Aggregate impact factor of scientific fields

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Abstract

Science journal impact indicators are not comparable because of inherent differences in publication and citation behaviors from field to field. A breakdown of the field aggregate impact factor of databases shows that for the 22 fields and four areas considered by Thomson Reuters, the leading provider of science indicators, five variables largely explain variance in impact factor of a given field. Therefore, it is necessary to consider all these sources of variance in the standardization process of the impact indicators. A Principal Component Analysis is employed to find the sources of the variance and a Cluster Analysis is used to detect similarities.

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Keywords: Impact Factor; Journal Evaluation; Principal Component Analysis; Cluster Analysis.

RESUMEN

Factor de impacto agregado según campos científicos
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Los indicadores de impacto de revistas no son comparables entre campos científicos debido a las diferencias significativas en los hábitos de publicación y citación. Una descomposición del factor de impacto agregado muestra, para los 22 campos y cuatro áreas consideradas en las bases de datos del principal proveedor de indicadores científicos (Thomson Reuters), que existen cinco variables que en mayor medida explican la varianza del factor de impacto de un campo. Por ello es necesario tener en cuenta estas fuentes de variación en el proceso de normalización de los indicadores de impacto. Para localizar las fuentes de la varianza se emplea un Análisis de componentes principales y para detectar las semejanzas se utiliza un Análisis clúster.

Palabras clave: Factor de Impacto; Evaluación de Revistas; Análisis de Componentes Principales; Análisis Clúster.

Introduction

The Impact Factor (FI) published in the *Journal Citation Reports* (JCR) by Thomson Reuters is defined as the average number of citations received by a journal in a given year of the "citable items" published in that journal over the previous two years. Since its presentation (Garfield, 1972), the FI has been criticized for certain arbitrary decisions entailed in its formulation. The literature has discussed aspects such as the definition of citable items (papers, reviews, conference reports and correspondence), and the focus and the two-year time frame as somehow representing the research front, etc. (Bensman, 2007). Moreover, critics have suggested numerous modifications (Althouse *et al.,* 2009; Bornmann and Daniel, 2008; Dorta-González and Dorta-González, 2013a,b).

The problem of comparing journals from diverse fields has its origin in institutional evaluation (Leydesdorff and Opthof, 2010; Opthof and Leydesdorff, 2010; Van Raan et al., 2010). The distribution of citations varies from

one scientific field to another, and in some cases even within the specializations of a given field (Dorta-González and Dorta-González, 2010, 2011a, b). Research centers; however, consist of researchers from widely diverse disciplines, who often strive to work in multidisciplinary groups. (Leydesdorff and Rafols, 2011; Wagner *et al*., 2011).

Most literature on the classification of journals into scientific fields has focused on correlating citation patterns (Leydesdorff, 2006; Rosvall and Bergstrom, 2008). Indexes such as the *JCR Subject Category List* classify journals into groups (Pudovkin and Garfield, 2002; Rafols and Leydesdorff, 2009). In this sense, Egghe and Rousseau (2002) define the Relative Impact Factor and FI similarly, taking all of the journals of a category as a single meta-journal. This indicator is called the Aggregate Impact Factor in *JCR*.

There are several statistical patterns exclusive to the fields. Garfield (1979a,b) proposes the term citation potential, based upon the average number of citations, to justify the systematic differences between scientific fields. For example, in the biomedical field lists of fifty or more citations is quite common, while in mathematics less than twenty citations is most commonly seen. These differences are owing to distinct citation cultures that significantly affect the FI by conditioning the likelihood of citation. The fractional recount corrects these differences on the basis of the sources cited (Leydesdorff and Bornmann, 2011; Moed, 2010; Zitt and Small, 2008). Thus, one citation of an article containing n citations counts as $1/n$ for the fractional recount, while it counts as 1 in the whole recount.

Another important variation exhibited between fields is the channel of dissemination exhibited in the results of the research activity. For example, researchers in social sciences and humanities publish more often in books than in journals, while those in computer sciences publish more often in conference reports than in journals. The differences between fields come about largely because of the proportion of *JCR* citations to other books and journals not included in the *JCR*, etc. (Althouse *et al*., 2009).

The objective of this paper is to identify the sources of variance in accord with scientific fields. The identification of these sources is fundamental for the purpose of implementing standardized, adjusted bibliometric indicators as appropriate for each field. In addition to the variables studied in the literature (the average number of citations and proportion of citation in the *JCR*), this paper examines three new variables: the field growth index; the proportion of *JCR* citations in the citation window, and the proportion of items cited and the citing party. Moreover, researchers present a breakdown of the impact factor into these five main sources of variance for all of the scientific fields and the fields in the Thomas Reuters data base.

BREAKDOWN OF IMPACT FACTOR INTO COMPONENTS

The impact of a journal is a gauge of the number of times research papers in an established count period cite papers published during a previous citation window. The Impact Factor (FI) of a journal as provided by Thomas Reuters uses a tally period of one year and citation window of two.

The Aggregate Impact Factor (FIA) of a field is obtained by weighing all of journals in a field as a single unit. As an average, the calculation of FIA depends on two values: the numerator is the number of citations in the current year over any of the items published in the journals of the field in the previous two years; and the denominator is the number of citable items published in those two years. The items published include citable items, such as papers, reviews, conference reports and correspondence, as well as corrections, editorials, news items and other materials.

The aggregate impact factor of a field (F) in year (T) can be broken down as follows:

$$FIA_t^F = a_t^F \cdot r_t^F \cdot p_t^F \cdot w_t^F \cdot b_t^F ,$$

where a_t^F is an indicator of growth of a field and $r_t^F \cdot p_t^F \cdot w_t^F \cdot b_t^F$, are four indicator of citation habits in said fields. These variables are defined in *Table 1.*

Table 1. Variables employed in the breakdown of the impact factor.

Notation	Definition	Description
a_t^F	Growth ratio	Quotient of citable items in year t and those that appear in the citation window.
r_t^F	Average number of citations	Quotient between total number of citations and total number of citable items.
p_t^F	Proportion of citations in *JCR*	Quotient between total number of citations of journals listed in *JCR* (excluding work documents, minutes, books and unindexed magazines) and the total number of citations.
w_t^F	Proportion of citations in *JCR* in the citation window	Quotient between total citations from *JRC* in the citation window and the total citations in the *JCR* itself.
b_t^F	Proportion between of items cited and citers in the citation window	Quotient between the total citations received and the citations made within the citation window.

The growth of a field can be attributed to two root causes: the inclusion of new journals and the publication of additional items in journals already listed. Nonetheless, a field may also undergo contraction.Take, for instance, that $a_t^F = 0.5$, when the number of citable items in years t, t-1, t-2. Coincide.

If $a_t^F > 0.5$, occurs, then growth of the field in terms of the number of citable items is produced. When $a_t^F > 0.5$ occurs then contraction is produced.

Though most citations of a journal come from journals in the same field, some portion come from journals of other fields. When b_t^F>1, the citations received by field F are greater than those produced in that field. On the other hand, when b_t^F<1, the citations received by field F are less than those produced by that field. This indicator is, therefore, a gauge of the exchange of citations among fields. For example, when b_t^F= 1, the field F receives 10% more citations than it produces.

The other variables are proportions. For example, if p_t^F= 0.5, half of the citations are *JCR* items; and where w_t^F= 0.25, a quarter of the *JCR* citations belong to the citation window

Material and methods

The bibliometric data were obtained from the online version of the *Journal Citation Reports* (*JCR*) during the first week of October 2011 (T=2010). The *JCR* data base (provided by Thomas Reuters, Philadelphia) may be consulted at www.webofknowledge.com.

Thomson Reuters assigns each *JCR* journal to one or more categories in accord with citing and cited journal (Pudovkin and Garfield, 2002). The Sciences 2010 edition contains 8073 journals classified in 174 categories; and the Social Sciences 2010 edition contains 2,731 journals classified in 56 categories.

This paper examines two data aggregation levels. The first level corresponds to the 22 *scientific fields* and the second to four *scientific areas*, both of which are listed in the Thomas Reuters data base.

The variables employed are shown in *Table 1*. Main Components Analysis method was used for locating the sources of variance, and an Analysis Cluster was used to detect similarities.

Results and discussion

Table 2 shows the Aggregate Impact and the components for the scientific fields of the Thomas Reuters data base. The *JCR* journal categories comprising each field appear in *Appendix 1* next to the FIA of each category and the percentage obtained within each field. The FIA of Sciences is 2.920, 58% higher than the figure for Social Sciences of 1.848.

Table 2. Aggregate impact factor and components for scientific areas as per the Thomas Reuter data base.

Code	Field	Number of Categories	Categories FIA Components					
			a_t^F	r_t^F	p_t^F	w_t^F	b_t^F	FIA_t^F
C1	Agricultural Sciences	6	0.58	35.93	0.80	0.16	0.80	2.142
C2	Biology & Biochemistry	12	0.56	45.86	0.90	0.18	0.92	3.859
C3	Clinical Medicine	50	0.56	38.84	0.87	0.19	0.92	3.330
C4	Computer Science	9	0.54	30.22	0.63	0.21	0.72	1.529
C5	Chemistry	15	0.55	37.20	0.90	0.19	0.87	3.061
C6	Economics & Business	8	0.62	45.82	0.66	0.15	0.59	1.642
C7	Engineering	39	0.55	27.74	0.77	0.19	0.84	1.931
C8	Environment/ Ecology	8	0.54	44.55	0.76	0.19	0.75	2.569
C9	Geosciences	13	0.55	42.96	0.79	0.15	0.77	2.232
C10	Immunology	2	0.52	42.66	0.90	0.22	1.01	4.342
C11	Materials Science	11	0.55	30.80	0.88	0.20	0.91	2.714
C12	Mathematics	6	0.55	25.75	0.77	0.15	0.82	1.345
C13	Microbiology	5	0.56	43.25	0.90	0.19	0.91	3.638
C14	Molecular Biology & Genetics	5	0.53	51.64	0.92	0.19	1.06	5.083
C15	Multidisciplinary	1	0.58	36.81	0.84	0.21	2.55	9.747
C16	Neuroscience & Behavior	5	0.54	49.19	0.90	0.16	0.95	3.653
C17	Pharmacology & Toxicology	3	0.55	46.16	0.87	0.20	0.69	3.013
C18	Physics	11	0.52	30.21	0.90	0.19	0.97	2.617
C19	Plant & Animal Science	15	0.54	43.27	0.81	0.14	0.75	1.980
C20	Psychiatry/Psychology	17	0.55	50.28	0.79	0.15	0.83	2.663
C21	Social Sciences, general	51	0.63	44.33	0.61	0.21	0.49	1.736
C22	Space Science	1	0.47	56.59	0.78	0.24	0.92	4.621

There is a great assortment of fields in terms of size. While some fields are comprised of a single category, others include more than fifty. Those exhibiting the greatest impacts are C15 (9.747, Multidisciplinary), C14 (5.083, Molecular Biology & Genetics) and C22 (4.621, Space Science). Those with

the least impact are C12 (1.345, Mathematics), C4 (1.529, Computer Science) and C6 (1.642, Economics & Business).

The fields exhibiting the largest growth are C21 (0.63, Social Sciences, general) and C6 (0.62, Economics & Business). These growth indices are owing to new journals being included in several categories in recent years. The only field exhibiting contraction, with a ratio below 0.5, is C22 (0.47, Space Science).

The highest citation average is exhibited in C22 (56.59, Space Science) and C14 (51.64, Molecular Biology & Genetics). The lowest citation averages come in C12 (25.75, Mathematics) and C7 (27.74, Engineering). The largest *JCR* citation proportion is exhibited in C14 (0.92, Molecular Biology & Genetics) and the lowest in C21 (0.61, Social Sciences, general), C4 (0.63, Computer Science) and C6 (0.66, Economics & Business). The highest proportion of *JCR* items in the citation window is exhibited in C22 (0.24, Space Science), and the lowest in C19 (0.14, Plant & Animal Science). The highest ratios between cited and citing items is in C15 (2.55, Multidisciplinary) and C14 (1.06, Molecular Biology & Genetics); while the lowest ratios are exhibited in C21 (0.49, Social Sciences, general) and C6 (0.59, Economics & Business).

An Analysis Cluster has determined that C15 (Multidisciplinary) exhibits components that are significantly different from those seen in other fields. As such it cannot be grouped with any other field. The fields C6 (Economics & Business) and C21 (Social Sciences, general) share a first cluster, while the remaining nineteen fields would be assigned to a second cluster.

Table 3 and *Figure 1* exhibit components for scientific areas. The area with greatest impact is Life Sciences & Biomedicine. The most highly determinant component in this value is the average number of citations. The Social Sciences have the least aggregate impact despite having the highest growth and average citations. Their low impact can be explained by the low proportion of *JCR* citations and the cited vs. citing ratio. Technology has the second lowest aggregate impact despite having greater proportion of *JCR* items in the citation window.

Table 3. Aggregate impact factor and components for scientific areas as per the Thomas Reuter data base.

Área	Fields	FIA Components					
		a_t^F	r_t^F	p_t^F	w_t^F	b_t^F	FIA_t^F
Life Sciences & Biomedicine	C1, C2, C3, C8, C10, C13, C14, C16, C17, C19	0.55	42.80	0.87	0.18	0.90	3.391
Physical Sciences	C5, C9, C12, C18, C22	0.54	34.97	0.87	0.18	0.88	2.667

Technology	C4, C7, C11	0.55	28.66	0.78	0.20	0.85	2.058
Social Sciences	C6, C20, C21	0.60	46.15	0.67	0.18	0.60	2.001

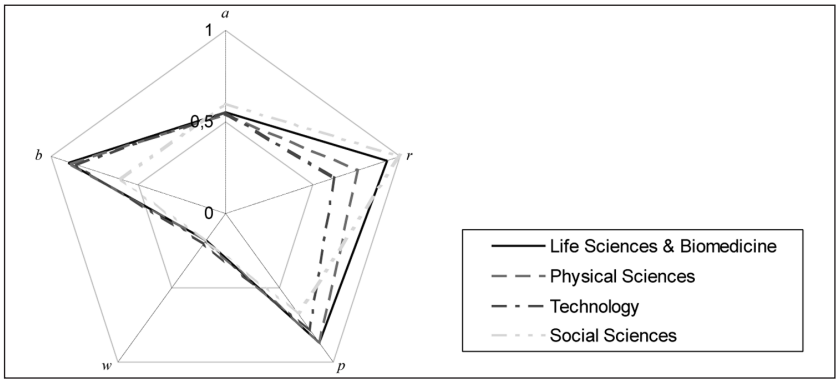

Figure 1. Components of the aggregate impact factor per the Thomas Reuters areas.

Appendix 1 shows the *JCR* journal categories that comprise each field with the corresponding aggregate impact of the category and its respective percentage within the entire field. The impact of Sciences is 58% higher than that for Social Sciences. Despite Social Sciences having on average 30% more citations, this disparity arises in part because most of these items are not included in *JCR*. In concrete terms, 40% of the Social Sciences citations are books and journals not indexed in the *JCR*, while for Sciences this figure is only 20%.

The impact variance is high within each edition. In Sciences, the categories exhibiting highest impact are those associated with biomedicine, while those with the lowest impact are in engineering and mathematics. Regarding Social Sciences, the categories with highest impact are psychology and economy, while those with the lowest are those associated with history.

A Main Components Analysis determines that most of the impact variance in Sciences is owing to three chief components: the proportion of *JCR* citations, the proportion of *JCR* citations in the citation window and the growth of the field itself. In contrast, this variance in Social Sciences is the result of only two chief components: the proportion of *JCR* citations in the citation window, and the ratio between cited and citing items. These main components also vary depending on the *JCR* edition, because the Social Sciences include disciplines, such as economy and history, which differ widely in terms of publishing habits and citations.

A Cluster Analysis initially identifies two journal group categories that generally include the Life Sciences which have the most significant social

component, and those social sciences that rely on mathematical methods, such as psychology, economy and business fields. There are, however, important differences between these two groups. A third group contains those social sciences that depend less on mathematical methods, such as education, sociology, language and law. Finally, a fourth group includes physical sciences and life sciences, e.g., mathematics, physics, chemistry, engineering and biomedicine.

Conclusions

The impact indicators of journals are not comparable between distinct scientific fields because of the systematic difference in publication and citation habits. The objective of this paper is to identify the sources of variance on the basis of scientific fields. The identification of these sources is fundamental to implement in practice standardized bibliometric indicators that are adjusted to the specifics of each field.

This paper presents a breakdown of the impact factor into five main variance sources. In addition to the variables identified in the literature, i.e., number of average citations and the proportion of *JCR* citations, this study establishes the existence of three new sources of variance: the field growth index, the proportion of *JCR* citations in the citation window and the cited vs. citing ratio. As such, in addition to weighing the two sources of variance cited in the literature, it is important to consider these new variables when attempting to standardize impact factors.

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Appendix 1

Scientific fields, JCR journal catgories,
percent within field and impacts

1. *Agricultural Sciences:* Agricultural Engineering, 6 %, 3.123; Agriculture, Multidisciplinary, 13 %, 1.673; Agronomy, 15 %, 1.774; Food Science & Technology, 40 %, 1.942; Horticulture, 7 %, 1.429; Nutrition & Dietetics, 19 %, 3.098.
2. *Biology & Biochemistry:* Anatomy & Morphology, 1 %, 1.976; Biochemical Research Methods, 9 %, 3.822; Biochemistry & Molecular Biology, 32 %, 4.435; Biology, 10 %, 4.114; Biophysics, 8 %, 3.291; Biotechnology & Applied Microbiology, 15 %, 3.256; Endocrinology & Metabolism, 9 %, 4.304; Evolutionary Biology, 3 %, 4.116; Mathematical & Computational Biology, 3 %, 3.038; Microscopy, 1 %, 2.293; Parasitology, 3 %, 3.056; Physiology, 6 %, 3.223.
3. *Clinical Medicine:* Allergy, 0 %, 3.844; Andrology, 0 %, 2.377; Anesthesiology, 1 %, 2.955; Cardiac & Cardiovascular Systems, 4 %, 4.277; Clinical Neurology, 5 %, 3.238; Critical Care Medicine, 1 %, 3.924; Dentistry, Oral Surgery & Medicine, 2 %, 1.966; Dermatology, 1 %, 2.525; Emergency Medicine, 1 %, 2.123; Endocrinology & Metabolism, 3 %, 4.304; Engineering, Biomedical, 2 %, 2.848; Gastroenterology & Hepatology, 2 %, 3.801; Geriatrics & Gerontology, 1 %, 3.158; Health Care Sciences & Services, 1 %, 2.154; Hematology, 2 %, 5.310; Immunology, 4 %, 4.585; Infectious Diseases, 2 %, 3.879; Integrative & Complementary Medicine, 0 %, 2.402; Materials Science, Biomaterials, 1 %, 3.729; Medical Informatics, 0 %, 1.893; Medical Laboratory Technology, 1 %, 2.208; Medicine, General & Internal, 4 %, 4.754; Medicine, Legal, 0 %, 1.787; Medicine, Research & Experimental, 3 %, 3.753; Neuroimaging, 0 %, 4.098; Nutrition & Dietetics, 2 %, 3.098; Obstetrics & Gynecology, 2 %, 2.397; Oncology, 6 %, 4.941; Ophthalmology, 2 %, 2.379; Orthopedics, 2 %, 2.048; Otorhinolaryngology, 1 %, 1.501; Pathology, 2 %, 2.763; Pediatrics, 3 %, 2.005; Peripheral Vascular Disease, 2 %, 4.612; Pharmacology & Pharmacy, 7 %, 3.134; Physiology, 2 %, 3.223; Primary Health Care, 0 %, N.A.; Public, Environmental & Occupational Health (Science), 3 %, 2.666; Public, Environmental & Occupational Health (Social Science), 2 %, 2.177; Radiology, Nuclear Medicine & Medical Imaging, 4 %, 2.972; Rehabilitation, 1 %, 2.103; Rehabilitation, 1 %, 1.632; Reproductive Biology, 1 %, 2.904; Respiratory System, 2 %, 3.475; Rheumatology, 1 %, 4.133; Sport Sciences, 2 %, 2.300; Surgery, 7 %, 2.272; Transplantation, 1 %, 2.876; Tropical Medicine, 1 %, 2.400; Urology & Nephrology, 2 %, 3.078.
4. *Computer Science:* Computer Science, Artificial Intelligence, 16 %, 1.940; Computer Science, Cybernetics, 2 %, 1.395; Computer Science, Hardware & Architecture, 7 %, 1.203; Computer Science, Information Systems, 15 %, 1.583; Computer Science, Interdisciplinary Applications, 18 %, 1.652; Computer Science, Software Engineering, 12 %, 1.240; Computer Science, Theory & Methods, 10 %, 1.404; Imaging Science & Photographic Technology, 3 %, 2.186; Telecommunications, 17 %, 1.331.
5. *Chemistry:* Biochemical Research Methods, 6 %, 3.822; Crystallography, 4 %, 1.681; Chemistry, Analytical, 7 %, 2.906; Chemistry, Applied, 5 %, 2.207; Chemistry, Inorganic & Nuclear, 5 %, 2.404; Chemistry, Medicinal, 5 %, 2.795; Chemistry, Multidisciplinary, 16 %, 4.586; Chemistry, Organic, 8 %, 2.853; Chemistry, Physical, 17 %, 3.615; Electrochemistry, 4 %, 3.615; Engineering, Chemical, 9 %, 1.940; Materials Science, Textiles, 1 %, 1.208; Physics, Atomic, Molecular & Chemical, 6 %, 2.344; Polymer Science, 6 %, 2.508; Spectroscopy, 2 %, 2.065.
6. *Economics & Business:* Agricultural Economics & Policy, 1 %, 1.088; Business, 14 %, 1.845; Business, Finance, 10 %, 1.602; Economics, 46 %, 1.459; History of Social Sciences, 2 %, 0.623; Industrial Relations & Labor, 2 %, 1.208; Management, 18 %, 2.249; Social Sciences, Mathematical Methods, 6 %, 1.392.
7. *Engineering:* Automation & Control Systems, 2 %, 1.532; Computer Science, Artificial Intelligence, 2 %, 1.940; Computer Science, Cybernetics, 0 %, 1.395; Computer Science, Hardware & Architecture, 1 %, 1.203; Computer Science, Interdisciplinary Applications, 3 %, 1.652; Construction & Building Technology, 1 %, 1.121; Energy & Fuels, 4 %, 2.912; Engineering, Aerospace, 1 %, 0.628; Engineering, Biomedical, 3 %, 2.848; Engineering, Civil, 3 %, 1.593; Engineering, Chemical, 6 %, 1.940; Engineering, Electrical & Electronic, 11 %, 1.541; Engineering, Environmental, 3 %, 3.258; Engineering, Geological, 1 %, 1.132; Engineering, Industrial, 1 %, 1.450; Engineering, Manufacturing, 1 %, 1.307; Engineering, Marine, 0 %, 0.207; Engineering, Mechanical, 3 %, 1.127; Engineering, Multidisciplinary, 2 %, 0.928; Engineering,

Ocean, 0 %, 0.998; Engineering, Petroleum, 0 %, 0.565; Ergonomics, 0 %, 1.436; Instruments & Instrumentation, 3 %, 1.675; Materials Science, Characterization & Testing, 1 %, 0.939; Mathematics, Applied, 6 %, 1.247; Mathematics, Interdisciplinary Applications, 2 %, 1.515; Mechanics, 4 %, 1.574; Nanoscience & Nanotechnology, 6 %, 4.365; Nuclear Science & Technology, 2 %, 1.025; Operations Research & Management Science, 2 %, 1.557; Physics, Applied, 12 %, 2.724; Physics, Fluids & Plasmas, 2 %, 2.151; Remote Sensing, 1 %, 1.948; Robotics, 0 %, 1.795; Spectroscopy, 2 %, 2.065; Telecommunications, 3 %, 1.331; Thermodynamics, 2 %, 1.608; Transportation Science & Technology, 1 %, 0.957; Water Resources, 3 %, 1.764.

8. *Environment/Ecology:* Biodiversity Conservation, 4 %, 2.688; Ecology, 20 %, 3.094; Engineering, Environmental, 13 %, 3.258; Environmental Sciences, 37 %, 2.507; Environmental Studies, 6 %, 2.027; Geography, Physical, 5 %, 2.323; Limnology, 3 %, 2.028; Water Resources, 13 %, 1.764.
9. *Geosciences:* Energy & Fuels, 20 %, 2.912; Engineering, Geological, 3 %, 1.132; Engineering, Petroleum, 2 %, 0.565; Geochemistry & Geophysics, 11 %, 2.358; Geography, Physical, 5 %, 2.323; Geology, 3 %, 1.868; Geosciences, Multidisciplinary, 25 %, 2.230; Meteorology & Atmospheric Sciences, 12 %, 2.475; Mineralogy, 3 %, 1.790; Mining & Mineral Processing, 3 %, 1.033; Oceanography, 7 %, 1.943; Paleontology, 3 %, 1.873; Remote Sensing, 3 %, 1.948.
10. *Immunology:* Immunology, 68 %, 4.585; Infectious Diseases, 32 %, 3.879.
11. *Materials Science:* Construction & Building Technology, 3 %, 1.121; Materials Science, Biomaterials, 4 %, 3.729; Materials Science, Ceramics, 3 %, 1.264; Materials Science, Coatings & Films, 5 %, 1.943; Materials Science, Composites, 2 %, 1.553; Materials Science, Characterization & Testing, 2 %, 0.939; Materials Science, Multidisciplinary, 48 %, 2.949; Materials Science, Paper & Wood, 1 %, 0.912; Materials Science, Textiles, 1 %, 1.208; Metallurgy & Metallurgical Engineering, 12 %, 1.346; Nanoscience & Nanotechnology, 18 %, 4.365.
12. *Mathematics:* Mathematical & Computational Biology, 7 %, 3.038; Mathematics, 29 %, 0.829; Mathematics, Applied, 30 %, 1.247; Mathematics, Interdisciplinary Applications, 10 %, 1.515; Physics, Mathematical; 14 %, 1.726; Statistics & Probability, 10 %, 1.241.
13. *Microbiology:* Microbiology, 56 %, 3.801; Microscopy, 3 %, 2.293; Mycology, 5 %, 2.059; Parasitology, 14 %, 3.056; Virology, 21 %, 4.122.
14. *Molecular Biology & Genetics:* Biochemistry & Molecular Biology, 53 %, 4.435; Cell & Tissue Engineering, 1 %, N.A.; Cell Biology, 24 %, 6.453; Developmental Biology, 4 %, 4.583; Genetics & Heredity, 18 %, 4.861.
15. *Multidisciplinary:* Multidisciplinary Sciences, 100 %, 9.707.
16. *Neuroscience & Behavior:* Behavioral Sciences, 8 %, 3.048; Clinical Neurology, 36 %, 3.238; Neuroimaging, 3 %, 4.098; Neurosciences, 50 %, 4.082; Psychology, Biological, 2 %, 2.682.
17. *Pharmacology & Toxicology:* Chemistry, Medicinal, 23 %, 2.795; Pharmacology & Pharmacy, 59 %, 3.134; Toxicology, 18 %, 2.765.
18. *Physics:* Acoustics, 2 %, 1.553; Imaging Science & Photographic Technology, 1 %, 2.186; Optics, 13 %, 2.204; Physics, Applied, 25 %, 2.724; Physics, Atomic, Molecular & Chemical, 9 %, 2.344; Physics, Condensed Matter, 16 %, 3.095; Physics, Fluids & Plasmas, 5 %, 2.151; Physics, Mathematical, 6 %, 1.726; Physics, Multidisciplinary, 13 %, 3.046; Physics, Nuclear, 3 %, 1.796; Physics, Particles & Fields, 6 %, 3.503.
19. *Plant & Animal Science:* Agriculture, Dairy & Animal Science, 7 %, 1.428; Entomology, 6 %, 1.409; Evolutionary Biology, 6 %, 4.116; Fisheries, 5 %, 1.579; Forestry, 4 %, 1.607; Horticulture, 3 %, 1.429; Limnology, 2 %, 2.028; Marine & Freshwater Biology, 10 %, 1.870; Mycology, 2 %, 2.059; Oceanography, 5 %, 1.943; Ornithology, 1 %, 1.182; Plant Sciences, 19 %, 2.692; Reproductive Biology, 5 %, 2.904; Veterinary Sciences, 15 %, 1.213; Zoology, 11 %, 1.613.
20. *Psychiatry/Psychology:* Behavioral Sciences, 8 %, 3.048; Criminology & Penology, 2 %, 1.260; Ergonomics, 2 %, 1.436; Family Studies, 3 %, 1.449; Psychiatry, 19 %, 3.507; Psychiatry, 12 %, 3.215; Psychology, 8 %, 2.741; Psychology, Applied, 4 %, 1.812; Psychology, Biological, 2 %, 2.682; Psychology, Clinical, 9 %, 2.459; Psychology, Developmental, 6 %, 2.572; Psychology, Educational, 3 %, 1.637; Psychology, Experimental, 9 %, 2.590; Psychology, Mathematical, 1 %, 1.840; Psychology, Multidisciplinary, 9 %, 2.098; Psychology, Psychoanalysis, 1 %, 1.147; Psychology, Social, 5 %, 1.835.

21. *Social Sciences, general:* Anthropology, 2 %, 1.381; Area Studies, 1 %, 0.640; Communication, 1 %, 1.271; Criminology & Penology, 1 %, 1.260; Cultural Studies, 0 %, N.A.; Demography, 1 %, 1.258; Education & Educational Research, 5 %, 1.242; Education, Scientific Disciplines, 2 %, 1.529; Education, Special, 1 %, 1.574; Environmental Studies, 3 %, 2.027; Ethics, 1 %, 1.232; Ethnic Studies, 0 %, 1.203; Family Studies, 1 %, 1.449; Geography, 2 %, 1.644; Geriatrics & Gerontology, 3 %, 3.158; Gerontology, 1 %, 2.335; Health Care Sciences & Services, 4 %, 2.154; Health Policy & Services, 3 %, 2.271; History, 1 %, 0.479; History & Philosophy of Science (Science), 1 %, 0.754; History & Philosophy of Science (Social Science), 1 %, 0.922; History of Social Sciences, 1 %, 0.623; Hospitality, Leisure, Sport & Tourism, 1 %, 2.212; Industrial Relations & Labor, 0 %, 1.208; Information Science & Library Science, 2 %, 1.430; International Relations, 2 %, 1.078; Law, 3 %, 1.495; Linguistics, 2 %, 1.471; Medical Ethics, 0 %, 1.581; Medicine, Legal, 1 %, 1.787; Nursing (Science), 4 %, 1.369; Nursing (Social Science), 4 %, 1.367; Planning & Development, 2 %, 1.233; Political Science, 4 %, 1.011; Psychology, Educational, 1 %, 1.637; Public Administration, 1 %, 1.199; Public, Environmental & Occupational Health (Science), 10 %, 2.666; Public, Environmental & Occupational Health (Social Science), 6 %, 2.177; Rehabilitation (Science), 2 %, 2.103; Rehabilitation, 2 %, 1.632; Social Issues (Science), 3 %, 1.721; Social Issues (Social Science), 1 %, 1.043; Social Sciences, Biomedical, 2 %, 2.002; Social Sciences, Interdisciplinary, 3 %, 1.227; Social Work, 1 %, 1.201; Sociology, 3 %, 1.111; Substance Abuse (Science), 1 %, 2.959; Substance Abuse (Social Science), 1 %, 2.261; Transportation, 1 %, 1.874; Urban Studies, 1 %, 1.211; Women's Studies, 1 %, 1.048.
22. *Space Science:* Astronomy & Astrophysics, 100 %, 4.609.