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Analyses : Featured Analyses : 2009 Jul/Aug - Brazilian Science on the Rise

## FEATURED ANALYSIS, July/August 2009

### Brazilian Science on the Rise

by Christopher King, Editor

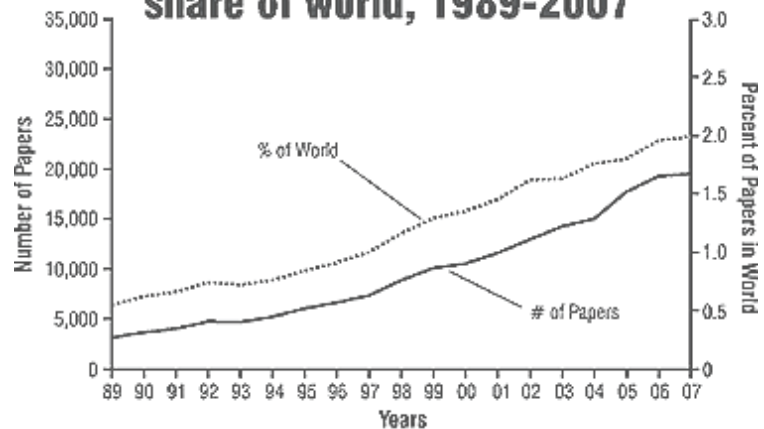


Over the last two decades, Brazil has been moving consistently upward in the output and impact of its scientific publications. This rise is in keeping with the country's status as one of the so-called BRIC nations (Brazil, of course, being the "B" in the acronym, along with Russia, India, and China), a group whose resources and economic potential, in the eyes of many observers, will likely give the quartet a significant share of the world's economic growth in the decades to come.

*Science Watch* has recently examined science in two of the BRIC nations: [India](#) (19[5]: 1-2, September/October 2008) and [China](#) (19[4]: 1-2, July/August 2008). Herewith, attention turns to Brazil.

For this assessment, *Science Watch* turned to the publication and citation statistics compiled in the Thomson Reuters *National Science Indicators*. The graph above tracks Brazil's output of Thomson Reuters-indexed papers, along with its percent share world science as reflected in the database, for each year between 1989 and 2007.

### Brazil: Number of papers and percent share of world, 1989-2007



SOURCE: Thomson Reuters National Science Indicators

As the graph to the right indicates, the rise in both of these indices has been steady, as the number of papers with at least one Brazil-based author address has increased six-fold during the period—from 3,176 papers in 1989 to more than 19,000 in 2007. Similarly, Brazil's percent share of world literature has grown from 0.56% in 1989 to 2.02% in 2007.

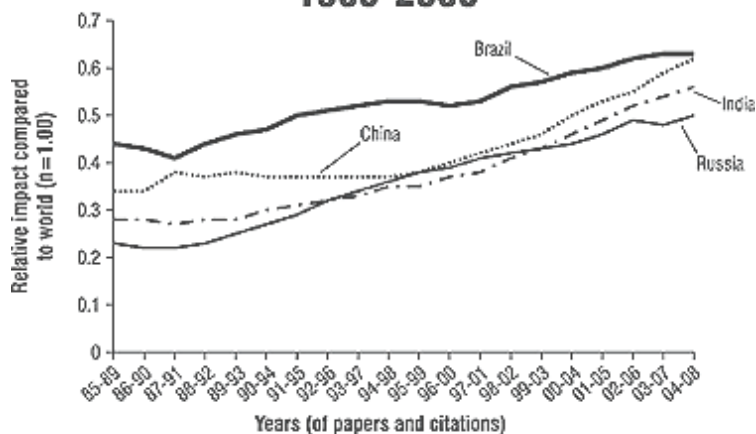
To further break down Brazil's scientific progress in recent years, *Science Watch* examined 21 main fields as covered in *National Science Indicators*, comparing Brazil's world share in two separate five-year periods: 1994 to 1998, and 2004 to 2008. The fields are listed in the [table](#) below, ranked in descending order from Brazil's highest percent share to the lowest during the latest five-year span. A third column at right gives the increase in percentage between the two periods.

As the table shows, Brazil's highest representation in the database is currently in agricultural sciences, with more than 5% of Thomson Reuters-indexed papers during the period—and with the increase between the 1994-98 and 2004-08 periods also representing the nation's highest rise of any field in the table. Second in the table, both in terms of Brazil's latest five-year share and in the increase since the earlier period, is plant & animal sciences.

To gauge the overall impact of Brazil's science, and to compare it to the other BRIC nations, the graph below charts a relative-impact score (that is, the nation's combined cites-per-paper mark representing all fields, compared against the world average) over a series of five-year overlapping periods between 1985 and 2008.

Since 1985, as can be seen in the top line of the graph, Brazil has logged the highest overall impact, compared to the world, of any of the BRIC nations (although none, including Brazil, has yet risen to match or exceed the overall world impact average). And, aside from a slight dip in the late 1980s, Brazil's impact has trended upward: from 44% of the world average in the 1985-89 period to 63% of the world mark for 2004-08. The graph, however, also suggests some doubt as to Brazil's continuing dominance in impact among the BRIC group, as India and, most noticeably, China, are both rising sharply in impact, while Brazil's trajectory in recent years has been comparatively flat.

### BRIC nations: Relative impact (all fields), 1985-2008



SOURCE: Thomson Reuters National Science Indicators

Although the graph does not show individual fields, figures from *National Science Indicators* indicate that engineering is the main specialty area in which Brazil scored highest in relative impact during the 2004-08 period: just 5% below the world mark.

Mathematics is also a relatively strong field, with Brazil scoring at 90% of the world average in the latest five-year window. Similarly, Brazil's overall impact mark of 3.71 cites per paper in physics is just 11% off the world figure of 4.71 cites per paper.

Progress in other fields can be assessed by comparing Brazil's relative impact in the latest five-year period against the earliest such span covered in *National Science Indicators*: 1981-85. By this measure, despite still lagging the world in impact, Brazil has come farthest in microbiology, starting with an impact average at only 24% of the world mark for 1981-85 and rising to within 57% (3.98 cites per paper for Brazil versus 7.03 cites for the world) during 2004-08. The nation has gained similarly in psychiatry/psychology (from 27% of the world score for 1981-85 to 60% in the latest five-year period) and space science (54% of the mark initially, increasing to 78% of the 2004-08 impact figure.)

In the last ten years, Brazil's most-cited paper (that is, exclusively featuring Brazil-based authors, as opposed to an international collaboration) is in the field of chemistry, as *Science Watch* determined by consulting the Thomson Reuters *Essential Science Indicators*. "Ionic liquid (molten salt) phase organometallic catalysis," (*Chemical Reviews*, 102[10]: 3667-91, 2002), by Jairton Dupont [ see also, see also], Roberto F. de Souza, and Paulo A.Z. Suarez, has now been cited more than 1,300 times. All three authors list their affiliation at the Universidade Federal do Rio Grande do Sul, Porto Alegre. ■

#### Brazil in World Science: 1994-98 vs. 2004-08

(Based on percent share of Thomson Reuters-indexed papers in each of 21 main fields, ranked by percentage in the latest five-year period, 2004-08)

Field	% in 94-98	% in 04-08	Increase in %
Agricultural Sciences	2.19	5.39	3.20
Plant & Animal Science	1.65	4.65	3.00
Microbiology	1.51	3.04	1.53
Pharmacology & Toxicology	1.06	2.84	1.78
Environment/Ecology	0.97	2.71	1.74
Neuroscience & Behavior	1.09	2.46	1.37
Physics	1.58	2.32	0.74
Immunology	0.96	2.25	1.29
Biology & Biochemistry	0.92	2.15	1.23


Space Science	1.72	2.15	0.43
Clinical Medicine	0.67	1.83	1.16
Molecular Biology & Genetics	1.04	1.81	0.77
Chemistry	0.87	1.78	0.91
Mathematics	1.11	1.78	0.67
Materials Science	0.66	1.52	0.86
Social Sciences	0.54	1.51	0.97
Engineering	0.62	1.46	0.84
Geosciences	0.79	1.45	0.66
Computer Science	0.59	1.35	0.76
Psychiatry/Psychology	0.18	0.86	0.68
Economics & Business	0.25	0.51	0.26

SOURCE: Thomson Reuters *National Science Indicators*.

**Christopher King is the Editor of the *Science Watch*® Newsletter, Thomson Reuters.**

KEYWORDS: BRAZIL, BRAZILIAN SCIENCE, SCIENCE IN BRAZIL, BRIC, BRAZILIAN IMPACT, RUSSIA, CHINA, INDIA.

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