

- [ScienceWatch Home](#)
- [Inside This Month...](#)
- [Interviews](#)

- [Featured Interviews](#)
- [Author Commentaries](#)
- [Institutional Interviews](#)
- [Journal Interviews](#)
- [Podcasts](#)

Analyses

- [Featured Analyses](#)
- [What's Hot In...](#)
- [Special Topics](#)

Data & Rankings

- [Sci-Bytes](#)
- [Fast Breaking Papers](#)
- [New Hot Papers](#)
- [Emerging Research Fronts](#)
- [Fast Moving Fronts](#)
- [Research Front Maps](#)
- [Current Classics](#)
- [Top Topics](#)
- [Rising Stars](#)
- [New Entrants](#)
- [Country Profiles](#)

About Science Watch

- [Methodology](#)
- [Archives](#)
- [Contact Us](#)
- [RSS Feeds](#)


[Interviews](#)
[Analyses](#)
[Data & Rankings](#)

Analyses : [Featured Analyses](#) : [Energy Gauge: Who Exactly Is In Power?](#)

FEATURED ANALYSIS, November/December 2008

Energy Gauge: Who Exactly Is In Power?

by Christopher King, Editor



Few topics these days are as pervasive and pressing as the discussion about energy: how it immediately affects matters both economic and political, and how the search for new and alternative technologies must be a priority. Accordingly, *Science Watch*® turns its attention to energy as a focus of scientific research.

To identify highly cited energy research of recent years, *Science Watch* turned to the "Energy & Fuels" category in which journals are covered in the *Science Citation Index*, part of the *Thomson Reuters Web of Knowledge*. This population of 94 specialty journals produced roughly 100,000 papers indexed by Thomson Reuters between 1998 and 2008. From that body of research, *Science Watch* identified the most-cited institutions, authors, and journals.

The two tables below present institutions ranked according to two separate measures: the **first table** (1a), by total citations to Energy & Fuels papers published and cited during the 1998 to 2008 period; and, the **second table** (1b), by impact, or citations per paper, among those institutions that published at least 100 papers in the category during the 11-year span. Highly cited authors and journals are featured in the **bottom table** (2).

Among institutions ranked by total citations, none surpasses Sandia National Laboratories, with more than 4,100 citations to its 395 papers, although another U.S. Department of Energy installation, the National Renewable Energy Laboratory (NREL), of Golden, Colorado, is not far behind. Along with these and other U.S. national facilities, the total-citations ranking features comparable government institutions representing other nations, including Spain's Consejo Superior de Investigaciones Cientificas (CSIC), France's Centre National de le Recherche Scientifique (CNRS), and Japan's National Institute of Advanced Industrial Science and Technology (AIST), along with the national science academies of China and Russia.

Nevertheless, in the midst of these large national institutions, a number of universities also make strong showings in the total-citations column, notably Pennsylvania State University, Imperial College London, and Princeton University.

Princeton, in fact, winds up atop the impact ranking, with an average of 13 citations to its 210 papers indexed in the Energy & Fuels category since 1998. Helping to anchor Princeton's standout performance are two featured names in the author table: the late Supramaniam Srinivasan, who contributed to highly cited surveys of **fuel-cell** research; and C.K. Law, who has published prolifically on aspects of combustion.

Just behind Princeton, a solid impact score is also posted by the Jülich

Most-Cited Journals in Energy & Fuels, 1998-2008

(Ranked by citations to papers published and cited between 1998 and 2008)

Rank	Journal	Citations
1	Journal of Power Sources	71,741
2	Bioresource Technology	26,617
3	Fuel	19,247
4	Solar Energy Mater. & Solar Cells	18,063
5	Energy & Fuels	17,650
6	Combustion and Flame	17,448
7	Intl. J. of Hydrogen Energy	16,186
8	Energy Conversion & Management	10,051

Research Centre (Forschungszentrum Jülich), a German national laboratory, thanks to its highly cited papers on photovoltaics, methanol fuel cells, and other topics.

Among authors, Ayhan Demirbas of Karadeniz Technical University in Trabzon, Turkey, collected nearly 1,900 citations on an output that exceeded 200 papers. (Of course, a prolific output by itself is no guarantee of high citations; besides Demirbas, eight other authors fielded more than 200 papers in this survey, but none of these names garnered more than 15 total citations.) Papers to which Demirbas contributed primarily discuss **biofuels**, along with broader aspects of energy policy in Turkey.

In the above **table** to the right, the *Journal of Power Sources* distinguishes itself with more than 71,000 collective citations to 7,705 papers indexed by Thomson Reuters since 1998—a total more than twice that of the next journal in the ranking.

Overall, the most-cited paper in this survey, from 1999, reports the achievement of 18.8% conversion efficiency in a thin-film **solar cell** (M.A. Contreras, *et al.*, *Prog. Photovoltaics*, 7: 311-6, 1999). The paper's current citation total of 465 considerably boosted the tallies of four authors featured here (all affiliated with the NREL at the time): Miguel Contreras, Rommel Noufi, Kannan Ramanathan, and Falah Hasoon. ■

9	Biomass & Bioenergy	8,234
10	Energy Policy	8,168
11	Proc. of the Combustion Institute	7,845
12	Fuel Processing Technology	7,205
13	Solar Energy	6,979
14	Applied Thermal Engineering	6,288
15	AAPG Bulletin	6,046

SOURCE: Thomson Reuters *Science Citation Index*.

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

Table 1a 

Energy & Fuels: Institutions Ranked by Citations (among those that published = 100 papers, 1998-2008)		
Rank	Institution	Citations 1998-2008
1	Sandia National Labs	4,147
2	Natl. Renewable Energy Lab	3,773
3	CSIC (Spain)	3,678
4	Chinese Academy of Sciences	3,541
5	Indian Institutes of Technology	3,166
6	Pennsylvania State University	2,870
7	Imperial College London	2,823
8	Princeton University	2,744
9	University of Illinois	2,647
10	Tohoku University	2,609
11	CNRS (France)	2,598
12	AIST (Japan)	2,482
13	Argonne National Lab	2,438
14	Lawrence Berkeley National Lab	2,331
15	Technical University of Denmark	2,278
16	MIT	2,215
17	Russian Academy of Sciences	2,175
18	Fraunhofer Institute Solar Energy Systems	2,099
19	University of Leeds	2,062
20	Stanford University	1,990
21	Tsinghua University	1,932
22	Chalmers University of Technology, Sweden	1,904
23	University of Kentucky	1,797

24	University of Sydney	1,764
25	University of New South Wales	1,722

SOURCE: Thomson Reuters *Science Citation Index*.

Table 1b 

Energy & Fuels: Institutions Ranked by Citation Impact (among those that published = 100 papers, 1998-2008)		
Rank	Institution	Impact 1998-2008
1	Princeton University	13.07
2	Jülich Research Centre, Germany	12.76
3	National Renewable Energy Lab	11.13
4	Cornell University	11.10
5	University of Victoria	11.03
6	Argonne National Lab	10.79
7	Sandia National Labs	10.50
8	North Carolina State University	10.46
9	Yale University	10.41
10	University of Sydney	9.75
11	Fraunhofer Institute Solar Energy Systems	9.72
12	MIT	9.63
13	United States Army	9.22
14	University of Ulster	8.94
15	Uppsala University	8.76
16	University of California, Berkeley	8.61
17	Karadeniz Technical University, Turkey	8.53
18	Oak Ridge National Lab	8.48
19	University of Queensland	8.34
20	University of Illinois	8.32
21	Yonsei University	8.13
22	University of Delaware	8.09
23	Paul Scherrer Institute, Zurich	8.06
24	University of Kentucky	8.06
25	Korea Institute of Science & Technology	8.05

SOURCE: Thomson Reuters *Science Citation Index*.

Table 2: 

Highly Cited Authors in Energy & Fuels, 1998-2008

(Ranked by total citations)

Rank	Name	Institution	Concentration	Papers	Citations
1	Ayhan Demirbas	Karadeniz Tech. U., Turkey	Biofuels	245	1,891
2	Rafael Kandiyoti	Imperial College London	Coal Derivatives	111	1,045
3	Rommel Noufi	Natl. Renewable Energy Lab	Solar Cells	17	959
4	Imbrahim Dincer	U. Ontario Inst. Technol.	Fuel Cells	94	910
5	Kim Dam-Johansen	Tech. Univ. Denmark	Combustion	48	877
6	Kannan Ramanathan	Natl. Renewable Energy Lab	Solar Cells	10	874
7	Falah Hasoon	Natl. Renewable Energy Lab	Solar Cells	9	871
8	Miguel Contreras	Natl. Renewable Energy Lab	Solar Cells	8	843
9	Arif Hepbasli	Ege University, Turkey	Technology & Policy	116	794
10	Supramaniam Srinivasan*	Princeton University	Fuel Cells	8	780
11	Khalil Amine	Argonne Natl. Lab	Battery Technology	41	773
12	Poonam Nigam	University of Ulster	Bioconversion	14	751
13	Chung K. Law	Princeton University	Combustion	86	744
14	Masaki Yoshio	Saga University	Battery Technology	44	740
15	Charles K. Westbrook	Livermore Natl. Lab	Combustion	23	735
16	Doron Aurbach	Bar-Ilan University, Israel	Energy Storage	40	721
17	Kamil Kaygusuz	Karadeniz Tech. U.	Technology & Policy	81	703
18	Chao-Yang Wang	Pennsylvania State Univ.	Fuel Cells	39	702
19	James C. Hower	University of Kentucky	Coal Geology	83	700
20	Alan A. Herod	Imperial College London	Coal Derivatives	63	690
21	Martin A. Green	Univ. New South Wales	Solar Cells	63	674
22	William J. Pitz	Livermore Natl. Lab	Kinetics/Combustion	21	671
23	Jürgen O. Besenhardt†	Graz Univ. Technol.	Battery Technology	32	665
24	Robert W. Bilger	University of Sydney	Combustion	36	652
25	Martin Winter	University of Münster	Battery Technology	26	647

SOURCE: Thomson Reuters *Science Citation Index*.

*Deceased 2004 † Deceased 2006

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

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[Analyses](#) : [Featured Analyses](#) : [Energy Gauge: Who Exactly Is In Power?](#)

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