

In terms of citations, the United Kingdom dominates European parasitology research much more clearly than any other biomedical discipline. Twice as many citations as second-ranking France and 23 UK researchers among the 30 most-cited authors are only two factors documenting this success.

Many people are sceptical about the free online encyclopedia *Wikipedia* and generally distrust the quality of its voluntary entries. However, concerning topics from biology and medicine, even many of the experts state that, overall, they are really surprised by the accuracy and correctness of the corresponding 'articles'.

'Parasitology' might be a good example. In the second paragraph of its article *Wikipedia* states, "The parasitic mode of life is the most common on the planet, with representatives from all major taxa, from the simplest unicellular organisms to complex vertebrates. Every free-living species has its own unique species of parasite, so the number of parasitic species greatly exceeds the number of free living species."

Okay, not exactly earthshaking news. However, the article commences as follows: "Parasitology is the study of parasites, their hosts and the relationship between them. As a biological discipline, the scope of parasitology is not determined by the organism or environment in question but by their way of life. This means it forms a synthesis of other disciplines and draws on techniques from fields such as cell biology, bioinformatics, biochemistry, molecular biology, immunology, genetics, evolution and ecology." Thus, in the first paragraph the pronounced multidisciplinary character is already singled out as one of the most prominent features of parasitology research.

Diverse discipline

With this information at hand, you can easily imagine the problems bound to arise when comparing, for example, the publications of somebody working on potential vaccines against malaria to those of a colleague studying the co-evolution of the parasitic fungus *Cordyceps kniphfoides* and its host, the ant *Cephalotes*

atratus. Or to a 'computational parasitologist' who combs, mainly *in sillico*, through the genomes of certain parasites searching for whatever useful sequences can be found.

As sure as such a multidisciplinary character greatly affects the comparison of individual parasitology researchers, you can be equally sure those individual differences are balanced out at a level where the research outputs of whole nations are compared.

However, one restriction we had to adopt in previous issues of *Lab Times* for the publication analyses of other biomedical disciplines also held true for this comparison of the European countries' publication performances in parasitology research. Since the publication platform *SCImago Journal & Country Rank (SCImagoJR)*, used for this analysis, doesn't provide any tools to extract relevant parasitology articles from multidisciplinary journals such as *Nature* or *The Lancet*, we weren't able to include any articles from these journals in the comparison of individual countries (see tables p. 38). The consequence being that we were forced to restrict the analysis to the 39 specialist journals listed by *SCImagoJR* in its 'Subject Category: Parasitology'.

Swiss papers cited the highest on average

Of course, this way some of the most prominent papers in the field might have been omitted from this part of the analysis. Nevertheless, we believe a survey, restricted to the expert journals only, certainly provides sufficiently valid indicators for the productivity of the individual countries' parasitology research over the period 1996 to 2007 (see tables on page 39). For the rankings of the most-cited researchers and papers in parasitology (see tables p. 40), however, publications in all journals were included.

Now for the results. On the European countries' level, the overwhelming dominance of the United Kingdom (UK) cannot

be overlooked. Between 1996 and 2007, researchers from the UK (co-)authored double the amount of articles in the parasitology journals compared to their colleagues from France, who ranked second. When assessing how frequently those articles have been cited to-date, the UK researchers gained even more ground: they actually collected more citations than second, third and fourth altogether (France, Germany and Switzerland). Nevertheless, at the pan-European level, the performances of France and Switzerland were well above average when compared to other biomedical disciplines.

Not least because of the strong performance by the UK, the USA has this time round clearly lost ground behind the whole of Europe, with not only less than half of the articles in the parasitology journals but also in the number of overall citations. The surprise here is Brazil and Kenya, both of which entered the non-European Top 6 for the first time and left behind countries like China, South Korea and New Zealand.

Even more surprising is Kenya's excellent 'citation per article' ratio. Articles in parasitology journals from 1996-2007, which included at least one author with an address in Kenya, were cited 15.1 times on average. Only Switzerland achieved a higher ratio (15.8); whilst Sweden (12.8) and Ireland (12.4) followed.

Clinical medicine clearly beats basic research

No surprise at all, however, is the fact that papers on human pathogens dominate the list of the most-cited articles. Numbers 1 and 2 were captured by an epidemiological and a biochemical article on *Plasmodium falciparum* and malaria; numbers 3, 4 and 5 comprise papers on the complete genomes of *Encephalitozoon cuniculi*, *Trypanosoma brucei* and *Leishmania major*.

Similarly, the vast majority of the 30 most-cited authors is also working on human pathogenic parasites. The 'leader' here, of course, is *Plasmodium* followed by *Leishmania*, *Trypanosoma* and parasitic helminths like *Schistosoma*, *Brugia malayi* and *Onchocerca volvulus*.

That's also one of the reasons why quite a number of the most-cited authors are working in clinical departments. Actually, five of the Top 10 have their desks and labs in institutes or faculties for tropical medicine. Among them are the two most-cited, Nicholas J. White and Kevin Marsh, who both hold professorships in Oxford but mainly work in research units run by the Wellcome Trust in Bangkok and Kilifi, Kenya, respectively.

From the remaining five researchers among the Top 10, three have specialised on parasite immunology – Fotis Kafatos, current president of the European Research Council, in 3rd place, Chris Newbold in 6th and Christian Bogdan in 10th. Robert Snow in 5th place is an expert in parasite epidemiology and Matthew Beriman (9th) has been one of the protagonists behind several parasites' genome projects at the Wellcome Trust Sanger Institute in Hinxton near Cambridge, UK.

Thus, the list of the most-cited authors again reflects the disciplinary diversity of parasitology research. One important sub-field, however, is not represented at all by any of the Top 30: ecology and evolution of parasites. At least in terms of citation numbers, this type of basic research in parasitology apparently has no chance against topics of immediate medical relevance.

So it remains for this last paragraph to at least mention that nevertheless, for example, aspects of host-parasite co-evolution clearly belong to the most interesting questions in parasitology of which nobody can say today how rapidly they might even become medically relevant.

RALF NEUMANN

Europe...

Country	Citations	Articles	Cit./Art.
1. Un. Kingdom	91,706	8,100	11.6
2. France	34,153	4,046	9.0
3. Germany	27,407	2,642	11.2
4. Switzerland	22,025	1,504	15.8
5. Netherlands	15,573	1,341	11.9
6. Spain	14,168	1,954	8.2
7. Italy	11,687	1,323	10.2
8. Belgium	10,184	1,074	9.9
9. Denmark	9,733	951	10.3
10. Sweden	8,143	677	12.9
11. Czech Rep.	5,185	813	7.0
12. Israel	4,088	509	8.7
13. Ireland	3,493	294	12.4
14. Norway	2,968	269	11.8
15. Poland	2,730	568	5.0
16. Austria	2,661	292	10.8
17. Finland	2,127	258	10.0
18. Slovakia	2,127	362	5.9
19. Greece	1,884	321	8.3
20. Portugal	1,839	289	8.7

Articles appeared between 1996 and 2007 in journals as listed by Scopus. Numbers for articles and citations (as of April 2009) were taken from the portal *SCImago Journal & Country Rank* (www.scimagojr.com) applying the subject category "Parasitology". A country's figures are derived from articles where at least one author working in the respective European nation is included in the author's 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	280,625	28,918	9.7
USA	129,763	12,132	11.6
Australia	27,549	2,385	11.7
Brazil	20,520	3,173	8.4
Canada	13,489	1,347	10.5
Japan	13,349	2,095	6.8
Kenya	11,780	839	15.1



Publication Analysis 1996-2007 – Parasitology

Most Cited Authors...

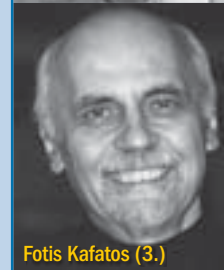
	Cit-ations	Art-icles
1. Nicholas J. White , Trop. Med. J. Radcliffe Hosp. Oxford (& Bangkok)	11,938	453
2. Kevin Marsh , Trop. Med. Churchill Hosp. Univ. Oxford (& Kilifi/Kenya)	7,703	243
3. Fotis C. Kafatos , Immunogenomics Imperial Coll. London	7,404	128
4. Brian M. Greenwood , London Sch. Hyg. & Trop. Med. Univ. London	7,302	219
5. Robert W. Snow , Trop. Publ. Health Univ. Oxford (& Nairobi)	6,311	165
6. Chris I. Newbold , Mol. Parasitol. Grp. J. Radcliffe Hosp. Oxford	5,354	80
7. Francois Nosten , Trop. Med. Churchill Hosp. Univ. Oxford (& Bangkok)	5,246	149
8. Peter G. Kremsner , Trop. Med. Univ. Tübingen (& Lambarene/Gabun)	5,037	300
9. Matthew Berriman , Wellcome Trust Sanger Inst. Hinxton	5,007	62
10. Christian Bogdan , Clin. Microbiol. Immunol. & Hyg. Univ. Erlangen	4,379	85
11. Marcel Tanner , Swiss Trop. Inst. Basel	4,093	236
12. Neil Hall , Sch. Biol. Sci. Univ. Liverpool	4,074	49
13. T. Martin Embley , Cell & Mol. Biosci. Univ. Newcastle	4,010	72
14. Alan M. Fairlamb , Mol. Parasitol. Univ. Dundee	3,832	94
15. Robert E. Sinden , Parasitol. Imperial Coll. Univ. London	3,802	91
16. Arnab Pain , Wellcome Trust Sanger Inst. Hinxton	3,496	54
17. Keith Gull , Mol. Microbiol. Sir William Dunn Sch. Pathol. Univ. Oxford	3,483	110
18. Martin Röllinghoff , Clin. Microbiol. Immunol. & Hyg. Univ. Erlangen	3,442	105
19. Anthony A. Holder , Parasitol. Natl. Inst. Med. Res. London	3,367	103
20. Reto Brun , Swiss Trop. Inst. Basel	3,274	226
21. Sanjeev Krishna , Infect. Dis. St. Georges Hosp. Med. Sch. London	3,265	113
22. Simon L. Croft , London Sch. Hyg. & Trop. Med. Univ. London	3,211	124
23. Jeremy C. Mottram , Wellcome Ctr. Mol. Parasitol. Glasgow	3,124	89
24. Stephen A. Ward , Trop. Med. Univ. Liverpool	3,123	138
25. Graham H. Coombs , Pharm. & Biomed. Sci. Univ. Strathclyde, Glasgow	3,044	116
26. H. Charles J. Godfray , Zool. Univ. Oxford	3,028	115
27. Maria Yazdanbakhsh , Parasitol. Univ. Leiden	2,952	96
28. Rick Maizels , Immunol. & Infect. Res. Univ. Edinburgh	2,810	87
29. Monique Capron , Inst. Pasteur INSERM Lille	2,803	156
30. Andrew P. Waters , Parasitol. Univ. Glasgow	2,749	93



Nicholas White (1.)



Kevin Marsh (2.)



Fotis Kafatos (3.)



Brian Greenwood (4.)



Peter Kremsner (8.)



Marcel Tanner (11.)



Maria Yazdanbakhsh (27.)



Monique Capron (29.)

Citations of articles published between 1996 and 2007 were recorded until April, 2009 using the Web of Science database from Thomson Scientific. The "most cited papers" had correspondence addresses in Europe or Israel.

... and Papers

	Citations
1. Snow RW, Guerra CA, Noor AM, Myint HY, Hay SI The global distribution of clinical episodes of <i>Plasmodium falciparum</i> malaria. <i>NATURE</i> , 434 (7030): 214-17 (2005)	626
2. Jomaa, H; Wiesner, J; Sanderbrand, S; ...; Soldati, D; Beck, E Inhibitors of the nonmevalonate pathway of isoprenoid biosynthesis as antimalarial drugs. <i>SCIENCE</i> , 285 (5433): 1573-1576 (1999)	474
3. Katinka, MD; Duprat, S; Cornillot, E; ...; Gouy, M; Weissenbach, J; Vivares, CP Genome sequence and gene compaction of the eukaryote parasite <i>Encephalitozoon cuniculi</i> . <i>NATURE</i> , 414 (6862): 450-453 (2001)	357
4. Berriman, M; Ghedin, E; ... Embley, TM; Gull, K; ...; Fairlamb, ...; Hall, N; Fraser, CM; Melville, SE; El-Sayed, NM The genome of the African trypanosome <i>Trypanosoma brucei</i> . <i>SCIENCE</i> , 309 (5733): 416-422 (2005)	321
5. Ivens, AC; Peacock, CS; ...; Berriman, M; ...; Mottram, JC; ...; Stuart, KD; Barrell, B; Myler, PJ The genome of the kinetoplastid parasite, <i>Leishmania major</i> . <i>SCIENCE</i> , 309 (5733): 436-442 (2005)	316