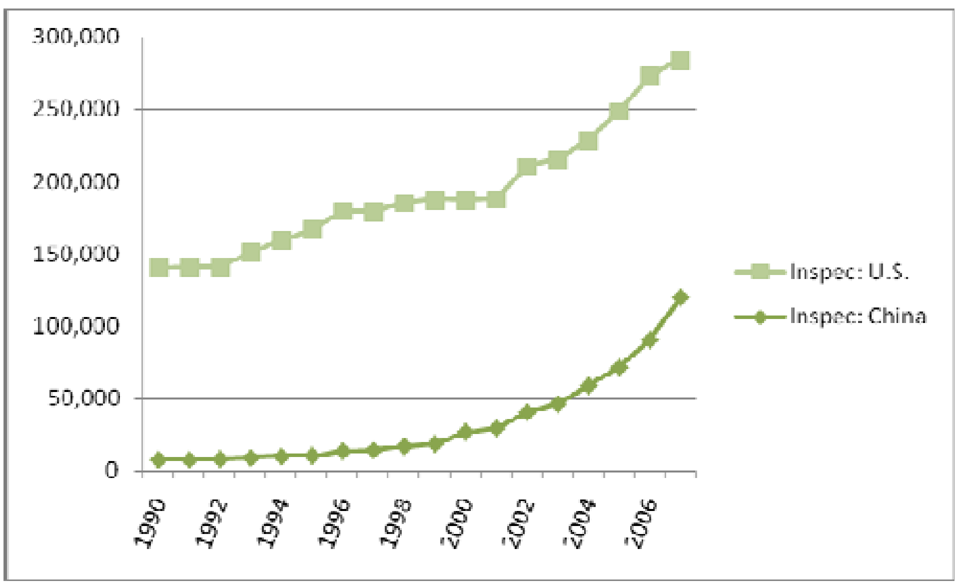
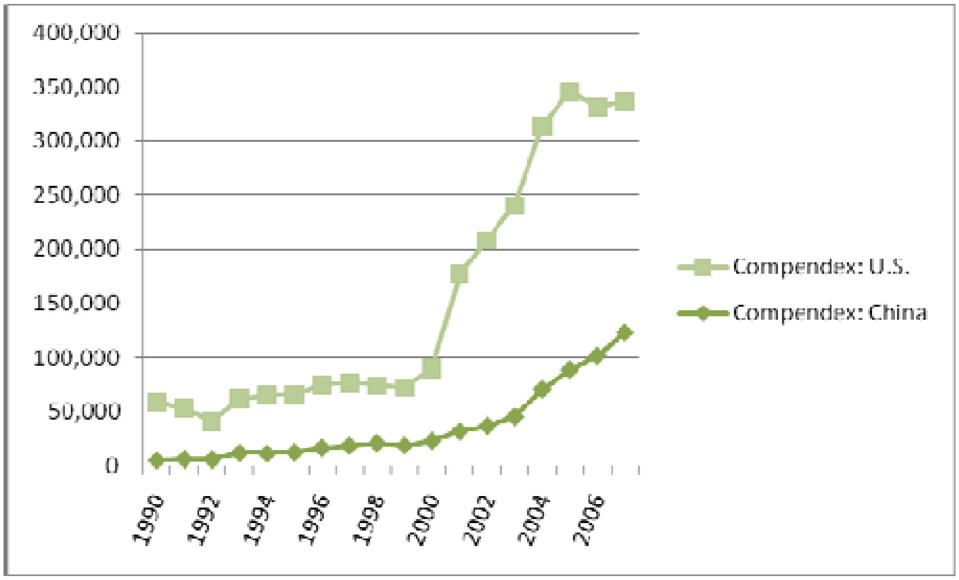


Figure 3 (graph of Table 4)



We note that, in Figure 3, the Compendex publications for the U.S. experience a noticable increase in the year 2001 and following. The same result is true for the other datasets but the trend is not as pronounced.