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FEATURED ANALYSIS, September/October 2009

Austrian Science: Ascendant in Impact

by Christopher King, Editor



Since the 1980s, the impact of scientific papers from Austria has been rising steadily, from a point well below the overall world average to a current score that exceeds the world mark and surpasses the combined impact average of the European Union nations, while also comparing favorably to larger neighbor nations such as Germany.

To survey Austrian research performance, *Science Watch* turned to the Thomson Reuters *National Science Indicators* database and its store of publication and citation figures.

Graph# 1 to the right shows the relative citation impact for Austria—that is, the nation's cites-per-paper average reflecting all fields—compared to the overall world average (represented as 1.00 on the graph's y axis) over a series of overlapping five-year periods from 1985 to 2008. Also tracked, for comparison, are analogous scores from a couple of neighboring nations—one small (Belgium) and one large (Germany)—along with a combined impact figure representing the current 27 member nations of the European Union (EU).

Of these comparative nations, Belgium is roughly similar to Austria in output, having fielded approximately 16,000 papers in 2008, according to *National Science Indicators*, compared to Austria's 11,000-odd. Germany's 2008 output, meanwhile, was above 87,000, while the collective EU nations accounted for more than 425,000 papers.

As the graph indicates, from the mid-1980s to the early 1990s the impact of Austrian research lagged the world average, also scoring notably below Belgium, Germany, and the EU bloc.

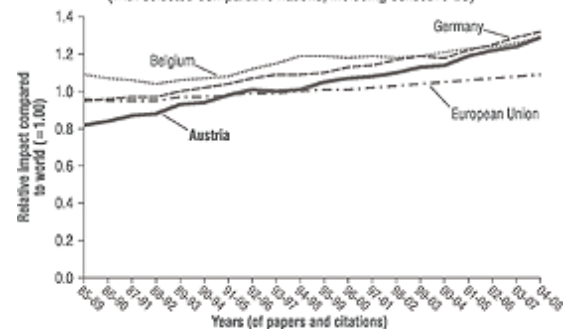
By the early 90s, however, Austria's overall impact was on the rise, first paralleling and then surpassing the EU figures, ultimately moving toward the scores of Belgium and Germany. As of the latest five-year period, reflecting 2004 to 2008, Austria's impact mark matched that of Germany precisely, coming in at 29% above the world average, just slightly below Belgium's score of 32% above the world baseline. (The EU's overall impact, meanwhile, registered at 9% above the world figure.)

For a closer look at Austria's recent concentration in science as reflected in the Thomson Reuters database, the table at the bottom of this page presents 21 main fields, showing Austria's percent share in each (that is, the number of papers bearing at least one author address in Austria, as a percentage of all Thomson Reuters-indexed papers) for the period 2004 to 2008.

Graph# 1

Austria: Relative citation impact, all fields, 1985-2008

(with selected comparative nations, including collective EU)



SOURCE: Thomson Reuters National Science Indicators

Austria's highest representation over the latest five-year period proved to be in Space Science, with participation in 818 reports, constituting 1.37% of the 59,699 papers in the field indexed by Thomson Reuters during that time. Clinical Medicine was next, with Austria's total of 12,974 papers (its highest actual paper tally of any of the fields shown) constituting 1.29% of the more than 1 million Clinical Medicine papers indexed during the five years.

The right-hand columns of the table show, respectively, Austria's cites-per-paper average in each field, and the nation's relative-impact score as compared to the world average for the 2004-08 period. In Space Science, for example, the impact of papers coauthored by Austria-based researchers was 15% below the average for the field (that is, Austria's score of 6.05 cites per paper compared to the world Space Science impact average of 7.14 cites per paper).

By contrast, the impact of Austria's 4,686 Thomson Reuters-indexed papers in the main field of Physics registered at 67% above the impact figure for the field (6.96 versus the world mark of 4.16). Plant & Animal Science proved to be another area of solid relative impact, with Austria's average of 4.21 cites per paper surpassing the world figure of 3.17 by 33%. Overall, in all but three of these main fields, the impact of Austria exceeded the world average.

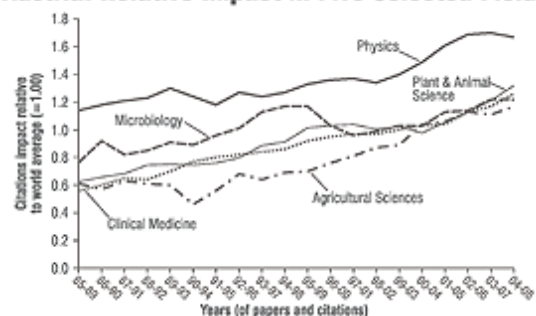
The fields of Physics and Plant & Animal Science also feature prominently in graph# 2 above, which tracks relative impact in five selected disciplines since 1985, in a series of overlapping five-year periods. Physics is clearly dominant, proceeding from a mark of 14% above the world average to its latest standing at +67%.

The five fields shown were selected by virtue of their notable upward progress since the 1985-89 period. By that measure, none surpassed Clinical Medicine, in which the impact of Austria-based research rose from more than 40% below the world average to its current score at 26% above. (The progress is even more striking if one looks farther back to 1981-85, before the initial period shown in the graph, when Austria's impact in Clinical Medicine was 56% below the world baseline.) Agricultural Sciences, similarly, rose from nearly 40% below the world figure to 17% above in the latest period.

Finally, for a quick look at Austria's most-cited paper of recent years, *Science Watch* consulted Thomson Reuters *Essential Science Indicators*SM, which tracks highly cited research over the last decade. For that period, the most-cited paper featuring an Austria-based author is a 1999 report on the physics of materials, "From ultrasoft pseudopotentials to the projector augmented-wave method," (*Physical Review B*, 59[3]: 1758-75, 1999), by Georg Kresse of the University of Vienna (and coauthor Daniel Joubert, University of the Witwatersrand, South Africa), now cited more than 4,000 times. ▀

Graph# 2

Austria: Relative Impact in Five Selected Fields



SOURCE: Thomson Reuters National Science Indicators

Austria: Output and Impact by Field

(Ranked by percent share of Thomson Reuters-indexed papers, 2004-08)

| Rank | Field | World share (%), 2004-08 | Number of papers | Citations per paper | Relative impact vs. world (%) |
|------|------------------------------|--------------------------|------------------|---------------------|-------------------------------|
| 1 | Space Science | 1.37 | 818 | 6.05 | -15 |
| 2 | Clinical Medicine | 1.29 | 12,974 | 7.25 | +26 |
| 3 | Immunology | 1.27 | 761 | 11.46 | +16 |
| 4 | Geosciences | 1.13 | 1,546 | 4.50 | +14 |
| 5 | Computer Science | 1.12 | 1,685 | 1.49 | -1 |
| 6 | Mathematics | 1.10 | 1,379 | 1.76 | +29 |
| 7 | Molecular Biology & Genetics | 1.06 | 1,461 | 15.02 | +33 |

| | | | | | |
|----|---------------------------|------|-------|------|-----|
| 8 | Neuroscience & Behavior | 1.05 | 1,535 | 8.38 | +4 |
| 9 | Physics | 1.00 | 4,686 | 6.96 | +67 |
| 10 | Microbiology | 1.00 | 812 | 8.56 | +22 |
| 11 | Plant & Animal Science | 0.99 | 2,663 | 4.21 | +33 |
| 12 | Biology & Biochemistry | 0.96 | 2,621 | 7.63 | +3 |
| 13 | Economics & Business | 0.96 | 700 | 1.60 | -25 |
| 14 | Environment/Ecology | 0.91 | 1,206 | 4.54 | +2 |
| 15 | Pharmacology & Toxicology | 0.87 | 787 | 6.24 | +15 |
| 16 | Materials Science | 0.85 | 1,964 | 3.79 | +25 |
| 17 | Chemistry | 0.72 | 4,236 | 5.92 | +17 |
| 18 | Engineering | 0.69 | 2,711 | 2.17 | +10 |
| 19 | Psychiatry/Psychology | 0.65 | 782 | 4.73 | +11 |
| 20 | Agricultural Sciences | 0.55 | 546 | 3.36 | +17 |
| 21 | Social Sciences | 0.41 | 813 | 1.80 | -9 |

SOURCE: Thomson Reuters *National Science Indicators*

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

KEYWORDS: AUSTRIA, AUSTRIAN SCIENCE, SCIENCE IN AUSTRIA, AUSTRIAN IMPACT, EUROPEAN UNION.

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