

SCIENCEWATCH

THE HOTTEST SCIENTIFIC RESEARCHERS AND RESEARCH

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WHO ARE THE THOUGHT LEADERS IN SCIENCE?

2012 was a year in which science made headlines. A year when a very small particle caused a very big stir. And a year in which, as always, a select few researchers saw their recent work attract a notably high degree of attention from other scientists. This annual report features the who's who and what's what of scientific researchers and research. These are the thought leaders of today. They are the individuals whose research is blazing new frontiers and shaping tomorrow's world.

This report highlights the researchers who, according to citations tracked during 2012, authored the most "Hot Papers" published over the preceding two years, as well as the papers published during 2012 that were most cited by year's end.

HUNT FOR THE “GOD PARTICLE” CHANGES THE FACE OF SCIENCE

The big news in science over the last year made for big news around the world: the announcement that experiments at the Large Hadron Collider (LHC) at CERN had produced evidence of the Higgs boson—the long-sought particle that ties together many elements of the Standard Model, the framework for explaining the fundamental forces at work in the universe.

The Higgs hunt looms large on the list of 2012’s most-cited papers, accounting for the #1 and #2 entries (both with approximately 200 citations by late December) along with nine other reports—in all, more than a fifth of the 51 featured papers.

The epic scale of the Higgs boson research has also fundamentally changed the face of scientific research with its emphasis on mass collaboration. Continuing the trend we first reported on last year, the Higgs research has

become the quintessential example of the growth in multi-author papers. Several Higgs-related papers published last year from the ATLAS and CMS collaborations at CERN listed upwards of 3,000 authors each.

These large collaborations, however, do not lend themselves to the space restrictions in this report’s listing of hot researchers, which features authors who recorded 11 or more Hot Papers in the course of 2012. So, in lieu of featuring the many hundreds of individual names, we are bestowing a collective honorable mention on the scientists of the ATLAS Collaboration, 22 of whose recent reports registered as Hot Papers during 2012. Kudos also to the CMS Collaboration, which posted nine Hot Papers, and to another experiment at CERN, the ALICE detector, with four.

GENOMICS AND BIOMEDICINE

Returning from last year's roundup, Richard K. Wilson of Washington University in St. Louis (WUSTL) leads the featured authors with multiple Hot Papers. Among his 15 key works is a *Nature* report, "A map of human genome variation from population-scale sequencing" (1000 Genomes Project, *Nature*, 467(7319): 1061-73, 2010). This report also figured in the previous ScienceWatch roundup for 2011 and has remained among biology's most-cited papers. Joining Wilson on this and several other reports, and thus earning inclusion in this year's roundup, were WUSTL colleagues Elaine Mardis, Li Ding and Robert Fulton. Two of these reports wound up in the table of the year's most-cited papers (#28, #39).

A few other authors of the *Nature* blockbuster made this year's hot list, including Jun Wang of BGI (originally the Beijing Genomics Institute). Wang's 13 additional Hot Papers present genomic data on, among other organisms, *E. coli*, the potato, and two species of ant.

A very familiar name to ScienceWatch, Eric Lander of the Broad Institute of MIT and Harvard, now making his ninth appearance in our annual roundup, can also count the *Nature* report among his Hot Papers, along with 12 other reports. These include discussions of general aspects of genomics along with specific studies of cancers of the ovaries, blood and brain. A 2012 report to which Lander contributed, on "missing heritability," also ranked among the year's hottest papers (#24).

The last of the current crop to share authorship on the highly cited *Nature* report is another returnee from last year, biostatistician Goncalo

Abecasis of the University of Michigan. In all, Abecasis contributed to a dozen recent papers that registered as hot during 2012, including genome-wide association studies on diabetes, body-mass index, and cardiovascular disease risk.

With 14 Hot Papers, Gregory Y.H. Lip of the University of Birmingham makes his first appearance in a year-end survey, thanks to reports on various aspects of atrial fibrillation. Another first-time honoree, Rob Knight of the Howard Hughes Medical Institute, University of Colorado, also recorded 14 Hot Papers. These examine the human "microbiome," the spectrum of microbial life that inhabits the human body.

After an absence from last year's list, Kari Stefansson of deCODE Genetics returns to the table of hot authors by virtue of 13 reports on genomic aspects of Parkinson's disease, schizophrenia and Alzheimer's.

Jeffrey A. Sosman of Vanderbilt University and Keith T. Flaherty of Massachusetts General Hospital each recorded 11 Hot Papers on oncology during 2012. The two researchers were actually among the coauthors on five of their reports, on papers examining compounds that fight metastatic melanoma by inhibiting an enzyme known as BRAF, which is associated with a genetic mutation underlying nearly half the instances of that disease. Two of these reports appeared in 2012 and ranked among the year's most cited (#10, #30). A recent Thomson Reuters report on Research Fronts includes a discussion of BRAF inhibitors in the treatment of melanoma.

Cancer is also the focus of 11 Hot Papers by another returnee from last year's list: P. Andrew Futreal of the M.D. Anderson Cancer Center. One of these papers, a 2012 *New England Journal of Medicine* report on "intratumor heterogeneity," logged nearly 150 citations by year's end and ranked #4 in the listing of 2012's hottest. (Note: the paper's corresponding author, Charles Swanton, discussed the report with ScienceWatch last year.)

Eleven Hot Papers return Salim Yusuf of McMaster University to the list from last year. The reports concern interventions in various cardiovascular conditions, including evaluation of the compounds dabigatran and warfarin for stroke prevention in patients with atrial fibrillation. Among his coauthors on two of these reports is Lars Wallentin of Uppsala University, who also scored 11 Hot Papers overall. One of these, on the thrombin-receptor antagonist vorapaxar, wound up at #47 among the year's most cited.



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MATERIALS RESEARCH

Along with the biomedical specialists, representatives from the physical sciences also registered strongly on the list of authors. Yongfang Li of the Institute of Chemistry, Chinese Academy of Sciences, contributed to 14 Hot Papers on polymer solar cells employing fullerene derivatives and other materials. Cells that incorporate polymers to harness the sun's energy—although their development currently lags the more commercially established technology using silicon—are ultimately expected to yield low-cost and versatile alternatives to conventional electricity. Polymer solar cells, therefore, currently constitute an extremely active area of materials research.

Working in this same area is Frederik C. Krebs of the Technical University of Denmark, another returnee from last year's list, whose 11 papers discuss polymer solar cells. One report, now cited roughly 200 times, describes the manufacture and integration of polymer solar cells in a lamp for the "Lighting Africa" initiative, as Krebs discussed with ScienceWatch in 2011. Krebs is also featured in the recent report on Research Fronts, in a section examining polymer solar-cell research.

Rodney S. Ruoff of the University of Texas, Austin, fielded a dozen Hot Papers on graphene, examining means for synthesizing and harnessing the compound in such applications as electrodes for supercapacitors and anode material for lithium ion batteries.

Graphene also figures in the work of Jianguo Yu of Wuhan University of Technology. Yu's 12 Hot Papers report on graphene nanosheets and graphene-based semiconductor photocatalysts, along with other materials, including titanium-dioxide nanotube arrays.

Graphene, consisting of a hexagonal arrangement of carbon atoms at a thickness of a single atom, has been very actively investigated over the last decade for a variety of applications in electronics and biomedicine.

Similarly, Hui-Ming Cheng of Shenyang National Laboratory for Materials Science, featured last year, returns to the list with 11 papers on advanced materials for energy storage, such as hybrid materials that combine graphene with other compounds.

BIG DATA RESEARCH


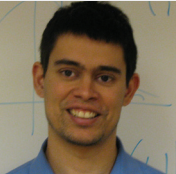

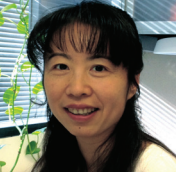








Outside the realm of materials, Zidong Wang of Brunel University recorded 12 Hot Papers presenting complex mathematical and statistical operations for the analysis of large datasets. This work (e.g., “A stochastic sampled-data approach


to distributed H-infinity filtering in sensor networks”) has found application in engineering, mathematics, computer science, physics, automation control and mechanics.



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THE HOTTEST SCIENTIFIC RESEARCHERS OF 2012*

 <p>Richard K. Wilson Washington University, St. Louis <i>Field: Genomics</i> <i># of Hot Papers: 15</i></p>	 <p>Goncalo Abecasis University of Michigan <i>Field: Biostatistics</i> <i># of Hot Papers: 12</i></p>
 <p>Yongfang Li Inst. of Chemistry, Chinese Academy of Sciences <i>Field: Chemistry/Materials</i> <i># of Hot Papers: 14</i></p>	 <p>Li Ding Washington University, St. Louis <i>Field: Genomics</i> <i># of Hot Papers: 12</i></p>
 <p>Gregory Y. H. Lip University of Birmingham <i>Field: Cardiology</i> <i># of Hot Papers: 14</i></p>	 <p>Elaine Mardis Washington University, St. Louis <i>Field: Genomics</i> <i># of Hot Papers: 12</i></p>
 <p>Jun Wang BGI <i>Field: Genomics</i> <i># of Hot Papers: 14</i></p>	 <p>Rodney S. Ruoff University of Texas, Austin <i>Field: Materials</i> <i># of Hot Papers: 12</i></p>
 <p>Eric S. Lander Broad Inst. of MIT at Harvard <i>Field: Genomics</i> <i># of Hot Papers: 13</i></p>	 <p>Jianguo Yu Wuhan University of Technology <i>Field: Materials</i> <i># of Hot Papers: 12</i></p>
 <p>Kari Stefansson deCODE Genetics <i>Field: Genomics</i> <i># of Hot Papers: 13</i></p>	 <p>Zidong Wang Brunel University <i>Field: Computing/Data Analysis</i> <i># of Hot Papers: 12</i></p>

	<p>Hui-Ming Cheng Shenyang National Laboratory</p> <p><i>Field: Materials</i> <i># of Hot Papers: 11</i></p>
	<p>Robert Fulton Washington University, St. Louis</p> <p><i>Field: Genomics</i> <i># of Hot Papers: 11</i></p>
	<p>P. Andrew Futreal U. Texas MD Anderson Cancer Ctr.</p> <p><i>Field: Genomics</i> <i># of Hot Papers: 11</i></p>
	<p>Frederik C. Krebs Technical University of Denmark</p> <p><i>Field: Materials/Energy</i> <i># of Hot Papers: 11</i></p>
	<p>Jeffrey A. Sosman Vanderbilt University</p> <p><i>Field: Oncology</i> <i># of Hot Papers: 11</i></p>
	<p>Lars Wallentin Uppsala University</p> <p><i>Field: Cardiology</i> <i># of Hot Papers: 11</i></p>
	<p>Salim Yusuf McMaster University</p> <p><i>Field: Cardiology/Epidemiology</i> <i># of Hot Papers: 11</i></p>

Not pictured:

<p>Rob Knight Howard Hughes Med. Inst., University of Colorado</p> <p><i>Field: Bioinformatics</i> <i># of Hot Papers: 14</i></p>
<p>Keith T. Flaherty Massachusetts General Hospital</p> <p><i>Field: Oncology</i> <i># of Hot Papers: 11</i></p>

*Based on number of Hot Papers
Source: Thomson Reuters Web of Science®

THE HOTTEST PAPERS

The following table lists the most-cited reports published during calendar year 2012 (omitting review articles and other summary reports in favor of “discovery accounts”), with citations tallied through late December. As in previous reports, the list carries the caveat that papers published early in the year have an obvious advantage in accruing citations, although this factor did not appear to overly affect the top five works, all of which appeared after March 1.

Among journals, the *New England Journal of Medicine* can boast the highest number of papers, with 13. Journals from the *Nature* family logged

nine appearances, while the Higgs surge helped *Physics Letters B* land eight, including the year’s top two.

In all, a big year for big science, given the preponderance of Higgs reports on the list. This table also attests to the ongoing effort to develop alternate energies—specifically, polymer solar cells (#5, #7, #19, #25). And abiding health concerns, both in the developing world (malaria, #9) and the developed world (obesity and cardiovascular disease: #12, #13, #15, #31, #35, #41, #43, #47) achieved high visibility among 2012’s most readily visible papers.

RANK	PAPER	FIELD	CITATIONS
1	G. Aad, <i>et al.</i> , “Combined search for the Standard Model Higgs boson using up to 4.9fb ⁻¹ of pp collision data at root s=7 TeV with the ATLAS detector at the LHC,” <i>Phys. Lett. B</i> , 710(1): 49-66, 29 March 2012.	Physics	202
2	S. Chatrchyan, <i>et al.</i> , “Combined results of searches for the Standard Model Higgs boson in pp collisions at root s=7 TeV,” <i>Phys. Lett. B</i> , 710(1): 26-48, 29 March 2012.	Physics	195
3	F.P. An, <i>et al.</i> , “Observation of electron-antineutrino disappearance at Daya Bay,” <i>Phys. Rev. Lett.</i> , 108(17): No. 171803, 23 April 2012.	Physics	144
4	M. Gerlinger, <i>et al.</i> , “Intratumor heterogeneity and branched evolution revealed by multiregion sequencing,” <i>New Engl. J. Med.</i> , 366(10): 883-92, 8 March 2012.	Genetics/ Oncology	143
5	L.T. Dou, <i>et al.</i> , “Tandem polymer solar cells featuring a spectrally matched low-bandgap polymer,” <i>Nature Photonics</i> , 6(3): 180-5, March 2012.	Materials	106
6	J.R. Lemen, <i>et al.</i> , “The Atmospheric Imaging Assembly (AIA) on the Solar Dynamics Observatory (SDO),” <i>Solar Physics</i> , 275(1-2): 17-40, January 2012.	Space Science	103
7	Y.M. Sun, <i>et al.</i> , “Solution-processed small-molecule solar cells with 6.7% efficiency,” <i>Nature Materials</i> , 11(1): 44-8, January 2012.	Materials	103
8	J.K. Ahn, <i>et al.</i> , “Observation of reactor electron antineutrinos disappearance in the RENO experiment,” <i>Phys. Rev. Lett.</i> , 108(19): 11 May 2012.	Physics	99
9	C.J.L. Murray, <i>et al.</i> , “Global malaria mortality between 1980 and 2010: a systematic analysis,” <i>Lancet</i> , 379(9814): 413-31, 4 February 2012.	Medicine	94
10	J.A. Sosman, <i>et al.</i> , “Survival in BRAF V600-mutant advanced melanoma treated with vemurafenib,” <i>New Engl. J. Med.</i> , 366(8): 707-14, 23 February 2012.	Medicine	87

RANK	PAPER	FIELD	CITATIONS
11	G. Aad, <i>et al.</i> , "Search for squarks and gluinos using final states with jets and missing transverse momentum with the ATLAS detector in root s=7 TeV proton-proton collisions," <i>Phys. Lett. B</i> , 710(1): 67-85, 29 March 2012.	Physics	85
12	J.L. Mega, <i>et al.</i> , "Rivaroxaban in patients with a recent acute coronary syndrome," <i>New Engl. J. Med.</i> , 366(1): 9-19, 5 January 2012.	Medicine	85
13	C.L. Ogden, <i>et al.</i> , "Prevalence of obesity and trends in body mass index among US children and adolescents, 1999-2010," <i>JAMA</i> , 307(5): 483-90, 1 February 2012.	Medicine	83
14	Y. Abe, <i>et al.</i> , "Indication of reactor (ν) over-bar(e) disappearance in the Double Chooz Experiment," <i>Phys. Rev. Lett.</i> , 108(13): No. 131801, 28 March 2012.	Physics	82
15	K.M. Flegal, <i>et al.</i> , "Prevalence of obesity and trends in the distribution of body mass index among US adults, 1999-2010," <i>JAMA</i> , 307(5): 491-7, 1 February 2012.	Medicine	79
16	J. Baselga, <i>et al.</i> , "Pertuzumab plus trastuzumab plus docetaxel for metastatic breast cancer," <i>New Engl. J. Med.</i> , 366(2): 109-19, 12 January 2012.	Medicine	72
17	V. Mourik, <i>et al.</i> , "Signatures of Majorana fermions in hybrid superconductor-semiconductor nanowire devices," <i>Science</i> , 336(6084): 1003-7, 25 May 2012.	Materials	71
18	S. Chatrchyan, <i>et al.</i> , "Search for the Standard Model Higgs boson decaying into two photons in pp collisions at root s=7 TeV," <i>Phys. Lett. B</i> , 710(3): 403-25, 12 April 2012.	Physics	71
19	C.E. Small, <i>et al.</i> , "High-efficiency inverted dithienogermole-thienopyrrolodione-based polymer solar cells," <i>Nature Photonics</i> , 6(2): 115-20, February 2012.	Materials	70
20	G. Aad, <i>et al.</i> , "Observation of a new particle in the search for the Standard Model Higgs boson with the ATLAS detector at the LHC," <i>Phys. Lett. B</i> , 716(1): 1-29, 17 September 2012.	Physics	69
21	A.S. Lok, <i>et al.</i> , "Preliminary study of two antiviral agents for hepatitis C genotype 1," <i>New Engl. J. Med.</i> , 366(3): 216-24, 19 January 2012.	Medicine	69
22	A. Arbey, <i>et al.</i> , "Implications of a 125 GeV Higgs for supersymmetric models," <i>Phys. Lett. B</i> , 708(1-2): 162-9, 14 February 2012.	Physics	67
23	P.L. Nolan, <i>et al.</i> , "Fermi Large Area Telescope second source catalog," <i>Astrophys. J. Suppl. Ser.</i> , 199(2): No. 31, April 2012.	Space Science	62
24	O. Zuk, <i>et al.</i> , "The mystery of missing heritability: Genetic interactions create phantom heritability," <i>PNAS</i> , 109(4): 1193-8, 24 January 2012.	Genetics	62
25	D.A.R. Barkhouse, <i>et al.</i> , "Device characteristics of a 10.1% hydrazine-processed Cu ₂ ZnSn(Se,S) ₄ solar cell," <i>Prog. Photovoltaics</i> , 20(1): 6-11, January 2012.	Materials	61
26	N. Suzuki, <i>et al.</i> , "The Hubble Space Telescope Cluster Supernova Survey. V. Improving the dark-energy constraints above z > 1 and building an early-type-hosted supernova sample," <i>Astrophys. J.</i> , 746(1): No. 85, 10 February 2012.	Space Science	60
27	B.F. Haynes, <i>et al.</i> , "Immune-correlates analysis of an HIV-1 vaccine efficacy trial," <i>New Engl. J. Med.</i> , 366(14): 1275-86, 5 April 2012.	Medicine	59

RANK	PAPER	FIELD	CITATIONS
28	L. Ding, <i>et al.</i> , "Clonal evolution in relapsed acute myeloid leukaemia revealed by whole-genome sequencing," <i>Nature</i> , 481(7382): 506-10, 26 January 2012.	Genomics/ Oncology	59
29	S. Chatrchyan, <i>et al.</i> , "Observation of a new boson at a mass of 125 GeV with the CMS experiment at the LHC," <i>Phys. Lett. B</i> , 716(1): 30-61, 17 September 2012.	Physics	57
30	F. Su, <i>et al.</i> , "RAS mutations in cutaneous squamous-cell carcinomas in patients treated with BRAF inhibitors," <i>New Engl. J. Med.</i> , 366(3): 207-15, 19 January 2012.	Medicine	55
31	S.K. Kodali, <i>et al.</i> , "Two-year outcomes after transcatheter or surgical aortic-valve replacement," <i>New Engl. J. Med.</i> , 366(18): 1686-95, 3 May 2012.	Medicine	54
32	M. Carena, <i>et al.</i> , "A 125 GeV SM-like Higgs in the MSSM and the $\gamma\gamma$ rate," <i>J. High Energy Physics</i> , 3: No 014, March 2012.	Physics	53
33	J. Baselga, <i>et al.</i> , "Everolimus in postmenopausal hormone-receptor-positive advanced breast cancer," <i>New Engl. J. Med.</i> , 366(6): 520-9, 9 February 2012.	Medicine	53
34	P. Bostrom, <i>et al.</i> , "A PGC1-alpha-dependent myokine that drives brown-fat-like development of white fat and thermogenesis," <i>Nature</i> , 481(7382): 463, 26 January 2012.	Bio-chemistry	53
35	R.R. Makkar, <i>et al.</i> , "Intracoronary cardiosphere-derived cells for heart regeneration after myocardial infarction (CADUCEUS): a prospective, randomized, phase 1 trial," <i>Lancet</i> , 379(9819): 895-904, 10 March 2012.	Medicine	50
36	P.R. Schauer, <i>et al.</i> , "Bariatric surgery versus intensive medical therapy in obese patients with diabetes," <i>New Engl. J. Med.</i> , 366(17): 1567-76, 26 April 2012.	Medicine	47
37	S.J. Park, <i>et al.</i> , "Resveratrol ameliorates aging-related metabolic phenotypes by inhibiting cAMP phosphodiesterases," <i>Cell</i> , 148(3): 421-33, 3 February 2012.	Medicine	47
38	J.S. Healey, <i>et al.</i> , "Subclinical atrial fibrillation and the risk of stroke," <i>New Engl. J. Med.</i> , 366(2): 120-9, 12 January 2012.	Medicine	47
39	J.H. Zhang, <i>et al.</i> , "The genetic basis of early T-cell precursor acute lymphoblastic leukaemia," <i>Nature</i> , 481(7380): 157-63, 12 January 2012.	Medicine	47
40	L.J. Hall, <i>et al.</i> , "A natural SUSY Higgs near 125 GeV," <i>J. High Energy Physics</i> , 4: No. 131, April 2012.	Physics	46
41	G. Mingrone, <i>et al.</i> , "Bariatric surgery versus conventional medical therapy for Type 2 diabetes," <i>New Engl. J. Med.</i> , 366(17): 1577-85, 26 April 2012.	Medicine	46

RANK	PAPER	FIELD	CITATIONS
42	D.H. Barouch, <i>et al.</i> , "Vaccine protection against acquisition of neutralization-resistant SIV challenges in rhesus monkeys," <i>Nature</i> , 482(7383): 89, 2 February 2012.	Immunology	46
43	L. Sjostrom, <i>et al.</i> , "Bariatric surgery and long-term cardiovascular events," <i>JAMA</i> , 307(1): 56-65, 4 January 2012.	Medicine	46
44	B.J. O'Roak, <i>et al.</i> , "Sporadic autism exomes reveal a highly interconnected protein network of de novo mutations," <i>Nature</i> , 485(7397): 246, 10 May 2012.	Genetics/Neuro-science	45
45	S. Heinemeyer, O. Stal, G. Weiglein, "Interpreting the LHC Higgs search results in the MSSM," <i>Phys. Lett. B</i> , 710(1): 201-6, 29 March 2012.	Physics	45
46	G. Aad, <i>et al.</i> , "Search for the Standard Model Higgs boson in the diphoton decay channel with 4.9 fb ⁻¹ of pp collision data at root s=7 TeV with ATLAS," <i>Phys. Rev. Lett.</i> , 108(11): No. 111803, 13 March 2012.	Physics	45
47	P. Tricoci, <i>et al.</i> , "Thrombin-receptor antagonist vorapaxar in acute coronary syndromes," <i>New Engl. J. Med.</i> , 366(1): 20-33, 5 January 2012.	Medicine	45
48	A. Azatov, R. Contino, J. Galloway, "Model-independent bounds on a light Higgs," <i>J. High Energy Physics</i> , 4: No. 127, April 2012	Physics	44
49	P.E. Cramer, <i>et al.</i> , "ApoE-directed therapeutics rapidly clear beta-amyloid and reverse deficits in AD mouse models," <i>Science</i> , 335(6075): 1503-6, 23 March 2012.	Bio-chemistry/Neuro-science	44
50	L. Britnell, <i>et al.</i> , "Field-effect tunneling transistor based on vertical graphene heterostructures," <i>Science</i> , 335(6071): 947-50, 24 February 2012.	Materials	44
51	J. Schwartzentruber, <i>et al.</i> , "Driver mutations in histone H3.3 and chromatin remodeling genes in paediatric glioblastoma," <i>Nature</i> , 482(7384): 226, 9 February 2012.	Genetics/Oncology	44

Source: Thomson Reuters Web of Science (Citations recorded as of late December 2012)

METHODOLOGY

To identify the hottest scientific researchers, analysts for ScienceWatch used Thomson Reuters InCites, the premier, web-based scientific and scholarly research evaluation tool for analyzing institutional productivity and benchmarking output against peers worldwide. InCites contains exclusive data related to the Hot Papers analysis. To qualify as a Hot Paper, a report must be published within the last two years and must be cited at a level notably above papers of comparable type and age published in the same journal. ScienceWatch analysts identified those authors who contributed to multiple Hot Papers as gauged by citations tallied during 2012.

Thomson Reuters Web of Science, the world's most authoritative source of academic citation data, was also used for the table of the year's most-cited papers. ScienceWatch analysts selected those reports published during calendar year 2012 that were most cited by late December. Review articles and other summary collections of data were eliminated in favor of "discovery accounts."

ABOUT SCIENCEWATCH

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