



Cell Biology

Microfilaments, mitochondria and nucleus in fibroblast cells

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Although Germany clearly leads the nations' ranking, one French lab dominates European cell biology research. Programmed cell death and stem cells are hot topics.

“For, as to the first, since our Microscope informs us that the substance of Cork is altogether fill'd with Air, and that that Air is perfectly enclosed in little Boxes or Cells distinct from one another.” These famous words, uttered by Robert Hooke in 1664, weren't perhaps the kick-off for cell biology research as such but it, at least, gave the discipline its name: the “little boxes” Hooke observed, reminded him of a cellula, a small room. Hence, he named them “cells”.

Modern cell biology's moments of glory came a few hundred years later. Especially in the 1960s and 70s, cell biologists churned out momentous discoveries about the cell. Microtubules, for instance, were first described in 1963 in hydra (*JCB*, 18(2):367-88) and in plant cells (*JCB*, 19(1):239-50). In the same year, Margit and Sylvan Nass, back then at the Wenner-Gren Institute for Experimental Biology in Stockholm, published their findings on “intramitochondrial fibers with DNA characteristics” – the first description of mitochondrial DNA (*JCB*, 19(3):593-611).

Fifty years on, we know a cell inside out. Or do we? Cell biological research is still hotly debated. Just last year (*LT* 4-2014), *LT* reporter, Karin Hollricher, unsuspectingly went to a scientific conference on aneuploidy and got roped into a heated discussion about mitosis. So, does research on mitosis attract the most citations? That's what we will explore in this publication analysis.

No changes at the top

First, as you'll perhaps know from past issues, we turn our attention to Europe and the individual countries' performance in cell biology. For this, we rely on so-called expert journals, as defined by Thomson Reuters' Web of Science database. In the last cell biology ranking from 2009 (*LT* 5-2009), covering papers, proceedings papers and reviews published between 1996 and 2007, Germany came out on top, followed by England and France, Italy and Switzerland. Six years later, nothing much has changed. As a matter of fact, the first 14 countries all kept their positions. Only one country took a major step up the ranking ladder: Portugal climbed six spots from 23rd to 17th place. Comparing the average citations per article, Switzerland performed best (42.7), followed by Scotland (36.6) and the Netherlands (36.4). It's also worth mentioning that cell biologically-themed articles are, on average, cited twice as often as, for instance, articles on reproductive biomedicine or parasitology, our last two publication analyses.

In the “battle” between Europe and the US, as usual, European cell biologists wrote more articles published in cell biology specialist journals. These articles, however, were cited less often than those penned by their US peers, in total (1,265,428 vs 1,649,744) and on average (26.7 vs 36.5).

Outside of Europe, Japan performed very well, scoring the second most total citations; and Singapore, although not one of the top nations when it comes to total citations, got ahead of many others, even Germany and France, with their average citations per article (32.1).

So, what are then the most cited papers and reviews in cell biology, published between 2007 and 2013? The undisputed number one, with more than 8,000 citations to-date, is Douglas Hanahan's and Robert Weinberg's update article on the “Hallmarks of Cancer: The Next Generation”. In second place, Tony Kouzarides informs the scientific community about chromatin modifications and functions. Also among the top five articles are two publications dealing with microRNAs. Interestingly, none of the highly-cited articles is about those hot topics, which occupy the majority of our most-cited cell biologists in Europe.

Hard to separate

This, eventually, brings us to the said top 30 list. Once again, we had to come up with a few criteria to limit the vast amount of researchers taking advantage of cell biological techniques, to those, who can be considered true cell biologists. Not an easy task, as we had to find out. While there are still many basic cellular mechanisms waiting to be fully elucidated, the best way to attract many citations is to combine cell biology with other disciplines. Hence, many of our top 30 authors appeared in other rankings, too. Guido Kroemer, for instance, topped both the Immunology and Cancer Research rankings. Boris Zhivotovsky was among the top 30 in Toxicology Research and Maria Blasco scored 9th place in the Ageing Research publication analysis.

So, we decided to include only those scientists, who published a considerable number of their articles and reviews in cell biologically-themed specialist journals. In addition, ‘cell biology’ must have been listed among the top two Web of Science categories for a given scientist.

Interestingly, Europe's top cell biologists are based in 13 different countries. England and France are home to five top cell biologists each. The French mecca for cell biology seems to be located in Villejuif, 7 km from the centre of Paris, in Guido

Kroemer's lab, to be more precise. Including Kroemer (1st), four of the five French cell biologists work or have worked there: Lorenzo Galluzzi (6th), Maria Chiara Maiuri (21st) and Oliver Kepp (24th).

And what are they working on? Programmed cell death in health and disease. Most of us are perhaps familiar with one way for a cell to die by choice – apoptosis – but there are many other death strategies, such as autophagic cell death, programmed necrosis, mitotic catastrophe and entosis (cellular cannibalism) as Kroemer informs on his website. Hence, one of his goals and that of his lab fellows is to “resolve the fundamental enigma: through which molecular and cellular mechanisms do cells die in normal tissue”. In cancer cells, however, these vital ways to bite the dust voluntarily are severely disturbed. Kroemer, thus, “launched a quest into the mechanisms that determine cell death resistance or connect different cell death modalities in cancer cells”.

Cell death, stem cells and enzymes

The four French aren't, however, the only ones interested in a cell's final moments; also David Rubinsztein (4th), Peter Vandenabeele (8th), Gerry Melino (16th), Mauro Piacentini (18th), Boris Zhivotovsky (25th) and Terje Johansen (30th) all study cell death.

Stem cells, on the other hand, usually mark the beginning of a cell's life cycle. Hans Clevers (2nd); Austin Smith (20th); Juan-Carlos Belmonte (27th) and Hendrick Stunnenberg (29th) have dedicated their professional lives to these undifferentiated cells. Directing the Center of Regenerative Medicine in Barcelona for many years, Juan-Carlos Belmonte has, in the meantime, transferred his office fully to the Salk Institute for Biological Studies in San Diego. While still in Spain, his lab made major headlines with “mini-kidneys” grown from human pluripotent stem cells (*Nature Cell Biol.*, 15:1507-15).

Between birth and death, a cell's life is full of action. Johan Auwerx (9th), for instance, wants to decipher metabolic pathways; Carlos Lopez-Otin (10th) has zeroed in on novel human proteases, such as metalloproteinases of the MMP and ADAMTS family, as well as serine and cysteine proteases. Benoit Viollet (12th) focusses on different but not less important enzymes, the energy sensor AMP-activated protein kinases. Ivan Dikic (22nd), on the other hand, follows the ubiquitin pathways to learn how they regulate endocytosis, immune responses, DNA repair and proteasomal degradation.

Last but not least, a few top 30 cell biologists have a weakness for a cell's genetic material. Jiri Bartek (17th) in the Prague-based Laboratory of Genome Integrity wants to understand the DNA damage response and DNA double strand breaks. Telomeres and their role in ageing and cancer are Maria Blasco's (19th) scientific passion.

What's the future of cell biology? Will it merge with other disciplines like oncology or immunology and disappear from the scientific world stage? Or will it perhaps just take a new direction? In a 2010 contribution to *Molecular Biology of the Cell* (21(22):3822), Kai Simons, former director of the Max Planck Institute of Molecular Cell Biology and Genetics in Dresden, Germany, gazes into the crystal ball, “I predict that engineers, who today lack training or knowledge of cell biology, will in the future take their inspiration from all the wonder machines that nature has produced. Molecular cell biologists are continuously unravelling the workings of the cellular nanomachineries. This will be a real source of future welfare and wealth globally, and not like the virtual dividends that result from manipulating the financial markets.”

KATHLEEN GRANSALKE

Europe...

Country	Citations	Articles	Cit./Art.
1. Germany	332,217	10,803	30.8
2. England	272,709	7,957	34.3
3. France	193,619	6,103	31.7
4. Italy	150,860	6,107	24.7
5. Switzerland	107,965	2,526	42.7
6. Netherlands	106,879	2,933	36.4
7. Spain	91,608	3,818	24.0
8. Sweden	62,306	2,040	30.5
9. Scotland	59,211	1,619	36.6
10. Israel	49,425	1,479	33.4
11. Belgium	49,373	1,463	33.8
12. Austria	39,705	1,324	30.0
13. Denmark	36,798	1,111	33.1
14. Finland	30,381	934	32.5
15. Norway	21,890	689	31.8
16. Poland	18,439	1,530	12.1
17. Portugal	17,829	717	24.9
18. Ireland	17,447	653	26.7
19. Hungary	15,339	631	24.3
20. Czech Rep.	14,644	700	20.9

Articles appearing between 2007 and 2013 in 'Cell Biology' journals as listed by *SCImago* and Thomson Reuters' *Web of Science*. The citation numbers are accurate as of July 2015. A country's figures are derived from articles, where at least one author working in the respective European nation is included in the authors' list. Israel is included because it is a member of many European research organisations and programmes (EMBO, FP7 of the EU...).

... and the World

	Citations	Articles	Cit./Art.
Europe	1,265,428	47,312	26.7
USA	1,649,744	45,174	36.5
Japan	251,505	10,653	23.6
China	179,933	11,538	15.6
Canada	161,045	5,826	27.6
Australia	100,926	3,402	29.7
South Korea	70,329	4,269	16.5



Publication Analysis 2007-2013 – Cell Biology

Most Cited Authors...

	Cit-ations	Art-icles
1. Guido Kroemer , Inst Gustave Roussy, Villejuif	32,352	312
2. Hans Clevers , Hubrecht Inst, Utrecht	15,248	149
3. Jürg Tschopp , Univ Lausanne, † 22.03.2011	15,001	99
4. David C. Rubinsztein , Med Genet, Univ Cambridge	12,655	107
5. Douglas Hanahan , Swiss Inst Expt Canc Res, Lausanne	12,597	38
6. Lorenzo Galluzzi , Inst Gustave Roussy, Villejuif	11,390	131
7. Peter Carmeliet , VIB Vesalius Res Ctr, KU Leuven	10,124	197
8. Peter Vandenabeele , VIB Inflamm Res Ctr, Univ Ghent	9,336	115
9. Johan Auwerx , Lab Integrat & Syst Physiol, EPFL, Lausanne	8,663	120
10. Carlos Lopez-Otin , Biochem & Mol Biol, Univ Oviedo	8,477	108
11. Kari Alitalo , Inst Biomed, Univ Helsinki	8,008	131
12. Benoit Viollet , Inst Cochin, Univ Paris	7,473	146
13. Michael P. Lisanti , Inst Canc Sci, Univ Manchester	7,459	217
14. Jiri Friml , Inst Sci & Technol, Klosterneuburg	7,255	112
15. Josef M. Penninger , Inst Mol Biotechnol, Vienna	7,181	167
16. Gerry Melino , Toxicol, Univ Leicester	7,126	161
17. Jiri Bartek , Inst Mol Genet, Prague	7,123	98
18. Mauro Piacentini , Biol, Univ Rome	7,072	75
19. Maria A. Blasco , Mol Oncol, Spanish Natl Canc Res Ctr, Madrid	7,071	89
20. Austin G. Smith , Stem Cell Inst, Univ Cambridge	7,056	60
21. Maria Chiara Maiuri , Inst Gustave Roussy, Villejuif	7,004	48
22. Ivan Dikic , Biochem, Univ Frankfurt	6,878	80
23. Tony Kouzarides , Gurdon Inst, Univ Cambridge	6,659	27
24. Oliver Kepp , Inst Gustave Roussy, Villejuif	6,521	94
25. Boris Zhivotovsky , Toxicol, Karolinska Inst, Stockholm	6,312	81
26. Dario R. Alessi , Coll Life Sci, Univ Dundee	6,286	78
27. Juan-Carlos I. Belmonte , Ctr Regenerat Med, Barcelona	6,267	116
28. Reinhard Fässler , Mol Med, Max Planck Inst Biochem, Martinsried	6,155	107
29. Hendrik G. Stunnenberg , Mol Biol, Radboud Univ Nijmegen	6,149	105
30. Terje Johansen , Med Biol, Univ Tromsø	6,103	37



Citations of articles published between 2007 and 2013 were recorded up until May 2015 using the *Web of Science* database from Thomson Reuters. The "most-cited papers" had correspondence addresses in Europe or Israel.

... and Papers

	Citations
1. Hanahan, D; Weinberg, RA Hallmarks of Cancer: The Next Generation <i>CELL</i> 144(5): 646-674 MAR 4 2011	8,222
2. Kouzarides, T Chromatin modifications and their function <i>CELL</i> 128(4): 693-705 FEB 23 2007	4,067
3. Valadi, H; Ekstrom, K; Bossios, A; Sjostrand, M; Lee, JJ Lotvall, JO Exosome-mediated transfer of mRNAs and microRNAs is a novel mechanism of genetic exchange between cells <i>NATURE CELL BIOLOGY</i> 9(6): 654-U72 JUN 2007	1,979
4. Haass, C; Selkoe, DJ Soluble protein oligomers in neurodegeneration: lessons from the Alzheimer's amyloid beta-peptide <i>NATURE REVIEWS MOLECULAR CELL BIOLOGY</i> 8(2): 101-112 FEB 2007	1,833
5. Landgraf, P; Rusu, M; Sheridan, R; [...] Sander, C; Zavolan, M; Tuschl, T A mammalian microRNA expression atlas based on small RNA library sequencing <i>CELL</i> 129(7): 1401-1414 JUN 29 2007	1,770