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The thematic orientation of publications mentioned on social media: Large-scale disciplinary comparison of social media metrics with citations

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Large-scale disciplinary comparison of social media metrics with citations

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Abstract

Purpose – The purpose of this paper is to analyze the disciplinary orientation of scientific publications that were mentioned on different social media platforms, focussing on their differences and similarities with citation counts.

Design/methodology/approach – Social media metrics and readership counts, associated with 500,216 publications and their citation data from the Web of Science database, were collected from Altmetric.com and Mendeley. Results are presented through descriptive statistical analyses together with science maps generated with VOSviewer.

Findings – The results confirm Mendeley as the most prevalent social media source with similar characteristics to citations in their distribution across fields and their density in average values per publication. The humanities, natural sciences, and engineering disciplines have a much lower presence of social media metrics. Twitter has a stronger focus on general medicine and social sciences. Other sources (blog, Facebook, Google+, and news media mentions) are more prominent in regards to multidisciplinary journals.

Originality/value – This paper reinforces the relevance of Mendeley as a social media source for analytical purposes from a disciplinary perspective, being particularly relevant for the social sciences (together with Twitter). Key implications for the use of social media metrics on the evaluation of research performance (e.g. the concentration of some social media metrics, such as blogs, news items, etc., around multidisciplinary journals) are identified.

Keywords Citation analysis, Bibliometrics, Altmetrics, Science indicators, Science mapping, Social media metrics

Paper type Research paper

Introduction

Web-based applications are starting to have an impact in scholars' daily practices (Wouters and Costas, 2012), involving a broad set of activities, from managing their literature using Mendeley, CiteULike or Zotero (Li *et al.*, 2011), to writing and reading blogs (Shema *et al.*, 2012), sharing publications in Facebook or Google+ (G+) (Zhu and Procter, 2012), tweeting about scientific papers (Haustein *et al.*, 2014c), or commenting on and rating books in Goodreads (Zuccala *et al.*, 2014, 2015).

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One important characteristic of these web-based practices is that they often leave "traces" in the form of saved publications in online reference managers, tweets, blogs, Facebook wall posts, etc. The collection and study of these traces is the main target of the so-called "altmetrics" (Priem *et al.*, 2010), which have opened the door to new ways of studying scientific communication and its different forms of perception by diverse audiences. However, "altmetrics" is not considered as a proper term for a series of metrics that are very diverse and complex (Rousseau and Ye, 2013). Instead "social media metrics" has been proposed (Haustein *et al.*, 2015a) as these metrics come from sources that are embedded in the social web (Bar-Ilan *et al.*, 2012), although the discussion on the proper term (or terms) for the different "traces" and events captured by these sources is still open (Haustein *et al.*, 2015b).

Research in altmetrics has mostly focussed on aspects about the description of the different sources and metrics (Galligan and Dyas-Correia, 2013; Khodiyar *et al.*, 2014; Piwowar, 2013), the coverage of publications by the different sources (Peters *et al.*, 2014; Robinson-García *et al.*, 2014; Zahedi *et al.*, 2014) and the adoption/use of social tools by different communities (Haustein *et al.*, 2014b; Mas-Bleda *et al.*, 2014; Thelwall and Maflahi, in press); correlations (particularly with citations) (Costas *et al.*, in press; Haustein *et al.*, 2014c, 2015a; de Winter, 2015) or data problems and quality (Chamberlain, 2013; Zahedi *et al.*, 2014).

In several of these previous works some disciplinary analyses have been performed (Hammarfelt, 2014; Haustein *et al.*, 2014c; Mohammadi and Thelwall, 2014; Zahedi and van Eck, 2014), pointing to differences in social media metrics across fields of science. However, a broader and detailed disciplinary analysis in a global map of science is still missing, which is essential to better understand the presence and role of social media metrics across disciplines. This paper intends to fill this gap.

Objective and research questions

The main objective is to analyze the disciplinary orientation of scientific publications that received mentions from different social media sources, and particularly to establish their main differences/similarities with citations. The following research questions are targeted:

RQ1. What is the presence and density of social media metrics across scientific disciplines? (with "density" here we mean strictly the average of metrics per paper (see similar terminology in Haustein *et al.*, 2015a), not to be confused with the "density view" from the VOSviewer tool explained below).

RQ2. How is the distribution of social media metrics across fields?

RQ3. What are the scientific disciplines that have a higher propensity to present some social media activity vs. citation impact?

Methods

For this study we have considered the same set of publications analyzed in a previous study (Costas *et al.*, in press). This set is composed of 500,216 Web of Science (WoS) publications (articles and reviews) from July until December 2011 with a Digital Object Identifier (DOI). The DOI is used as the linking element across the different data sources. Citation data have been collected up to week 39 (August) 2014, considering a citation window of more than 2.5 years. Mendeley readerships have been collected (using the Mendeley REST API) up to mid October 2014 and Altmetric.com data has

been collected (through their API) up to 12 November 2014. As a result, the data set allows the analysis of publications with a substantially larger window for citations and social media metrics (as compared to most previous studies).

The 250 Thomson Reuters Subject Categories (http://ip-science.thomsonreuters.com/mjl/scope/scope_scie/#AA) have been used as disciplinary scheme. Each journal in WoS is assigned to one or more subject categories. Whenever a publication (by extension of the journal classification) is assigned to more than one discipline, the publication is fractionalized by the number of different disciplines and the same is applied to the different metrics. The aim of the fractionalization is to avoid the multiplicative effect of the database by the multi-classification of some journals (Herranz and Ruiz-Castillo, 2012).

Thomson Reuters' classification contains a category of "Multidisciplinary sciences," which is not a real discipline as it covers generalist journals such as *Nature*, *PLoS ONE*, *Proceedings of the National Academy of Sciences*, and *Science*, which publish articles from all fields of science. In order to avoid the effect of this category, publications from the category have been individually re-allocated, as far as possible, to other more specific subject categories on the basis of their references (following a similar methodology as suggested by Glänzel *et al.*, 1999).

Based on the previous data set, several size-dependent (total counts) and size-independent indicators (ratios of indicators per publication) have been calculated (Table I).

Indicator	Name	Definition
Size-dependent		
P	Total publications	Total number of articles and reviews in a discipline. Values are fractional due to the multi-classified publications (this applies to all indicators)
TCS	Total citation score	Sum of all citations received by P (including self-citations)
TRS	Total readership score	Sum of all readerships accounted for P as computed by Mendeley
TTS	Total Twitter mentions	Sum of all Twitter mentions received by P as captured by Altmetric.com
TBS	Total blog mentions	Sum of all times blog mentions received by P as captured by Altmetric.com
TNS	Total mentions in mainstream news media	Sum of all mentions by mainstream news media received by P as captured by Altmetric.com
TFS	Total Facebook mentions	Sum of all mentions in Facebook received by P as captured by Altmetric.com
TGS	Total Google Plus [G+] mentions	Sum of all mentions in G+ received by P as captured by Altmetric.com
Size-independent (calculated only for the re-classified set of publications)		
MCS	Mean citation score	TCS/P
MRS	Mean readership score	TRS/P
MTS	Mean Twitter score	TTS/P
MBS	Mean blogs score	TBS/P
MFS	Mean Facebook score	TFS/P
MGS	Mean G+ score	TGS/P
MNS	Mean mainstream news media score	TNS/P

Table I.
Main indicators calculated (size-dependent and size-independent)

Several additional supplementary material to this paper have been published in a Figshare fileset in Costas *et al.* (2015) including two files: "Supplementary material 1" and "Supplementary material 2." In Appendix 2 (which can be found also in "Supplementary material 1" in the Figshare fileset) the list of 250 subject categories together with all the size-dependent indicators is presented. Based on this table, all the size-independent indicators as well as all maps and results presented in this paper can be reproduced. Appendix 2 also includes all the metrics (with the indicators followed by the string "reclas") for the 249 fields with the re-classified publications. In "Supplementary material 2" all underlying data for the VOSviewer maps are also presented.

The analysis of the data has been performed using SPSS and the VOSviewer 1.5.7 (www.vosviewer.com/). Several classifications of disciplines by the median and quartiles have been performed using the NTILE() command in SQL, which basically divides the distribution of fields in two or four parts of equal size (https://msdn.microsoft.com/en-us/library/ms175126.aspx).

VOSviewer visualizations

In order to explore and compare the presence of social media metrics across disciplines in a global map of science the VOSviewer has been used (www.vosviewer.com/), particularly the "density view" and "label view" techniques (van Eck and Waltman, 2010, 2011). In addition, a global map of science has been used for the visual inspection of the disciplines. This underlying map can be obtained from the VOSviewer web site (www.vosviewer.com/maps/wos_subject_categories). This map has been already applied for the exploration of different Mendeley readerships (Zahedi and van Eck, 2014). It is important to notice that this underlying map is created based on citations (not on altmetric scores). Thus, the map allows detecting areas of "thematically" closely related disciplines in terms of citation linkages.

The VOSviewer "density view" technique allows to explore in which disciplines the different metrics are more prominent. This is possible because the density view reveals the general structure of the map by drawing the attention to the most important disciplinary areas. It has, however, the disadvantage that it can hide some individual disciplines that may have particularly high values in some of the indicators but are surrounded by neighbouring disciplines with low densities (and vice versa). In the context of this paper is important to distinguish the "density view" from the analysis of the density of metrics per publication (i.e. the average presence of metrics per paper across disciplines).

Complementary to the density view, the "label view" has been also considered. In this view, disciplines are indicated by their label and by a circle. The more important the discipline is in terms of the metric (i.e. its size-dependent indicator), the larger its label and its circle. Colors have been assigned to the disciplines based on the quartile value sorted by the density of the metric in the discipline (i.e. the average of the metric per publication per discipline). Thus, red circles refer to disciplines in the first quartile, orange to disciplines in the second quartile, yellow to disciplines in the third quartile and gray to disciplines in the fourth quartile. Compared to the density view, the label view allows for the identification of disciplines with the highest values of metrics per paper.

Limitations

This study has the following limitations. In the first place, the set of publications is only composed of WoS-covered scientific articles and reviews. This means that mostly

English-language scientific journals articles and reviews are considered (see also Alperin, 2015 in this issue) and that other outputs (e.g. books, book chapters, articles in local languages, etc.) are not considered. This implies that areas like the humanities are less visible (Hammarfelt, 2014; Moed, 2005). A second limitation has to do with the use of the DOI as the linking element for the different data sources (Altmetric.com and Mendeley). Not all publications from all fields have incorporated the DOI standard (Haustein *et al.*, 2015a) and altmetrics data providers may fail in their proper collection (Bar-Ilan *et al.*, 2012). Other more general problems related with altmetrics data such as data quality, robustness, consistency, or missing data (Zahedi *et al.*, 2014) are also to be expected, therefore the data collection standards (and limitations) by Altmetric.com and Mendeley need to be observed. Nevertheless, given the large scale of this study we consider it informative and relevant for a better understanding of the field distribution of social media metrics and their comparison with citations.

Results

What is the presence and density of social media metrics across scientific disciplines?

The "Multidisciplinary sciences" category exhibits the highest counts for all the metrics (citations and all social media metrics) and also has the highest rates of metrics per publication of all categories (cf. Appendices 2 and 3). The values of all metrics in the "reclas" section are higher for all disciplines, which is the result of the impact added by those re-classified publications from the multidisciplinary journals. The sum of Mendeley readerships tends to be higher than the sum of citations for most disciplines (39 fields are exceptions to this pattern, including disciplines such as "Oncology," "Chemistry: physical," "Chemistry: multidisciplinary," "Physics: multidisciplinary" or "Astronomy and astrophysics" among others). In other words, 210 fields (84 percent) have the same or a higher number of readerships than citations.

All size-dependent indicators increase when the "Multidisciplinary sciences" publications are re-classified (Table II). Citations and readerships present the highest overall counts, with readerships being higher than citations. The next source in overall

	p	TCS	TRS	TTS	TBS	TFS	TGS	TNS
All categories								
Median	1,034.17	5,126.42	9,679.52	182.04	12.50	17.83	4	3.68
Mean	2,000.86	14,986.17	21,387.85	939.17	65.87	101.45	27.18	21.94
SD	2,450.85	25,595.40	37,578.43	3,251.25	246.09	285.62	146.08	117.13
N (WoS categories)	250	250	250	250	250	250	250	250
Minimum	11	1	3	0	0	0	0	0
Maximum	13,900.95	207,475	399,314	46,271	3,621	3,140	2,237	1,811
Sum	500,216	3,746,542	5,346,963	234,793	16,468	25,363	6,796	5,484
Re-classified								
Median	1,075.49	5,262.81	10,103.33	309.44	18.18	26.94	8.85	6.59
Mean	2,008.90	15,046.35	21,473.75	942.94	66.14	101.86	27.29	22.02
Std. Deviation	2,428.05	23,844.87	31,624.94	1,709.58	117.52	220.90	51.32	38.85
N (WoS categories)	249	249	249	249	249	249	249	249
Minimum	11	1	3	0	0	0	0	0
Maximum	14,636.67	169,439.04	248,018.82	15,796.88	794.51	1,729.20	329.43	249.69
Sum	500,216	3,746,542	5,346,963	234,793	16,468	25,363	6,796	5,484

Table II. Main descriptive values (size-dependent indicators)

number of counts is Twitter, followed by Facebook, mentions in blogs, G+ and finally mainstream news media mentions. This is in line with the observations by Robinson-García *et al.* (2014) regarding the coverage of different types of altmetrics sources from Altmetric.com for WoS publications.

The main descriptive values for the size-independent indicators (Table III) confirm the higher rate of readerships per paper for the different subject categories as compared to citations (both in average and median). The other metrics basically present the same order in density values, with Twitter being the most important, followed by Facebook, Blogs and G+ and news. In contrast with citations and readerships, the size-independent indicators of the other metrics are below 1 in most of the cases. Actually, there are only 30 disciplines (12 percent) where the density of tweets per publication is higher than 1, and only 6 (2 percent) where this value is higher than 2 ("Medicine: general and internal," "Nutrition and dietetics," "Sport sciences", "Psychology: social," "Integrative and complementary medicine" and "Psychology: biological"). For all the other data sources, the density is always below 1, this meaning that on average publications receive less than one mention.

Which fields accumulate more social media metrics and which ones have the highest density of metrics per publication?

A series of figures (from Figures 1-4) is presented. Figure 1 is composed by 2 graphs. The graph on top shows the "density view" map for citations; the graph on the bottom presents the "label view," with the size of the circles defined by the total sum of citations per discipline while the colors are defined by the mean citation score of the discipline (i.e. the size-independent indicator).

Considering the general distribution of citations across fields in the WoS (Figure 1), the shape of the maps are in line with the general distribution of publications and citations across disciplines in the Web of Science (Moed, 2005 and cf. also Appendix 1), where biomedical and natural science disciplines (on the top and right sides of the map) exhibit a stronger presence of citations (and publications) than the engineering disciplines (on the bottom part of the map), and the social sciences and humanities (on the left side of the map). Notice that there is no great difference between these maps and the graphs based on the same indicator (TCS) considering the "Multidisciplinary sciences" (Appendix 3(b)), although still some concentration of citations in the "Multidisciplinary sciences" category is visible.

Mendeley (Figure 2(a)) exhibits a strong similarity with citations but with readerships having more disciplinary areas highlighted across the map, particularly in the fields related with psychology, social sciences and economics. The mean readerships per publication across disciplines (Figure 2(b)) shows a broader dispersion across the disciplines in the map, with disciplinary areas from all over the map showing

Re-classified Mult.	MCS	MRS	MTS	MBS	MFS	MGS	MNS
Median	4.91	9.49	0.32	0.02	0.03	0.01	0.01
Mean	5.47	10.41	0.48	0.03	0.05	0.01	0.01
SD	3.23	6.53	0.54	0.04	0.08	0.02	0.01
n (WoS categories)	249	249	249	249	249	249	249
Minimum	0.05	0.18	0.00	0.00	0.00	0.00	0.00
Maximum	15.93	34.97	3.31	0.23	0.86	0.24	0.08

Table III. Main descriptive values (size-independent indicators)

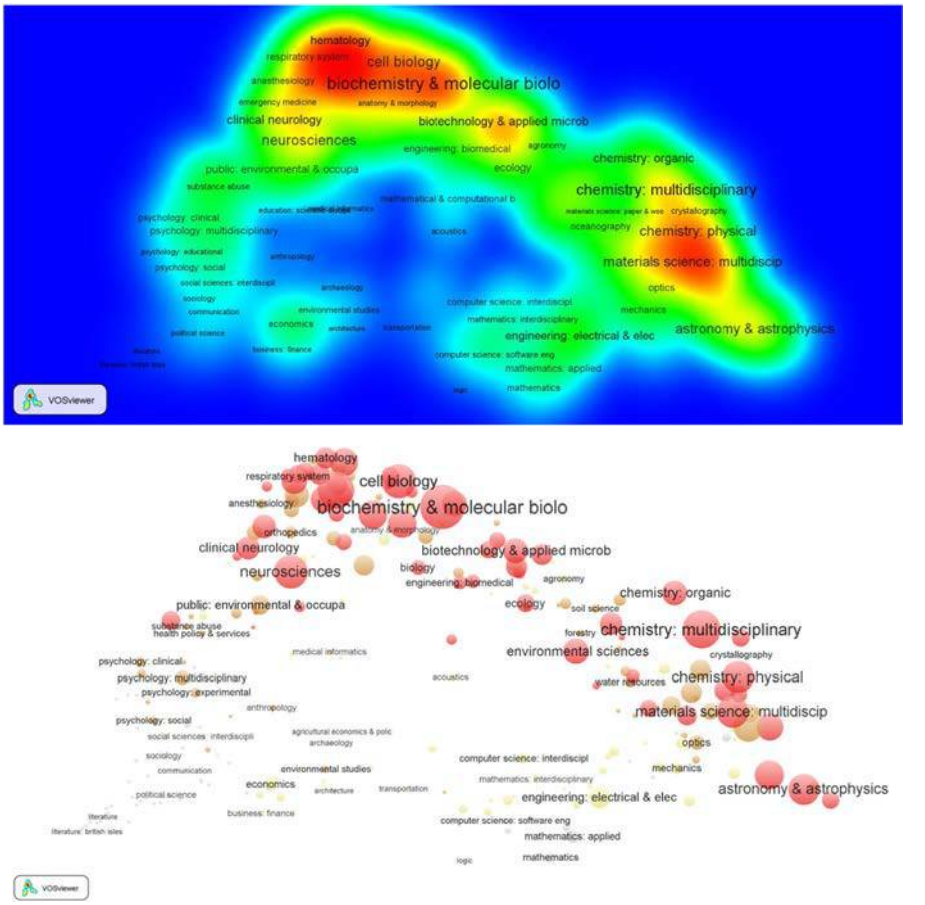
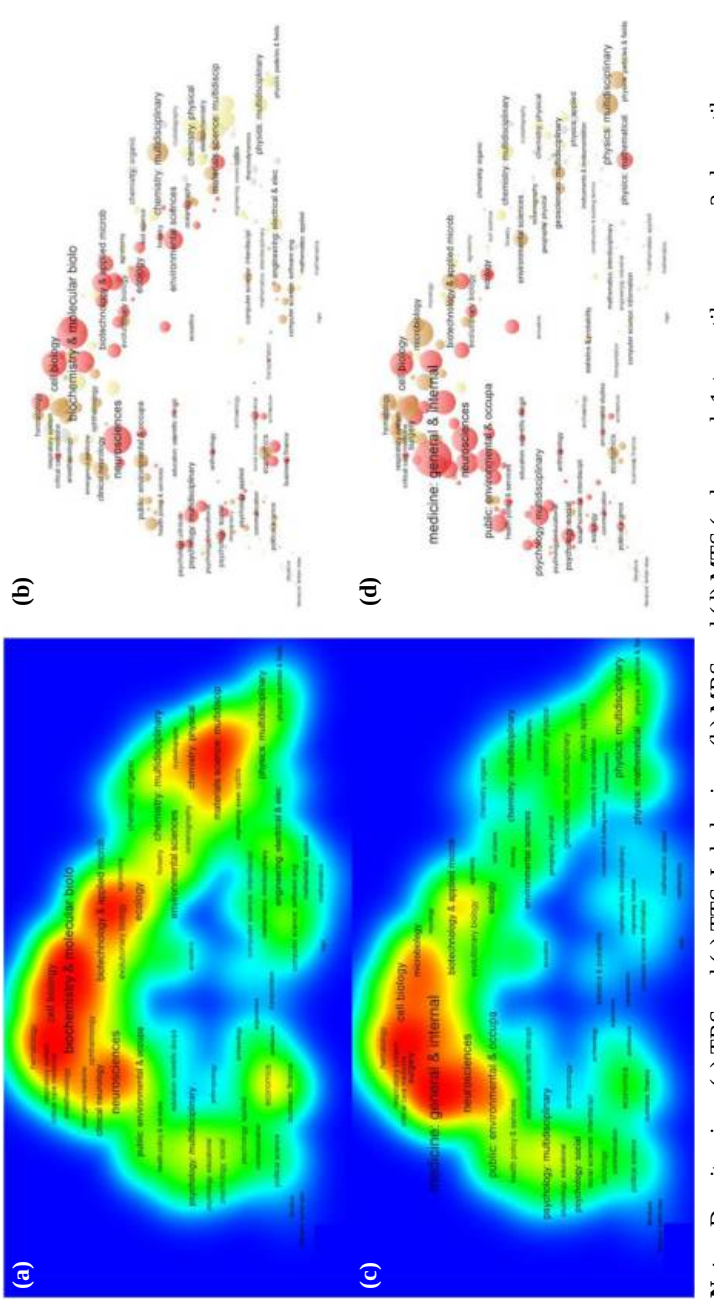


Figure 1.
Citations

Notes: Top: density map of TCS; bottom: TCS nodes size (MCS cluster color: red: 1st quartile, orange: 2nd quartile, yellow: 3rd quartile and gray: 4th quartile)

relatively high values of readerships per publication. Similar to previous results (Zahedi and van Eck, 2014) the more technical and engineering fields also exhibit a lower density of readerships per publication (right-bottom areas of the map in Figure 2(b)).

In the case of Twitter, a first relevant characteristic is that Twitter counts tend to strongly accumulate around the publications of journals that belong to the "Multidisciplinary sciences" (see Appendix 3(d)). Once the multidisciplinary effect is removed, tweets concentrate mostly around the general medical fields as well as in psychology and social sciences (Figure 2(c)), with a lack of twitter in the disciplines of the right hand side of the map. The distribution of the mean Twitter scores per publication for the different disciplines (Figure 2(d)) shows how are precisely the general medicine, psychology and social sciences disciplines the ones achieving the highest MTS values. It is noticeable the low presence of tweets in the areas of chemistry and physics (at the right hand side of the map, with the exception of "Physics: mathematical," which is influenced by the more than 4,000 tweets that go to a single article (www.altmetric.com/details.php?



Notes: Density view: (a) TRS and (c) TTS. Labels view: (b) MRS and (d) MTS (colors: red: 1st quartile, orange: 2nd quartile, yellow: 3rd quartile and gray: 4th quartile)

Figure 2.
Mendeley (top graphs). Twitter (bottom graphs)

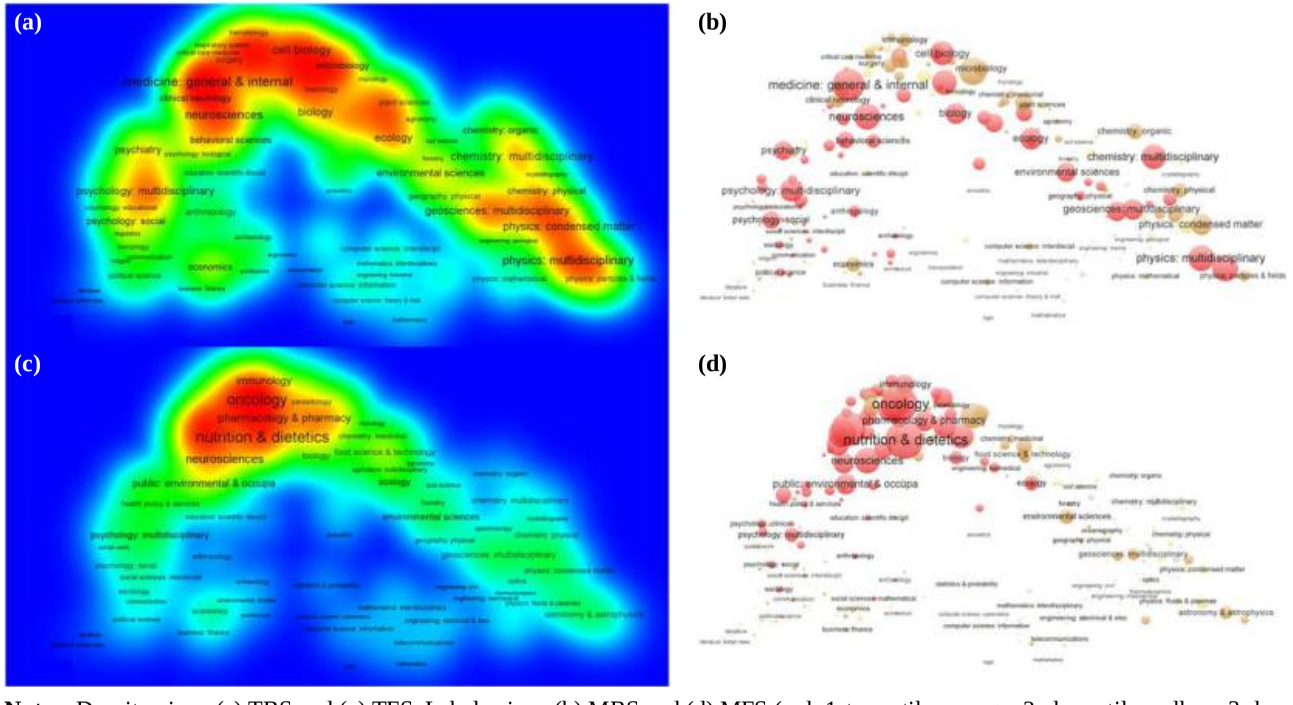
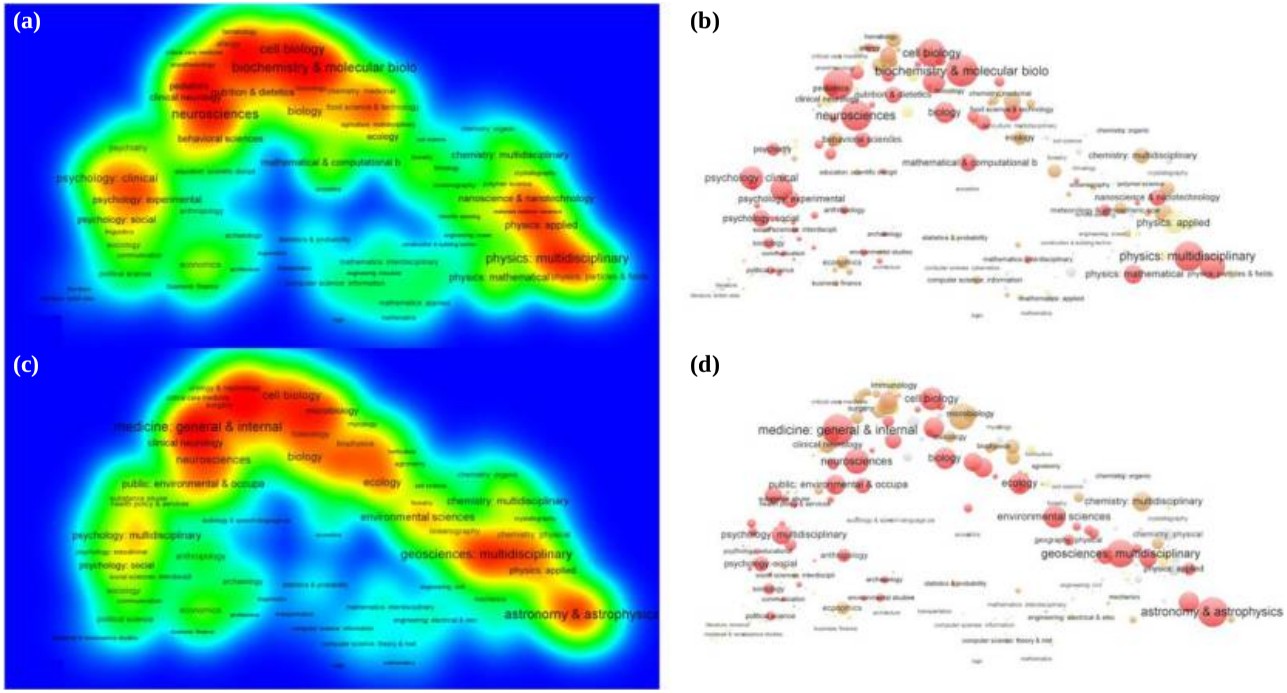


Figure 3.
Blogs (top graphs).
Facebook (bottom graphs)

Notes: Density view: (a) TBS and (c) TFS. Labels view: (b) MBS and (d) MFS (red: 1st quartile, orange: 2nd quartile, yellow: 3rd quartile and gray: 4th quartile)



Notes: Density view: (a) TGS and (c) TNS. Labels view: (b) MGS and (d) MNS (red: 1st quartile, orange: 2nd quartile, yellow: 3rd quartile and gray: 4th quartile)

Figure 4.
G+ (top graphs).
News (bottom graphs)

doi = 10.1088/1751-8113/44/49/492001) with an amusingly short abstract as the answer to the paper title: "Probably not.") and particularly the engineering and technical sciences (bottom of the graph).

Blog mentions also strongly concentrate around the "Multidisciplinary sciences" (cf. Appendix 3(e)). However, again when the re-classification of these publications is considered, a broader dispersion across all disciplines is observed, both when considering the size-dependent (TBS) and size-independent indicator (MBS) (Figure 3(a) and (b)). However, it is remarkable that the humanities (extreme of the left hand side of the maps) and engineering disciplines (bottom-right part of the map) still present the lowest values. Very similar conclusions as for blogs, can be also extracted for the analysis of news and G+ (Figure 4(a)-(d)).

An interesting difference is noticeable for Facebook (Figure 3(c) and (d)), in which a strong concentration is observed in some medical fields (particularly "Oncology" and "Nutrition and dietetics"), with a similar pattern also for the size-independent indicator (MFS). This pattern is strongly influenced by a single publication with an extremely high amount of Facebook mentions (www.altmetric.com/details.php?doi = 10.1080/01635581.2011.589959), classified in these two fields of "Oncology" and "Nutrition and dietetics." The fact that this single publication has more than 1,500 Facebook mentions (the next paper in our data set has 617 Facebook mentions, the next in "Oncology" has 170 and 65 in "Nutrition and dietetics") suggests the strong influence that outliers may have when working with these social media metrics, even at the level of entire disciplines. A manual check for outliers has been performed for the other sources, and with the exception of the paper with the funny abstract (previously mentioned) no other relevant cases have been detected. However, the skewness of these metrics and the potential effects of outliers are aspects that clearly deserve future attention.

What are the scientific disciplines that have a higher propensity to present social media mentions vs citation impact?

The presence of citations and social media metrics differ across disciplines. The distribution of all the fields has been partitioned in two halves (using the NTILE() SQL function) sorting the fields in decreasing order by each of the size-independent indicators under study. Disciplines are classified respectively as "High" and "Low" based on which of the halves they belong to (i.e. above or below the median). Those disciplines that are high (or low) compared to other disciplines in terms of citations, but low (or high) in any other of the social media metrics are detected. In order to simplify the analysis the disciplines have been categorized by "Sciences," "Social Sciences" and "Arts and Humanities" as determined by the three databases that compose the Web of Science (i.e. Science Citation Index, Social Sciences Citation Index and Arts & Humanities Citation Index), of which 173 (69 percent) are Sciences, 49 (20 percent) are Social Sciences and 27 (11 percent) are Arts and Humanities. Table IV presents the raw number of disciplines per main disciplinary area together with the share of disciplines of that area that belong to that combination of the high/low grouping (between brackets).

The majority of the disciplines (around 60 percent) have the same positioning (high-high or low-low) regardless of whether this is based on citations or social media metrics. Among the high-high group of Sciences we have "Biochemistry and molecular biology," "Oncology," "Neurosciences," "Environmental sciences" or "Biotechnology and applied microbiology" among others. There are between 11 and 14 Social Sciences disciplines

MCS	MRS	Sciences	Social Sciences	Arts and Humanities
High	High	65 (38%)	14 (29%)	0 (0%)
Low	High	17 (1%)	28 (57%)	1 (04%)
High	Low	46 (27%)	0 (0%)	0 (0%)
Low	Low	45 (26%)	7 (14%)	26 (96%)
MCS	MTS	Sciences	Social Sciences	Arts and Humanities
High	High	64 (37%)	14 (29%)	0 (0%)
Low	High	14 (08%)	29 (59%)	4 (15%)
High	Low	47 (27%)	0 (0%)	0 (0%)
Low	Low	48 (28%)	6 (12%)	23 (85%)
MCS	MBS	Sciences	Social Sciences	Arts and Humanities
High	High	69 (4%)	14 (29%)	0 (0%)
Low	High	16 (09%)	21 (43%)	5 (19%)
High	Low	42 (24%)	0 (0%)	0 (0%)
Low	Low	46 (27%)	14 (29%)	22 (81%)
MCS	MFS	Sciences	Social Sciences	Arts and Humanities
High	High	71 (41%)	11 (22%)	0 (0%)
Low	High	18 (1%)	20 (41%)	5 (19%)
High	Low	40 (23%)	3 (06%)	0 (0%)
Low	Low	44 (25%)	15 (31%)	22 (81%)
MCS	MGS	Sciences	Social Sciences	Arts and Humanities
High	High	65 (38%)	14 (29%)	0 (0%)
Low	High	17 (1%)	21 (43%)	8 (3%)
High	Low	46 (27%)	0 (0%)	0 (0%)
Low	Low	45 (26%)	14 (29%)	19 (7%)
MCS	MNS	S	SS	AH
High	High	65 (38)	14 (29%)	0 (0%)
Low	High	17 (1%)	24 (49%)	5 (19%)
High	Low	46 (27%)	0 (0%)	0 (0%)
Low	Low	45 (26%)	11 (22%)	22 (81%)

Note: Number of fields and share of fields for main areas (Sciences, Social sciences, Arts and Humanities) are in brackets

Table IV.
Disciplines by citations and social media metrics

(depending on the metric) that are high both in citations and social media metrics (e.g. psychology-related disciplines or "Health policy and services," "Anthropology," "Gerontology" or "Social sciences: biomedical"). Arts and Humanities disciplines mostly belong to the low-low group. Just a small set of Arts and Humanities fields are among the high group with social media metrics (including "Religion," "History and philosophy of science" or "Archaeology," this last one being the only Arts and Humanities discipline above the median in all social media metrics). Between 41 and 59 percent (depending on the metric) of the Social Sciences disciplines are generally high with social media metrics and low in citations (e.g. "Sociology," "Social sciences: interdisciplinary" or "Communication"). Only a few disciplines from the Social Sciences are low both in citations and social media metrics (including here among others: "Social work," "Law" or "Area studies"). Similarly, some Sciences fields are low in both types of metrics, including "Engineering: electrical and electronic," "Mathematics: applied," "Mathematics" or "Crystallography." Between 23 and 27 percent of the Sciences disciplines have lower numbers in social media metrics while they score high in citations (i.e. the high-low combination). These include fields such as "Engineering: chemical," "Polymer science," "Optics," "Chemistry: inorganic and nuclear," "Electrochemistry," "Chemistry: applied" and "Physics: nuclear" among others.

Discussion

The emerging field of altmetrics (Kwok, 2012) has been perceived by some as a "revolution" in the field of scientometrics (Bornmann, 2014a), although still important debates are taking place on their proper taxonomy (Rousseau and Ye, 2013), meaning(s) (Bornmann, 2014b; Priem *et al.* 2012a, b), reliability (Costas *et al.*, in press; Waltman and Costas, 2014), validity (Colquhoun, 2014), and potential uses (Crotty, 2014; Neylon, 2014).

In order to unveil the main characteristics and properties of these new metrics, several studies have focussed on their main patterns, comparing them with citations and other bibliographic characteristics (Costas *et al.*, in press; Haustein *et al.*, 2014a, c; Waltman and Costas, 2014). Here a large-scale disciplinary analysis is presented, using a combination of quantitative and explorative techniques, contributing to the understanding of the thematic and disciplinary orientation of these new social media metrics.

Main results show that all metrics achieve their highest scores in the "Multidisciplinary sciences" category, especially in some of the social media metrics (i.e. blogs, news, and G+), suggesting the importance of considering classification schemes that avoid the problem of heterogeneous multidisciplinary categories. This bias toward multidisciplinary journals of blog mentions has been already discussed (Groth and Gurney, 2010; Shema *et al.*, 2012) and supports the idea that these sources mostly reflect the mainstream media's tendency to cover publications from leading journals (e.g. *Nature*, *Science* or *PNAS* among others). This strong concentration in multidisciplinary journals also needs to be considered when working with these sources. However, once the multidisciplinary effect is removed, these metrics tend to be dispersed across the whole map of science, although it is not clear to what extent this is also an effect of the multidisciplinary nature of the publications from these journals.

Most of the social media metrics (Twitter, blogs, news, G+, and Facebook) show density values below 1 across all disciplines, and only Twitter has values above 1 for some fields. This low density implies that the potential construction of indicators based on these sources may be challenged by their limited reliability. For example, it could happen that with small changes in the counts, the indicators can be substantially modified in a relatively short period of time or with different data collection methodologies, and they will be sensitive to outliers (the two extreme cases for Facebook and Twitter discussed in this paper are good examples of this point).

The observed higher density of Mendeley readerships over citations for most disciplines has been previously discussed (Mohammadi and Thelwall, 2014; Zahedi *et al.*, 2014) and could be attributed to the faster accumulation of readerships compared to citations, although other reasons such as the potential increase in Mendeley users over time may also need to be considered. Future research should study if this pattern would remain with longer citation windows. This finding supports the idea of Mendeley readerships as one of the strongest social media metrics for analyzing journal articles (Hammarfelt, 2014; Torres-Salinas *et al.*, 2013).

VOSviewer maps show that Mendeley has a stronger presence across a larger variety of disciplines, in contrast to citations that concentrate more in the medical and natural sciences. The distribution of Twitter mentions across disciplines exhibits an inverse pattern compared to citations with Twitter having a stronger presence in the more general medical fields, psychological disciplines and social sciences (although still low in the humanities fields). This finding supports previous results (Costas *et al.*, in press) on the prominent presence of tweets around the social sciences and provides

some support to the potential interest of Twitter for capturing "popular" or "socially relevant" publications (Bornmann, 2013, 2014b), although this needs further exploration given the complexity of motivations and limitations related to Twitter activity (Haustein *et al.*, 2014c).

Most disciplines tend to remain in the same half of the distributions (high-high or low-low) when ranked both by citations and social media metrics. There are, however, interesting deviations. First, a substantial number of the social sciences disciplines improve their position with respect to other science fields when considering social media metrics, thus reinforcing the potential value of these metrics for these disciplines (Mohammadi and Thelwall, 2014; Costas, *et al.*, in press). Second, important science disciplines that are high in their positioning based on citations (including mostly Engineering disciplines, and some physics and chemistry fields) are lower ranked based on the social media metrics, suggesting that social media metrics are not equally relevant for all disciplines.

In contrast to this improved position of the Social Sciences, the Arts and Humanities disciplines are systematically placed in the lower positions of the distributions of both citations and social media metrics. Thus, humanities journal articles basically remain among the lowest both cited and social media mentioned publications, an aspect that has been already pointed out by Hammarfelt (2014) and could be related to the greater focus on journal articles by most altmetrics tools.

Conclusions

Mendeley is the strongest social media source with similar characteristics to citations in terms of their distribution across fields. Particularly relevant is the higher density of readerships over citations (after almost three years) in most disciplines.

The social sciences is one of the areas that changes the positioning of its disciplines more substantially in its benchmark with the more science disciplines. This is the case for most social media metrics, and particularly for Mendeley and Twitter. This is in line with previous results (Torres-Salinas *et al.*, 2013) suggesting that Mendeley readerships could play an important role in these fields, where also citations tend to be more problematic (Nederhof, 2006). On the other hand, the more humanistic, natural and engineering sciences have a very low presence across all social media metrics and therefore their use in these fields needs to be more carefully considered.

Twitter has a stronger focus on general medicine, psychology and social sciences as these disciplines have a higher density of tweets per publication than other disciplines. This supports the idea of a more "social" orientation of this source, although still more research is necessary in order to better understand the problems (e.g. automated mentions, Haustein *et al.*, in press) and potential value of this source as a proper "societal impact" indicator.

With the exception of Mendeley (and to some degree also Twitter) the less prevalent social media sources (blogs, G+ or mainstream news mentions) have an important bias around multidisciplinary journals like *Nature*, *Science*, or *PNAS*. Thus, their potential usefulness is limited by this bias toward this type of journals, although the effect of this bias might be reduced by using classification without such a multidisciplinary category. Also, their susceptibility to outliers must be bear in mind when working with them.

Finally, more research is still necessary on issues related with data collection and data quality (Zahedi *et al.*, 2014), particularly on how to identify and characterize outliers, strange and funny cases, data errors, biases, etc., as well as issues related with the skweness and distribution of metrics across publications. Also, similarly to

citations, which have been researched for many years and still pose important conceptual challenges (Nicolaisen, 2007; Wouters, 2014), social media metrics need a better understanding of their meaning, value, realistic uses and conceptual limitations (Haustein *et al.*, 2015b) before they can be reasonably fully incorporated in the study of scientific communication and evaluation practices.

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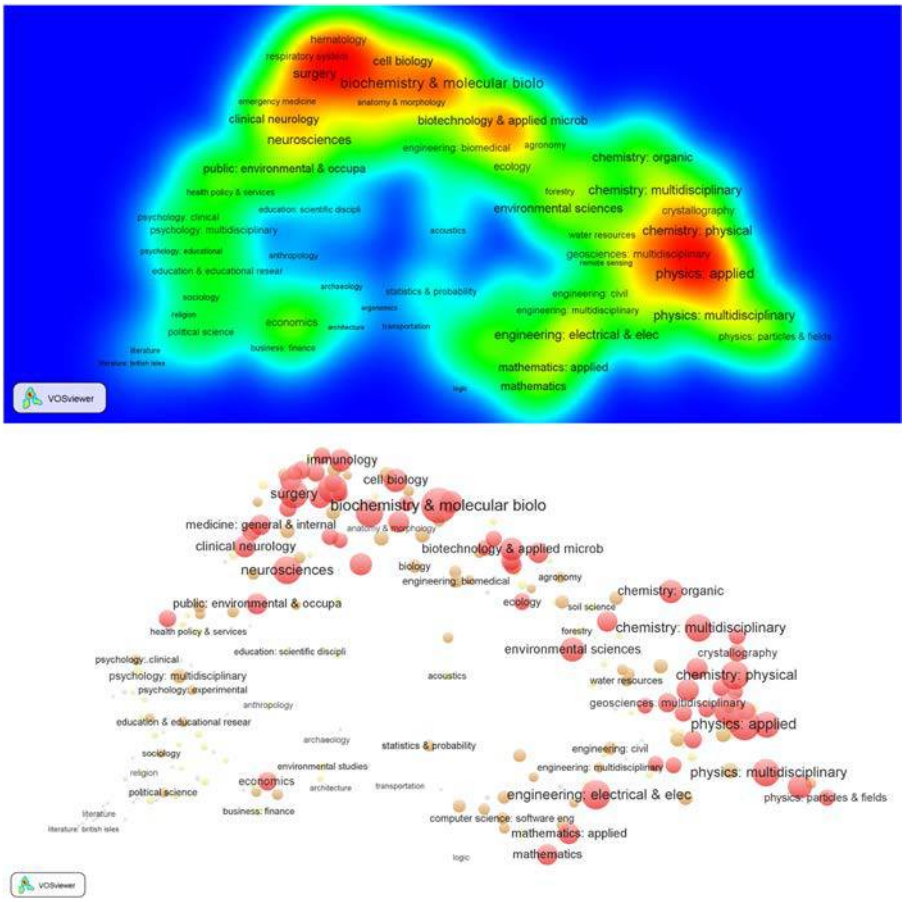
Appendix 1



Notes: Top: density map of P; bottom: P node size and cluster colors, red: 1st quartile, orange: 2nd quartile, yellow: 3rd quartile and grey: 4th quartile

Figure A1. Publications

Table AI.
Main size-dependent indicators per subject category and indicators calculated for the re-classification ("reclas") of publications in the "Multidisciplinary sciences" category

Subject category	P	TCS	TRS	TTS	TBS	TNS	TFS	TGS	P reclas	TCS reclas	TRS reclas	TTS reclas	TBS reclas	TNS reclas	TFS reclas	TGS reclas
Acoustics	888.50	3810.33	6437.83	35.00	2.17	2.83	8.00	0.50	902.41	3921.88	6741.59	76.07	4.78	5.44	10.21	1.81
Automation and control systems	1243.83	5709.67	6071.42	11.75	1.33	0.33	3.33	0.50	1253.13	5763.68	6221.44	26.17	2.89	1.62	3.92	1.65
Agriculture: dairy and animal science	1482.83	6199.00	9699.83	104.17	7.00	1.17	28.83	0.33	1495.91	6342.78	10049.92	142.13	10.83	4.55	32.14	5.07
Agricultural economics and policy	94.33	292.75	900.58	14.58	1.50	0.50	3.00	0.00	96.26	345.02	1097.19	32.79	3.84	1.35	4.62	0.45
Agriculture: multidisciplinary	997.83	3917.75	6717.08	124.75	9.00	4.00	20.33	1.83	1014.40	4128.62	7271.28	183.46	14.54	5.34	24.97	6.66
Engineering: aerospace	781.92	1704.08	3376.83	19.00	3.25	2.75	4.50	0.00	786.00	1743.88	3417.11	29.19	4.29	4.33	4.86	2.93
Agronomy	1432.67	6677.17	12045.33	43.58	15.50	1.50	5.17	0.33	1460.84	7158.31	13108.81	234.07	24.58	6.97	14.55	3.50
Allergy	431.17	4643.17	3803.42	489.58	25.33	6.00	63.50	24.17	448.55	4851.64	4083.27	539.98	26.97	6.21	68.15	27.37
Anatomy and morphology	471.67	2050.83	4040.67	78.00	12.33	3.50	12.33	1.00	522.84	2771.23	5627.85	249.54	30.88	16.06	24.68	7.77
Andrology	213.00	1332.50	1020.50	151.50	5.00	1.00	11.50	1.00	216.63	1368.58	1068.76	157.45	5.23	1.16	12.02	1.03
Anesthesiology	1232.58	8475.42	12304.08	1043.25	20.50	3.83	129.83	6.17	1245.29	8635.61	12561.59	1077.73	22.47	4.62	132.99	6.92
Biodiversity conservation	548.17	4184.67	17517.00	241.67	39.67	18.67	33.00	2.33	599.00	5177.69	20949.32	554.20	82.07	37.00	55.62	10.88
Anthropology	549.18	2455.97	8933.28	257.07	84.17	19.33	26.48	7.83	572.30	2836.89	10238.78	559.41	118.67	46.83	47.59	25.79
Archaeology	304.42	843.58	3101.17	63.50	17.42	3.67	6.50	2.50	310.55	968.03	3513.57	145.71	31.23	15.84	18.77	11.60
Architecture	94.50	24.00	409.50	5.00	2.00	0.00	0.00	0.00	94.77	29.10	410.67	5.00	2.00	0.00	0.00	0.00
Area studies	256.83	385.17	1551.00	85.00	4.33	1.50	7.50	0.00	257.80	396.89	1575.04	88.78	5.23	1.55	7.62	0.10
Art	108.83	72.17	441.50	17.83	0.50	0.00	0.00	0.00	109.89	72.50	444.67	17.83	0.50	0.00	0.00	0.00
Humanities: multidisciplinary	324.50	220.50	1165.00	116.00	8.50	1.50	2.00	0.00	325.26	231.37	1197.73	123.04	9.06	1.50	2.45	0.17
Astronomy and astrophysics	6863.18	81175.38	41039.47	2760.67	393.92	132.25	182.83	171.00	6938.59	83646.86	43015.46	3367.42	521.46	238.31	210.68	204.15
Psychology: biological	160.17	1268.08	2836.83	79.17	11.50	4.17	5.08	2.83	187.20	1672.15	4042.63	473.55	36.50	13.88	26.23	44.41
Behavioral sciences	1127.75	9322.67	23811.75	754.83	94.33	39.67	75.08	21.00	1234.06	10719.32	28426.63	1569.30	152.81	65.19	120.21	83.77
Biochemical research methods	3433.50	32907.48	61968.22	2038.23	151.70	26.92	99.42	71.58	3778.13	39428.87	75201.31	3004.20	223.85	53.54	159.12	102.85
Biochemistry and molecular biology	13900.95	155716.95	222251.72	6414.47	446.67	123.67	627.17	246.08	14636.67	169439.04	248018.82	8551.94	600.10	187.96	762.37	329.43
Biology	1875.92	14062.42	37879.33	1376.42	214.00	66.17	116.58	70.83	2195.85	19466.64	51405.31	2876.67	342.70	123.34	214.80	147.98
Biophysics	2586.00	20243.50	31974.72	459.27	35.05	7.50	62.62	6.33	2916.42	26039.35	41933.87	1115.88	73.54	24.13	105.37	29.25
Biotechnology and applied microbiology	5841.13	46440.32	93096.02	2317.47	151.28	28.20	227.95	54.50	6196.51	52956.88	106140.08	3367.03	234.81	59.66	298.52	94.23
Plant sciences	4668.58	36457.00	64611.25	797.50	52.92	12.67	94.67	15.17	4772.25	38389.76	68953.39	1219.33	79.04	23.04	114.84	27.63
Business	1224.50	4744.00	32665.17	358.33	23.83	3.50	31.83	7.50	1228.28	4793.91	32879.98	426.15	26.66	4.46	33.35	10.77
Business: finance	865.92	3090.50	13088.08	115.50	7.00	0.00	12.50	0.00	870.19	3125.51	13277.27	275.63	11.31	1.27	38.77	13.88
Oncology	9485.53	110555.48	86373.08	5703.57	191.02	99.28	1574.47	89.50	9718.08	114551.39	92241.73	6150.04	218.59	108.94	1612.50	107.22
Cardiac and cardiovascular systems	5544.67	55787.67	42346.33	1921.42	77.17	25.00	221.67	21.50	5626.32	56877.70	43928.33	2080.07	84.88	29.04	233.88	25.69
Cell biology	5809.67	90476.45	139144.63	4526.27	334.03	98.95	383.00	186.83	6435.72	102507.42	160652.16	6249.14	445.29	144.62	486.55	252.33
Thermodynamics	1007.55	5841.15	6778.07	12.25	0.50	0.50	3.92	0.58	1015.62	5917.57	6872.72	21.49	1.85	1.32	4.53	1.53
Chemistry: applied	2101.83	13570.67	13463.83	131.42	11.08	5.08	25.75	2.67	2126.46	14088.38	14157.06	187.55	17.42	7.75	29.27	4.40
Chemistry: medicinal	2952.50	21885.92	21323.17	464.92	44.08	7.92	71.33	9.08	3011.90	23120.72	22996.66	598.51	56.42	12.98	81.82	19.76
Chemistry: multidisciplinary	8681.77	120420.68	108942.33	2424.53	429.28	79.83	100.92	57.83	8813.57	124218.18	114459.35	2854.25	468.74	103.75	123.62	84.64

(*continued*)

Table AI.

Subject category	P	TCS	TRS	TTS	TBS	TNS	TFS	TGS	P reclas	TCS reclas	TRS reclas	TTS reclas	TBS reclas	TNS reclas	TFS reclas	TGS reclas
Chemistry: analytical	4972.17	41422.00	35457.97	1052.35	31.22	16.33	49.12	8.42	5043.23	42865.08	37789.91	1315.36	49.51	28.24	61.58	16.39
Chemistry: inorganic and nuclear	3307.58	26590.58	15602.67	229.17	9.25	2.00	53.67	12.00	3326.90	27567.01	16489.58	388.18	20.57	10.85	57.06	15.03
Chemistry: organic	6348.12	53412.37	34712.48	458.58	175.08	9.25	40.17	5.50	6383.14	54555.73	36106.02	576.89	187.55	16.31	45.23	8.71
Chemistry: physical	9355.93	85389.53	81524.48	1114.98	140.80	21.18	66.58	57.75	9447.97	88261.99	85467.32	1358.03	173.30	43.43	76.37	71.12
Classics	63.00	16.00	43.50	1.00	0.00	0.00	0.00	0.00	63.08	16.83	46.50	1.17	0.00	0.00	0.00	0.00
Computer science: artificial intelligence	2033.95	9065.75	21530.22	95.38	4.17	0.83	11.67	3.17	2062.06	9349.21	22603.28	201.60	10.62	2.43	15.81	8.09
Psychology: clinical	1386.67	8745.42	22086.42	1145.33	71.83	19.50	80.42	167.83	1404.80	9007.97	22780.19	1304.61	80.07	22.94	88.66	173.95
Computer science: cybernetics	170.17	823.33	2237.33	18.33	1.00	0.00	0.83	1.83	178.47	899.44	2567.84	37.40	1.73	0.27	1.23	2.67
Computer science: hardware and architecture	665.50	1251.25	4518.67	39.17	1.42	0.50	3.08	2.50	673.12	1334.02	4762.24	169.97	5.09	1.56	28.87	13.32
Computer science: information systems	1964.03	6472.18	20778.77	327.77	33.87	2.50	13.42	10.28	1980.01	6628.29	21287.11	526.06	40.20	4.01	40.41	24.37
Communication	393.50	1360.67	8023.33	469.17	18.67	6.50	24.00	10.25	395.41	1372.18	8099.04	504.97	20.43	7.10	24.86	12.43
Computer science: interdisciplinary applications	1974.05	9165.30	21560.03	311.70	27.48	2.50	14.00	7.62	2030.47	9762.77	23068.71	488.29	41.60	10.58	28.78	13.09
Computer science: software engineering	1756.28	5159.50	17183.22	160.72	4.67	0.50	7.25	4.00	1770.83	5262.81	17519.62	196.33	7.72	1.63	8.30	6.65
Computer science: theory and methods	1443.87	3156.67	10061.88	130.88	5.50	4.50	5.92	5.17	1463.31	3370.39	10587.74	214.35	13.80	7.62	8.91	9.85
Construction and building technology	758.58	3377.92	7037.75	16.17	0.83	0.50	3.42	0.50	767.54	3396.77	7066.59	27.95	1.61	0.63	3.68	0.74
Criminology and penology	451.17	1626.17	4512.33	305.67	4.67	6.17	3.83	0.50	452.46	1636.92	4537.93	311.94	5.00	6.23	3.88	0.65
Emergency medicine	1036.00	4190.75	7550.50	942.50	78.50	9.25	83.50	6.75	1041.17	4246.46	7648.40	983.89	80.51	9.81	88.44	8.38
Crystallography	3513.70	6562.37	4145.30	20.22	3.25	1.00	9.00	2.00	3548.12	7322.60	5237.76	93.76	7.62	3.78	12.23	3.71
Dance	19.00	30.00	66.00	1.00	0.00	0.00	0.00	0.00	19.00	30.00	66.00	1.00	0.00	0.00	0.00	0.00
Demography	201.17	695.33	1934.00	81.17	7.50	2.50	2.50	1.00	206.10	756.42	2190.73	159.83	12.63	4.37	7.35	7.90
Dentistry/oral surgery and medicine	2676.17	12107.83	27406.17	882.00	18.83	6.50	89.00	6.00	2688.02	12234.80	27627.66	906.92	20.88	7.52	91.60	10.37
Dermatology	2270.42	11539.50	11105.25	755.25	24.83	9.83	71.92	4.00	2300.21	11932.27	11688.37	808.93	28.63	11.60	76.69	5.35
Geochemistry and geophysics	3329.93	22626.05	31522.38	333.75	31.00	20.25	36.00	5.00	3378.98	23862.98	33647.72	648.13	90.55	87.84	55.26	20.03
Substance abuse	703.50	4795.17	6767.50	606.83	28.00	17.00	30.00	5.33	711.83	4897.38	6969.09	644.89	30.40	18.07	32.48	6.66
Ecology	3074.47	26281.08	101680.58	1258.08	257.95	75.53	210.23	24.73	3223.86	28918.95	109941.89	2182.46	361.65	122.81	265.24	69.28
Economics	3987.08	14249.65	45210.92	1256.65	140.75	33.33	42.95	33.83	4010.86	14594.51	46581.14	1699.56	167.43	43.66	80.71	58.70
Education and educational research	1334.83	3859.83	24477.42	645.67	18.50	7.75	31.67	5.00	1342.95	3919.97	24712.99	788.71	23.74	8.99	35.75	8.11
Education: scientific disciplines	601.50	2076.83	6999.08	537.00	22.00	1.75	37.33	9.50	607.20	2170.23	7159.55	585.06	26.58	3.55	41.10	14.30
Education: special	309.50	1367.08	3653.92	85.25	3.25	0.50	14.42	1.00	311.45	1406.91	3741.60	99.01	4.20	0.64	16.07	1.46
Psychology: educational	448.67	2168.50	8031.25	208.42	16.50	9.00	4.83	2.00	454.17	2250.61	8379.41	322.48	22.54	10.31	10.03	14.81
Electrochemistry	2860.50	24501.25	22838.22	46.77	3.30	0.00	14.70	2.00	2872.08	24842.35	23307.72	87.36	6.69	3.09	16.12	4.60

(*continued*)

Table AI.

Subject category	P	TCS	TRS	TTS	TBS	TNS	TFS	TGS	P reclas	TCS reclas	TRS reclas	TTS reclas	TBS reclas	TNS reclas	TFS reclas	TGS reclas
Evolutionary biology	1019.00	13366.50	32811.83	702.33	161.50	40.83	76.17	31.17	1186.32	16181.26	41230.07	1651.45	269.12	98.47	136.57	78.75
Developmental biology	1009.92	12098.17	21064.25	436.25	96.83	6.83	27.17	16.17	1239.36	16626.20	29572.29	989.36	132.30	20.67	64.56	28.37
Endocrinology and metabolism	5387.92	57001.50	49263.50	3328.67	139.17	48.83	641.25	60.17	5553.50	59365.30	52742.46	3639.06	160.19	58.10	681.79	73.25
Energy and fuels	3450.48	34702.77	54988.47	256.98	27.88	10.02	26.83	6.33	3466.03	35290.08	55659.34	308.72	32.92	12.56	28.64	9.51
Engineering: multidisciplinary	1316.80	4690.90	6440.73	140.25	3.50	2.50	2.67	0.83	1331.80	4762.12	6550.70	154.53	5.47	4.15	2.80	2.09
Engineering: biomedical	2151.27	16009.72	27158.55	359.03	20.25	6.00	34.83	6.00	2191.55	16568.01	28553.34	469.74	30.76	11.63	43.25	11.62
Engineering: environmental	1703.40	16911.18	21032.73	301.25	23.83	27.17	25.00	5.67	1720.08	17248.18	21752.83	379.10	32.13	30.09	29.62	8.65
Engineering: chemical	5688.33	39096.85	40354.05	124.67	5.25	6.75	29.42	1.75	5706.70	39723.29	40953.70	174.40	11.01	9.84	31.55	4.40
Engineering: industrial	444.67	1853.00	5943.17	35.33	1.33	0.00	2.67	0.00	452.26	1865.74	5970.80	37.66	1.51	0.00	2.89	0.04
Engineering: manufacturing	665.25	2528.67	5046.08	23.83	1.33	0.00	1.83	0.00	674.86	2547.18	5079.18	30.68	1.86	0.47	2.69	0.28
Engineering: marine	90.25	197.25	350.00	2.25	0.00	0.25	0.00	0.25	91.46	207.52	371.44	3.58	0.13	0.30	0.00	0.38
Engineering: civil	2013.83	8564.18	13883.42	43.35	0.87	1.45	5.12	0.25	2034.24	8638.27	14075.58	64.08	2.23	2.08	6.21	0.92
Engineering: ocean	138.92	460.67	826.83	7.75	1.00	0.25	0.00	0.25	140.87	503.84	922.19	24.68	4.13	1.58	1.13	0.95
Engineering: petroleum	107.20	240.37	661.90	1.50	0.00	0.00	0.83	0.00	110.26	258.99	708.20	6.24	1.05	1.37	1.29	0.14
Engineering: electrical and electronic	9864.43	39553.65	56543.62	150.95	23.28	5.42	23.00	14.15	9910.36	40263.17	58232.55	424.65	36.94	12.04	55.61	34.27
Engineering: mechanical	2912.08	10370.95	14112.58	17.50	1.50	0.83	13.92	2.08	2937.40	10486.46	14287.60	42.32	4.57	3.49	15.15	4.07
Entomology	1470.17	6204.00	11664.33	217.83	23.00	11.67	18.00	0.00	1508.15	6657.08	12845.37	339.77	40.02	21.46	29.43	10.61
Environmental sciences	6646.97	53999.40	98030.60	1890.17	220.83	106.92	233.58	44.42	6735.43	55941.24	102810.36	2399.60	279.60	133.12	264.84	62.77
Environmental studies	871.32	4650.02	17822.52	298.20	56.98	13.90	17.07	6.57	883.41	4966.05	18872.28	407.29	66.37	17.39	23.39	9.28
Ergonomics	118.75	428.00	2199.17	32.33	2.00	0.75	0.58	0.33	120.50	435.44	2222.52	35.27	2.06	0.75	0.75	0.33
Ethnic studies	71.10	155.30	695.45	34.65	1.00	0.00	1.90	0.00	71.37	156.57	699.34	34.80	1.00	0.00	1.90	0.00
Family studies	372.92	1188.17	3973.25	183.33	5.50	1.67	11.92	0.50	375.09	1211.39	4028.11	225.81	7.18	2.85	15.68	1.70
Film: radio: television	71.50	53.50	298.50	11.00	0.00	0.00	2.00	0.50	71.50	53.50	298.50	11.00	0.00	0.00	2.00	0.50
Fisheries	1071.50	4299.92	10262.17	65.83	6.00	1.50	20.92	0.00	1093.82	4652.23	11466.60	153.52	17.10	5.87	29.25	1.54
Folklore	11.00	1.00	5.00	0.00	0.00	0.00	0.00	0.00	11.06	1.50	8.06	0.06	0.11	0.06	0.06	0.00
Food science and technology	4423.50	25986.25	34406.17	724.58	38.42	16.17	158.17	11.00	4463.02	26521.37	35665.29	943.06	48.88	23.27	173.08	30.78
Forestry	971.33	4906.67	12952.33	56.00	9.00	0.00	30.33	2.33	987.54	5238.89	13879.15	121.27	16.08	3.68	35.40	4.58
Gastroenterology and hepatology	3818.17	37667.67	25031.17	1336.67	50.00	17.83	165.33	14.83	3894.49	38929.96	26651.49	1484.64	58.16	20.32	177.53	22.14
Genetics and heredity	4543.58	60402.92	105967.00	3965.75	347.00	60.08	534.25	112.75	5065.54	69908.54	125234.71	5547.36	471.51	113.29	642.13	162.75
Geography	628.30	2730.83	9687.83	197.33	9.53	3.70	13.40	6.40	634.17	2856.32	10103.33	241.78	14.01	5.91	15.88	7.45
Geography: physical	760.55	5426.08	14185.08	112.83	38.87	11.03	23.23	0.90	794.95	6198.74	16370.95	399.74	78.93	34.89	39.32	11.18
Geology	507.67	3419.83	5516.83	42.50	22.00	9.00	13.33	6.00	526.24	3827.18	6332.90	196.25	42.50	23.61	22.01	10.46
Geosciences: multidisciplinary	4123.10	29435.77	46884.10	1469.03	248.53	128.78	151.33	22.67	4201.84	31209.46	50755.77	2100.65	344.11	206.11	184.44	52.76
Geriatrics and gerontology	986.50	7248.17	10084.17	421.17	30.83	7.50	50.00	6.67	1019.68	7720.07	10917.70	503.13	37.76	10.42	57.64	9.73
Health policy and services	851.30	4407.10	9746.40	936.38	60.92	17.50	61.50	11.50	867.85	4551.48	10018.78	986.84	62.95	18.00	63.83	12.50
Hematology	3160.33	36271.28	33430.22	1011.52	37.28	9.20	169.50	4.33	3319.50	38998.07	37224.27	1306.85	56.49	18.05	199.07	10.08

(*continued*)

Table AI.

Subject category	P	TCS	TRS	TTS	TBS	TNS	TFS	TGS	P reclas	TCS reclas	TRS reclas	TTS reclas	TBS reclas	TNS reclas	TFS reclas	TGS reclas
History	781.58	564.17	1598.50	158.25	4.00	2.50	18.92	1.50	783.87	569.97	1629.59	163.36	4.50	2.60	19.02	1.71
History and philosophy of science	447.17	735.42	3379.58	333.25	35.67	4.00	16.83	6.50	453.81	780.92	3571.02	388.94	38.77	4.50	18.43	8.19
History of social sciences	150.42	205.33	727.25	49.33	0.83	0.00	1.42	0.00	150.90	206.58	731.45	49.48	1.08	0.00	1.42	0.00
Horticulture	428.67	1759.83	3069.00	10.25	7.33	0.00	3.33	0.33	442.40	1912.24	3373.90	34.84	8.88	0.86	4.72	1.28
Psychology: developmental	1032.33	7035.33	19665.17	789.17	66.42	17.00	81.42	11.50	1049.38	7314.00	20495.25	1071.88	81.09	21.45	98.58	27.78
Public: environmental and occupational health	5045.13	32035.95	52202.48	6455.12	206.53	90.45	478.17	57.08	5164.35	33370.85	54487.24	6925.53	229.36	102.93	507.60	71.36
Immunology	5364.83	64609.25	75681.67	2555.50	115.08	42.83	341.25	48.58	5646.05	69201.82	82312.48	3271.84	156.06	60.64	415.52	81.19
Industrial relations and labor	144.83	304.50	1301.67	74.00	3.00	1.83	3.00	2.00	145.73	313.99	1338.21	103.33	3.82	2.06	6.29	3.48
Infectious diseases	2769.33	24605.17	26199.33	1742.83	64.67	31.17	147.33	5.50	2919.51	26744.93	29536.47	2211.82	93.12	43.23	198.86	31.50
Psychology: applied	578.00	2824.17	13493.42	318.25	19.50	9.50	7.33	4.33	582.30	2864.41	13644.21	443.35	25.96	10.77	9.20	8.85
Information science and library science	549.70	2023.43	12345.27	430.60	17.70	2.00	15.00	9.87	556.25	2064.83	12517.28	499.59	21.90	3.03	16.61	12.03
Instruments and instrumentation	2378.80	10466.77	11990.68	172.20	10.12	2.50	15.75	11.32	2396.44	10880.04	12709.16	322.35	18.18	8.52	20.29	15.49
International relations	554.17	1424.33	6161.33	264.33	17.50	4.00	12.83	12.00	558.18	1488.74	6408.30	333.07	22.07	7.44	14.38	14.91
Law	417.00	819.67	2457.75	140.25	10.00	2.83	7.25	0.00	419.08	846.78	2565.83	190.57	13.19	4.00	8.84	2.47
Medicine: legal	574.22	2361.93	4864.48	115.97	14.67	5.83	19.92	3.83	578.46	2416.47	4972.49	128.81	15.86	6.36	21.18	4.15
Asian studies	132.00	54.50	369.00	23.00	0.00	0.00	2.50	0.50	132.05	56.20	377.75	24.50	0.45	0.05	2.55	0.60
Linguistics	577.67	1543.00	6974.08	182.50	3.83	1.75	12.33	2.58	583.00	1581.97	7124.59	229.61	6.64	3.01	14.89	7.25
Limnology	320.33	1870.42	3846.50	11.08	4.17	2.67	1.92	0.33	334.70	2104.22	4571.49	54.73	9.53	4.52	5.78	2.10
Language and linguistics theory	330.00	558.50	2604.17	50.17	3.00	0.50	5.17	0.25	332.41	572.91	2658.39	86.63	5.31	1.50	7.47	4.30
Literary reviews	30.50	13.00	69.50	4.50	0.00	0.00	0.00	0.00	30.50	13.00	69.50	4.50	0.00	0.00	0.00	0.00
Literature	367.00	143.00	656.17	85.83	2.33	0.00	4.50	2.00	367.49	144.39	657.13	85.94	2.58	0.00	4.50	2.00
Management	1539.75	6813.42	41224.17	571.50	18.00	9.33	42.50	11.17	1545.80	6880.59	41506.91	726.50	25.48	11.56	45.18	17.36
Literature: African: Australian: Canadian	19.00	1.00	9.00	0.00	0.00	0.00	0.00	0.00	19.00	1.00	9.00	0.00	0.00	0.00	0.00	0.00
Operations research and management science	1604.83	6330.98	15282.83	104.82	3.00	1.00	5.53	4.17	1612.74	6386.22	15487.20	138.41	5.26	1.70	6.33	5.80
Literature: American	50.00	25.00	114.00	8.00	0.00	0.00	1.00	0.00	50.00	25.00	114.00	8.00	0.00	0.00	1.00	0.00
Literature: British isles	37.67	8.50	12.83	3.00	0.00	0.00	0.00	0.00	37.67	8.50	12.83	3.00	0.00	0.00	0.00	0.00
Literature: German: Dutch: Scandinavian	33.00	9.50	29.00	0.00	0.00	0.00	0.00	0.00	33.00	9.50	29.00	0.00	0.00	0.00	0.00	0.00
Marine and freshwater biology	2151.50	10942.08	30626.17	186.00	28.83	9.50	44.42	3.00	2198.57	11668.70	32949.00	342.78	48.04	16.78	57.50	10.88
Materials science: paper and wood	86.83	393.50	349.00	0.67	0.00	0.00	0.00	0.00	87.67	430.06	404.84	5.34	0.13	0.06	0.06	0.06
Materials science: ceramics	1559.00	7434.00	6690.50	7.00	1.00	0.00	3.00	1.00	1564.39	7529.28	6808.60	14.63	2.23	0.95	3.44	1.58
Materials science: multidisciplinary	10994.10	84112.15	88937.33	832.05	174.95	41.68	61.75	93.98	11077.14	86314.71	92001.04	1015.49	199.00	57.18	71.47	105.45
Mathematics: applied	5251.83	16760.18	9671.20	85.18	3.58	1.83	14.33	3.00	5288.76	17071.12	10367.93	251.81	11.09	6.59	23.22	17.19

(*continued*)

Table AI.

Subject category	P	TCS	TRS	TTS	TBS	TNS	TFS	TGS	P reclas	TCS reclas	TRS reclas	TTS reclas	TBS reclas	TNS reclas	TFS reclas	TGS reclas
Mathematics: interdisciplinary applications	1154.00	4269.10	4825.70	96.77	4.00	3.00	11.50	3.83	1179.96	4491.42	5450.55	369.52	15.00	5.57	40.23	19.31
Mathematics	5211.83	10347.25	5370.67	85.58	15.42	0.50	2.00	3.00	5236.30	10410.22	5464.00	90.68	16.20	0.81	2.35	3.54
Social sciences: mathematical methods	240.50	767.58	1789.75	46.17	3.00	0.67	1.25	0.00	251.01	910.67	2300.23	356.10	18.93	8.34	31.75	18.85
Medical informatics	405.50	1950.38	6214.08	504.97	4.90	1.20	17.67	8.87	424.29	2196.75	6701.69	566.67	8.15	2.21	22.55	10.54
Mechanics	3123.25	13234.60	14708.28	121.63	5.70	1.67	11.88	6.48	3159.31	13575.10	15244.21	168.78	11.07	6.82	13.73	9.61
Medical laboratory technology	852.17	5093.33	4258.17	165.50	4.67	1.67	24.67	0.33	883.02	5600.94	4799.44	212.09	6.74	2.84	37.30	1.71
Medicine: general and internal	4521.67	45388.92	41647.58	14977.67	748.25	234.08	1326.92	268.08	4776.65	49227.28	47356.24	15796.88	794.51	249.69	1390.12	294.44
Metallurgy and metallurgical engineering	2594.25	9922.67	8686.83	21.83	1.33	0.33	2.83	0.83	2606.42	10052.90	8846.00	33.03	2.90	1.60	3.59	1.99
Medicine: research and experimental	3381.43	34101.25	37422.95	2501.65	139.55	67.53	283.87	58.58	3686.04	39421.14	45333.35	3189.19	179.78	82.42	347.83	83.49
Literature: romance	26.50	5.50	14.50	1.50	0.00	0.00	0.00	0.00	26.57	8.14	17.50	3.57	0.29	0.21	0.14	0.14
Literature: Slavic	56.00	8.00	10.00	0.00	0.00	0.00	0.00	0.00	56.00	8.00	10.00	0.00	0.00	0.00	0.00	0.00
Materials science: biomaterials	1010.33	11787.33	14164.83	111.00	7.83	3.33	11.83	1.50	1024.47	12001.63	14557.31	129.60	11.02	5.07	13.68	3.16
Materials science: characterization and testing	475.50	1371.08	1810.92	8.25	0.50	0.00	0.75	0.00	478.98	1382.42	1832.43	9.83	0.97	0.66	0.90	0.15
Materials science: coatings and films	919.58	4667.33	5012.67	6.58	1.00	0.50	2.33	0.00	927.84	4982.77	5359.61	22.92	2.81	2.38	2.56	0.49
Materials science: composites	787.67	4535.58	5358.92	4.25	1.00	0.00	2.25	0.00	792.23	4541.47	5363.89	4.35	1.00	0.00	2.25	0.00
Materials science: textiles	224.33	1055.67	864.83	3.50	0.00	0.00	2.67	0.00	224.94	1074.38	890.85	5.11	0.13	0.00	2.67	0.00
Medieval and renaissance studies	75.00	29.00	85.00	6.00	0.00	0.00	1.50	0.00	75.19	39.33	126.97	18.00	1.22	2.00	1.94	1.00
Meteorology and atmospheric sciences	2879.43	23152.70	29869.18	694.95	247.62	44.12	95.42	29.17	2920.05	24158.13	31995.78	1121.42	293.01	71.92	116.07	45.21
Microbiology	5710.83	49515.58	74610.50	1979.50	132.42	36.17	228.67	30.25	5948.83	53483.92	81939.51	2631.51	186.36	58.25	271.12	54.22
Microscopy	368.33	1933.00	3646.67	16.83	1.00	2.00	6.00	0.00	396.56	2425.45	4545.99	63.94	4.86	4.52	10.12	0.78
Mineralogy	545.83	2813.83	2889.58	13.17	0.00	0.50	2.33	0.00	555.69	3037.86	3228.08	57.14	8.05	15.04	6.21	1.22
Multidisciplinary sciences	11908.00	207475.00	399314.00	46271.00	3621.00	1811.00	3140.00	2237.00	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL
Music	180.00	156.00	795.25	78.75	2.50	1.50	3.50	1.50	181.10	166.28	851.53	88.03	2.69	1.50	5.08	2.97
Mycology	680.42	3643.67	5336.58	86.17	12.50	4.00	12.00	36.00	699.73	3900.68	5953.88	142.64	16.68	6.51	14.11	36.76
Clinical neurology	5544.42	44749.75	55942.00	3434.42	155.25	56.00	576.58	37.42	5662.15	46589.76	59605.52	3916.18	183.92	70.14	612.86	62.57
Neurosciences	8676.83	94014.17	200720.67	6563.17	450.08	128.75	716.83	235.75	8948.91	98341.92	210714.65	7796.26	528.27	162.11	788.98	304.87
Nuclear science and technology	2609.92	7335.42	7718.67	61.67	1.08	0.00	5.58	0.00	2618.77	7444.30	7869.48	196.39	3.40	1.97	8.20	1.86
Nursing	2025.83	5742.50	14591.08	1064.17	12.50	2.83	121.33	8.00	2030.84	5779.92	14664.67	1080.31	13.22	3.10	123.23	8.67
Nutrition and dietetics	2759.50	21517.17	27304.42	6072.50	155.08	67.75	1715.33	78.67	2811.87	22207.55	28501.37	6230.13	164.85	71.92	1729.20	87.49
Obstetrics and gynecology	3544.83	19142.25	20028.58	1624.00	62.42	39.58	349.42	64.75	3581.85	19620.20	20660.04	1733.78	67.43	42.63	361.42	66.77
Oceanography	1415.57	9354.05	17228.53	134.08	49.83	14.42	19.00	2.58	1454.53	10052.14	19309.26	322.77	76.57	26.97	31.15	11.81
Remote sensing	405.02	2875.22	5785.47	90.25	10.00	2.75	3.83	4.00	409.51	2945.34	5967.47	114.51	12.23	5.30	5.89	5.18
Ophthalmology	3234.50	19200.00	20341.50	573.50	12.50	8.00	144.00	6.50	3270.86	19585.60	21260.43	658.97	16.26	10.27	150.50	10.84

(*continued*)

Table AI.

Subject category	P	TCS	TRS	TTS	TBS	TNS	TFS	TGS	P reclas	TCS reclas	TRS reclas	TTS reclas	TBS reclas	TNS reclas	TFS reclas	TGS reclas
Optics	3848.62	18088.92	19717.97	164.80	21.08	8.50	25.00	5.25	3891.08	19275.47	21954.34	309.44	40.15	15.78	35.39	14.56
Ornithology	291.00	1284.00	4392.50	71.00	5.00	5.00	8.00	1.00	304.77	1421.71	4981.29	127.00	13.17	8.73	11.78	2.87
Orthopedics	2583.00	13060.75	20003.33	1322.17	17.33	7.92	236.67	14.25	2595.65	13202.33	20250.84	1350.66	19.45	10.53	239.24	16.10
Otorhinolaryngology	1605.83	5836.00	6998.00	377.17	5.33	3.00	38.17	5.50	1617.65	5964.34	7250.49	406.83	6.96	3.92	39.69	6.21
Paleontology	531.83	2159.33	4007.33	42.50	28.50	4.50	14.67	2.33	551.42	2483.25	5029.67	234.79	56.96	20.50	24.53	10.67
Parasitology	1433.50	11547.17	17574.17	560.17	39.17	9.33	58.00	22.83	1510.25	13021.78	19878.65	777.91	59.69	19.65	75.84	34.73
Pathology	2350.33	15808.67	13553.17	592.33	19.17	2.83	71.67	14.50	2477.53	17913.07	16568.97	842.20	31.76	9.39	93.79	18.72
Pediatrics	4089.00	20069.33	26461.58	4144.08	165.83	65.50	910.33	61.67	4142.19	20729.02	27534.44	4317.61	174.04	69.64	930.92	70.25
Pharmacology and pharmacy	8235.58	66755.58	71089.08	2642.83	130.33	25.75	481.00	32.17	8474.18	70478.02	76986.51	3157.77	164.38	39.54	520.55	46.31
Philosophy	788.50	828.42	3320.00	70.75	7.25	0.00	9.00	4.42	791.06	843.66	3357.85	85.51	8.76	0.23	9.34	4.68
Physics: applied	11555.95	70049.33	84480.05	1007.93	215.42	36.93	72.87	122.08	11632.18	72407.32	87971.36	1236.80	243.52	53.80	86.44	137.57
Imaging science and photographic technology	290.85	1888.55	3716.13	5.45	0.00	0.75	0.83	0.00	298.50	1999.88	3993.58	40.42	3.21	3.17	3.92	2.11
Physics: fluids and plasmas	2726.67	11951.85	12907.53	465.35	12.50	2.25	26.00	12.50	2761.84	12399.75	13956.40	686.51	20.54	6.50	55.94	29.75
Physics: atomic: molecular and chemical	3750.08	26475.83	27509.33	764.25	17.00	5.50	96.25	14.00	3805.17	28372.32	30071.00	960.11	40.91	16.54	108.14	25.30
Physics: multidisciplinary	8596.50	71888.00	68635.67	5024.17	474.67	88.67	144.17	242.67	8714.44	74806.23	73616.20	5667.05	531.24	111.20	193.18	287.96
Physics: condensed matter	7679.67	58104.85	65191.75	731.52	317.42	29.43	53.83	45.58	7752.43	60614.46	68697.70	1050.43	346.84	43.45	87.51	68.04
Physiology	2235.50	18683.17	24096.83	1143.83	35.50	15.50	238.50	20.00	2450.62	22026.41	31200.07	1836.63	81.03	36.46	283.52	59.99
Physics: nuclear	1491.92	8991.33	3446.83	164.67	6.83	3.00	19.92	4.33	1499.57	9100.56	3668.62	247.78	13.09	7.02	22.54	7.96
Physics: particles and fields	2948.50	26223.67	9550.83	791.08	89.58	8.83	69.75	37.67	2962.44	26446.17	9915.08	928.67	98.44	15.40	74.37	43.11
Planning and development	487.58	1535.17	8126.67	116.33	11.75	2.83	7.67	1.67	492.16	1587.21	8325.16	153.26	14.27	3.80	9.12	2.92
Physics: mathematical	2409.92	10609.93	12307.28	2843.77	37.33	4.17	65.33	96.67	2454.91	11212.39	13660.63	3097.74	51.45	14.57	102.28	116.11
Poetry	14.00	3.00	3.00	0.00	0.00	0.00	0.00	0.00	14.00	3.00	3.00	0.00	0.00	0.00	0.00	0.00
Political science	1147.75	3109.83	12418.25	688.17	52.67	21.50	25.33	14.00	1151.97	3186.07	12742.08	794.83	59.41	25.09	30.27	19.43
Polymer science	5139.92	36871.08	31113.42	283.17	3.83	4.58	24.75	6.25	5157.25	37300.84	31772.98	320.19	10.39	8.52	26.94	8.98
Psychiatry	3478.42	29755.33	44206.08	3193.25	257.50	70.00	269.08	43.92	3539.45	30777.65	46455.24	3582.81	281.79	77.45	296.53	60.28
Psychology: multidisciplinary	2524.58	17495.42	55158.08	3608.33	348.67	76.83	215.83	96.00	2592.21	18362.11	58415.67	4644.47	408.14	98.83	250.63	166.27
Public administration	313.92	827.17	3486.17	89.50	2.58	2.50	4.50	3.00	315.24	841.00	3532.47	93.11	3.07	2.72	4.83	3.22
Psychology: psychoanalysis	79.00	119.50	431.00	29.00	0.50	1.00	0.00	0.00	79.58	128.04	443.58	34.55	0.63	1.20	1.14	0.34
Psychology: mathematical	110.42	642.67	1797.42	71.58	5.00	1.50	1.50	3.00	120.74	742.43	2248.41	224.20	14.02	2.64	5.29	18.65
Psychology: experimental	1224.42	7956.92	32711.42	1131.92	123.00	27.92	49.83	56.67	1271.03	8544.40	35011.21	1765.90	155.91	37.88	71.84	99.53
Radiology: nuclear medicine and medical imaging	5655.68	36764.63	51122.22	1179.20	23.83	14.67	120.58	27.83	5718.12	37613.77	53096.28	1494.35	41.80	23.39	144.99	49.55
Rehabilitation	1397.58	5914.25	16621.75	811.50	15.17	3.83	124.58	3.67	1407.56	6040.48	16979.84	873.19	19.95	6.02	128.71	6.46
Respiratory system	2021.17	17293.33	14745.92	912.33	27.17	4.00	163.33	6.50	2078.21	17968.38	15733.41	996.58	30.52	5.62	169.12	8.29
Reproductive biology	1052.58	7630.83	7359.75	269.25	12.33	7.00	41.67	9.50	1083.69	8038.83	7952.94	337.84	16.23	9.63	48.68	10.41

(*continued*)

Table AI.

Subject category	P	TCS	TRS	TTS	TBS	TNS	TFS	TGS	P reclas	TCS reclas	TRS reclas	TTS reclas	TBS reclas	TNS reclas	TFS reclas	TGS reclas
Rheumatology	1831.50	16106.50	14722.50	1003.00	20.00	7.50	151.00	8.50	1857.36	16476.09	15208.20	1058.29	22.00	8.38	156.01	9.97
Social issues	235.15	768.07	2612.52	176.37	13.25	3.00	8.98	8.83	237.57	797.08	2701.26	221.30	15.78	3.57	10.74	12.12
Psychology: social	1066.67	5892.83	25509.83	1693.33	200.83	50.17	68.50	44.33	1080.11	6069.49	26472.20	2339.96	235.47	61.78	85.12	93.89
Social sciences: interdisciplinary	703.02	2149.63	8716.53	554.73	17.83	8.75	26.65	12.83	708.26	2216.76	8883.20	617.24	21.76	9.94	28.52	14.83
Social sciences: biomedical	351.80	2005.93	4445.65	410.63	59.33	6.83	13.92	2.33	366.08	2173.66	4961.27	641.87	71.56	11.51	25.19	25.15
Social work	431.92	1132.50	3923.83	176.17	4.08	0.83	22.00	0.00	433.16	1144.02	3954.38	185.28	4.43	1.06	22.37	0.27
Sociology	1064.27	3179.47	12484.12	800.32	39.33	25.50	29.73	17.00	1075.49	3350.27	13117.43	1110.52	58.50	32.78	62.85	40.72
Soil science	1023.08	6505.17	12653.08	81.50	2.00	1.00	28.00	0.00	1034.59	6710.32	13150.26	184.38	4.98	3.06	31.26	1.08
Spectroscopy	2343.42	10947.25	9817.58	103.08	3.42	0.50	13.25	2.00	2367.23	11389.40	10559.10	236.70	9.90	4.99	17.72	4.28
Sport sciences	1689.25	11530.67	23566.92	5351.33	119.33	34.50	489.50	22.50	1710.74	11769.77	24034.28	5415.78	124.69	36.89	495.35	25.84
Statistics and probability	1644.42	4855.75	8300.05	190.38	9.73	0.20	10.50	4.00	1706.06	5811.30	10785.24	567.03	39.94	11.33	30.91	18.08
Surgery	9229.42	49501.33	49935.17	2578.75	87.42	25.58	311.33	13.75	9298.86	50369.87	51129.87	2684.16	93.73	29.36	322.73	19.07
Telecommunications	1895.85	5177.72	8911.38	32.58	0.75	0.50	7.17	1.67	1900.45	5259.70	9091.84	153.60	3.31	1.53	32.60	12.05
Theater	58.67	18.00	36.33	3.00	0.00	0.00	1.00	0.00	58.67	18.00	36.33	3.00	0.00	0.00	1.00	0.00
Religion	458.50	303.50	1190.50	83.00	8.50	2.00	16.50	4.00	458.78	306.05	1196.48	83.86	8.50	2.00	16.61	4.00
Toxicology	2464.08	17964.00	17850.50	1022.33	43.83	31.50	706.75	12.17	2534.78	19049.82	19493.15	1179.70	54.46	36.07	716.92	14.88
Transplantation	897.83	6140.50	4400.33	233.25	7.33	1.33	13.42	0.83	921.44	6433.36	4827.73	263.93	8.70	1.79	17.52	1.29
Transportation	228.75	1057.40	3890.33	50.73	2.17	2.42	0.45	0.00	229.67	1070.82	3923.73	55.52	2.46	2.48	0.54	0.09
Tropical medicine	573.33	3628.67	6494.33	274.67	14.67	8.67	26.50	14.83	606.13	3981.43	7217.57	331.11	19.77	11.74	30.97	15.95
Urban studies	274.63	847.00	3906.50	87.50	6.20	1.03	9.57	5.23	276.31	869.14	3977.39	95.09	6.80	1.11	9.85	5.44
Urology and nephrology	3619.67	29755.33	19771.00	1660.00	61.50	17.00	185.33	12.00	3661.25	30331.28	20440.38	1728.49	66.49	19.21	192.05	13.10
Veterinary sciences	2797.83	11699.75	32322.67	650.00	14.00	5.17	172.08	8.83	2841.76	12212.20	33349.74	752.08	23.98	12.34	183.47	12.37
Peripheral vascular disease	2842.33	27089.58	21890.58	955.42	57.25	16.33	126.42	12.83	2930.70	28308.42	23541.75	1099.58	64.50	20.17	139.51	17.69
Virology	2424.17	24679.50	27200.67	1106.50	71.83	8.33	144.33	20.00	2555.39	26937.25	30571.61	1430.56	97.81	20.06	168.72	33.84
Women's studies	256.83	685.08	2441.75	173.67	6.75	5.58	11.75	2.25	258.84	700.96	2477.73	254.97	9.45	6.52	13.56	2.59
Zoology	1659.00	8611.33	29644.17	446.58	85.00	50.92	60.42	7.17	1795.70	10446.44	35400.62	1093.56	153.47	90.88	100.09	47.29
Mining and mineral processing	510.42	2015.17	2620.00	3.83	0.00	0.00	0.33	0.00	514.14	2031.54	2641.98	7.57	0.34	0.32	0.49	0.07
Water resources	1788.32	9998.50	16516.53	56.78	9.37	5.20	10.67	1.00	1803.32	10241.63	17135.42	141.43	15.82	7.74	16.09	2.99
Ethics	262.42	723.25	3687.58	181.58	13.67	0.83	7.50	4.67	264.23	742.00	3750.27	212.55	15.12	1.18	8.67	7.81
Hospitality: leisure: sport and tourism	245.50	1066.00	4779.67	37.33	1.33	0.83	3.67	1.83	246.70	1077.73	4820.27	45.80	1.98	0.92	4.02	2.14
Health care sciences and services	1647.92	9350.45	20784.08	2434.48	98.28	19.75	132.50	23.70	1677.91	9619.06	21318.56	2565.20	105.01	21.36	138.37	27.89
Transportation science and technology	352.42	1624.23	3662.83	28.65	0.33	1.67	0.70	0.00	354.15	1636.69	3701.36	33.63	0.71	1.73	0.87	0.20
Literary theory and criticism	26.83	5.00	42.33	1.50	0.00	0.00	0.00	0.50	26.83	5.00	42.33	1.50	0.00	0.00	0.00	0.50
Agricultural engineering	446.17	3979.83	7269.50	30.67	2.33	0.67	2.50	0.83	449.26	4031.70	7389.24	38.53	2.83	0.91	2.79	1.81
Critical care medicine	956.42	9829.42	14561.00	640.50	27.75	3.92	129.92	4.25	994.95	10303.12	15242.74	707.25	30.48	5.77	135.55	6.29

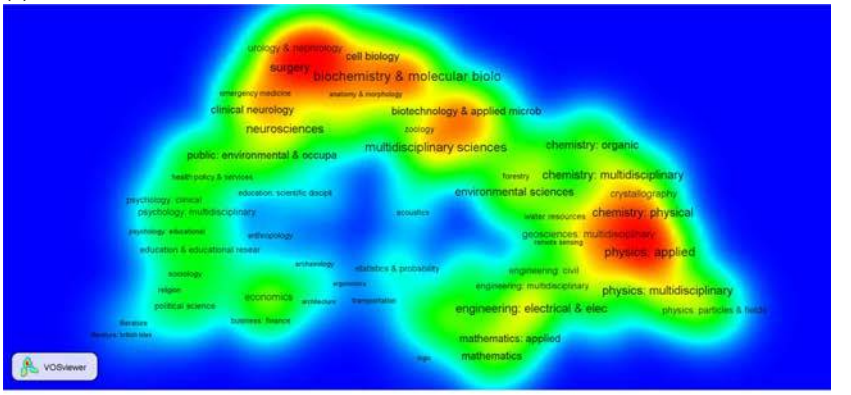
(*continued*)

Subject category	P	TCS	TRS	TTS	TBS	TNS	TFS	TGS	P reclas	TCS reclas	TRS reclas	TTS reclas	TBS reclas	TNS reclas	TFS reclas	TGS reclas
Mathematical and computational biology	1103.05	7352.93	25003.87	1699.02	77.57	4.03	41.50	76.33	1276.73	10307.73	32366.88	2329.05	127.03	22.75	85.53	99.88
Engineering: geological	415.67	1564.00	2346.67	17.17	0.00	0.00	4.83	0.00	420.52	1574.28	2367.85	20.14	0.20	0.11	5.03	0.00
Integrative and complementary medicine	467.75	1975.33	4447.50	1388.67	19.50	7.25	403.83	13.00	472.34	2029.96	4539.60	1407.48	21.46	8.63	406.42	14.03
Neuroimaging	304.67	2901.83	7527.17	95.17	6.67	3.00	10.83	3.83	338.26	3353.86	8909.04	304.24	19.59	7.57	22.36	22.54
Gerontology	440.83	2735.17	4286.50	260.83	14.17	4.00	27.00	3.67	450.64	2860.06	4541.39	295.64	16.90	4.85	29.89	6.59
Robotics	321.67	1122.17	3858.67	12.17	2.33	2.33	1.00	0.33	324.70	1144.29	3905.92	15.41	3.27	3.22	1.05	1.03
nanoscience and nanotechnology	3226.48	37609.37	38918.40	650.58	138.03	28.00	45.62	81.73	3272.69	39381.15	41388.46	789.60	156.37	37.98	52.43	89.92
Cultural studies	207.83	314.00	2154.33	127.33	9.50	1.50	4.50	1.00	208.09	314.39	2157.11	127.83	9.56	1.50	4.56	1.00
Medical ethics	82.92	253.17	608.00	80.17	9.00	0.83	2.00	0.00	84.20	266.37	646.93	108.21	10.33	1.10	2.96	3.14
Cell and tissue engineering	223.50	3195.53	4317.05	161.35	13.28	1.20	13.25	2.00	258.93	4072.13	5802.02	285.63	23.14	5.50	25.89	4.41
Primary health care	211.17	951.17	1626.00	273.50	7.67	2.33	25.83	1.17	215.63	987.34	1684.26	292.28	8.65	2.50	26.59	1.35
Audiology and speech-language pathology	439.00	1902.17	5167.08	166.50	4.00	2.75	13.83	0.83	452.31	2025.00	5564.80	219.48	6.66	4.60	16.53	2.43
Logic	87.75	95.08	193.92	14.08	0.25	0.00	0.00	1.00	88.25	96.25	195.08	14.08	0.25	0.00	0.00	1.00

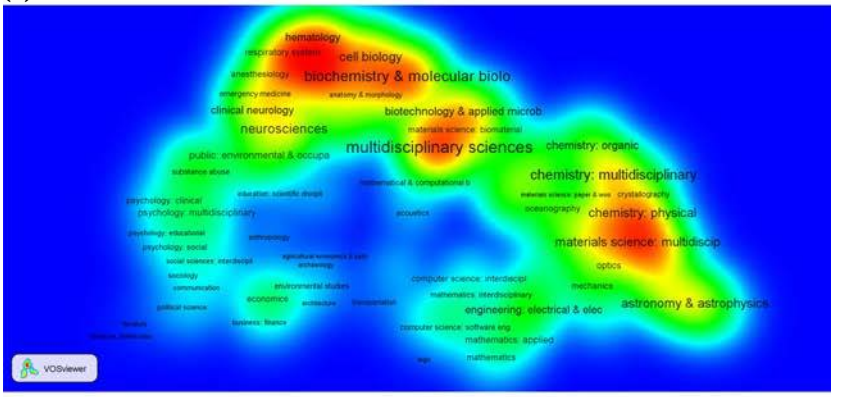
Table AI.

Appendix 3

(a)



(b)



(c)

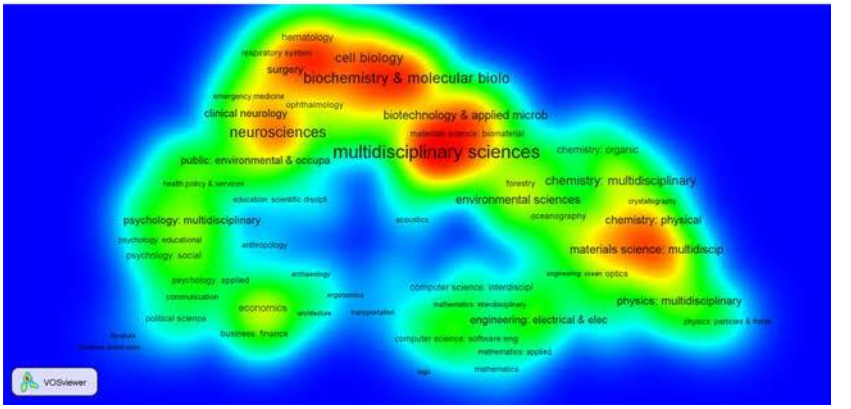
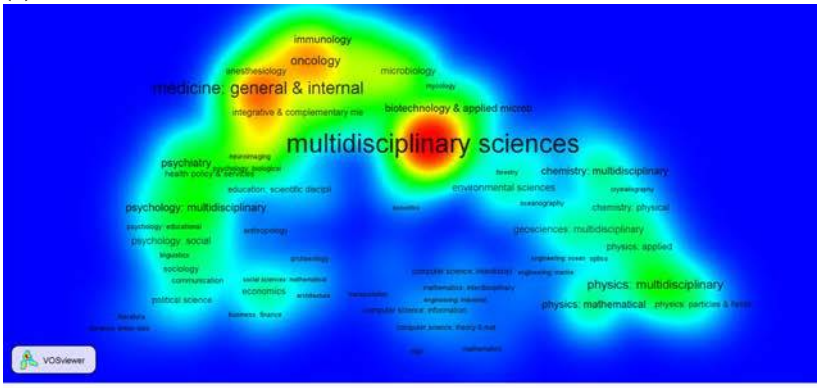


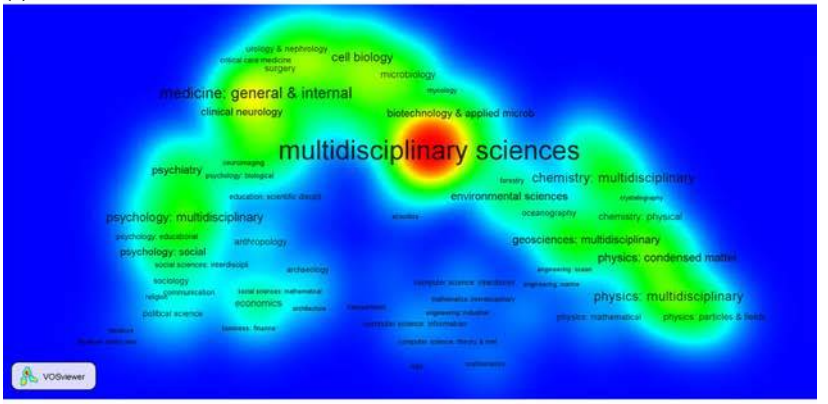
Figure A2.
Density figures including the "Multidisciplinary sciences" category

(continued)

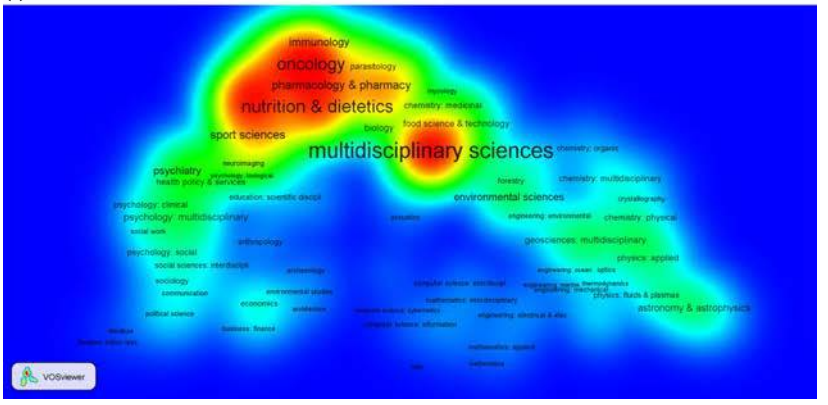
(d)



(e)

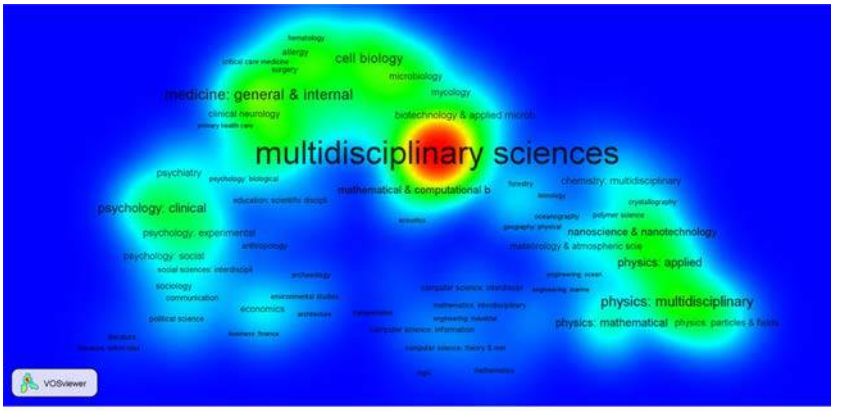


(f)

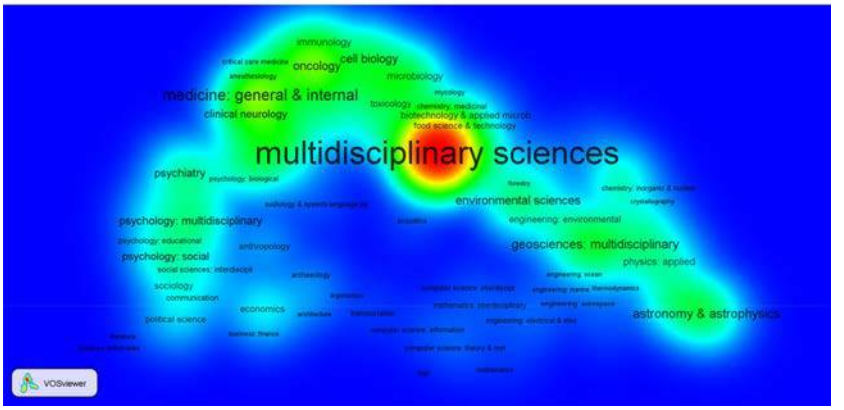


(continued)

(g)



(h)



Notes: (a) Publications; (b) Citations; (c) Mendeley; (d) Twitter; (e) Blogs; (f) Facebook; (g) G+; (h) News

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