Authorship Patterns and Collaborative Research in Astrobiology, 2012-2017

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Authorship Patterns and Collaborative Research in the
Astrobiology, 2012-2017

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kottithavam@gmail.com

Abstract: This paper presents a bibliometric study of Astrobiology during the period of 2012-2017. A total of 519 articles and 3048 authors in the journal were examined by year to ascertain authorship patterns, author productivity, and degree of collaboration. The average number of authors per paper is 5.872% and the average productivity per author is 0.170%. The average degree of collaboration is 0.861, which clearly indicates its dominance upon multi authored contributions.

Key Words: Bibliometrics; Publication Analysis; Authorship Patterns; Degree of Collaboration; Research Trends; Astrobiology; Collaborative Research.

Introduction

The Astrobiology is the leading peer-reviewed international journal for astronomers, biologists, chemists, geologists, microbiologists, paleontologists, and planetary scientists designed to advance our understanding of life’s origin, evolution, and distribution in the universe. This authoritative journal disseminates the most current findings and discoveries coming out of recent interplanetary exploration and laboratory - and field-based research programs. Astrobiology was launched in 2001 and published monthly by Mary Ann Liebert, Inc. is a privately held independent publishing company founded by its president, Mary Ann Liebert, in 1980. The company publishes peer-reviewed academic journals, books, and trade magazines in the areas of biotechnology, biomedical research/life sciences, clinical medicine, alternative/integrative medicine, surgery, and law. Its headquarters are in New Rochelle, New York, United States.

The journal's scope includes astrophysics, astropaleontology, bioastronomy, cosmochemistry, ecogenomics, exobiology, extremophiles, geomicrobiology, gravitational biology, life detection technology, meteoritics, origins of life, planetary geoscience, planetary
protection, prebiotic chemistry, space exploration technology and terraforming Astrobiology is Indexed/Abstracted in: MEDLINE; PubMed Central; Current Contents®/Agriculture, Biology & Environmental Sciences; Current Contents®/Physical, Chemical & Earth Sciences; Science Citation Index Expanded; Biological Abstracts; BIOSIS Previews; Journal Citation Reports/Science Edition; EMBASE/Excerpta Medica; EM Biology; Scopus; Geobase; Compendex; Chemical Abstracts; PsycINFO; GeoRef; Astrophysics Data System.

**Literature Review**

Arya studied authorship pattern and collaborative research trends in the field of veterinary medicine based on the data collected from 'Indian Journal of Veterinary Medicine' published during the period 1999 - 2007. Thavamani & Velmurugan, studied the publication trends of scholarly papers in *Annals of Library and Information Studies*, through a bibliometric analysis of 310 contributions in the journal during the year 2002–2012. Thavamani identified the growth and authorship pattern of productivity of articles of source journal "DESIDOC Journal of Library & Information Technology". It was observed from the study that the year 2008 was most participating year during the study period 2007 - 2011. Thavamani, analyzed the Malaysian Journal of Library and Information Science. A total of 279 research articles and 575 authors were examined by growth of contributions by year and volume, authorship patterns by year and volume, authorship patterns, author productivity, single and multi authored papers by year, authorship patterns by global, most prolific contributors and degree of collaboration.

Thavamani, studied of Collaborative Librarianship (CL) during the period of 2009-2014. A total of 223 research contributions and 343 authors were examined by growth of contributions by year and volume, authorship patterns by year and volume, growth of authors by year, authorship patterns, author productivity, authorship patterns by global, most prolific contributors and degree of collaboration. Thavamani, studied the authorship trend in the “Chinese Librarianship: an International Electronic Journal (CLIEJ)” during the period of 1996-2013. A total of 133 articles and 221 authors in the Journal were examined by year and volume to ascertain authorship patterns, author productivity, and degree of collaboration. Velmurugan & Radhakrishnan, conducted with 448 contributions published in the journal selected six years for a period between 2007 and 2012. Taşkın & Aydinoglu, studied the bibliometric investigation of the NASA Astrobiology Institute (NAI) funded research that was published between 2008 and 2012.
Objectives

The objectives of the present study are as follows:

❖ To identify the Contributions by Type of Documents, to trace Research Contributions by Year.
❖ To study Authorship Patterns, to trace Author’s Productivity and to identify Most Prolific Authors and to trace Authorship patterns by Country.
❖ To identify affiliated Institution by authors and to identify degree of author collaboration.

Methodology

The data was collected from the website (LiebertOpenAccess.com) of the Astrobiology. Seventy Two (72) issues from six (6) volumes from 2012 to 2017 have been selected for the study. All articles are source article published in the last six years (2012 – 2017) were recorded in a separate white sheet and results were entered in Microsoft Excel. Statistical Package for Social Sciences (SPSS) was used for the analysis. These data were organized, calculated, tabulated, analyzed, and presented by using simple arithmetic and statistical methods in order to provide analysis.

Data Analysis

Data on the bibliographic records were collected from the online version of the Astrobiology pertaining to the period 2012 – 2017. A total of 519 contributions and 3048 authors were analyzed the journal. The flowing tables and brief analyses represent the substance of this research.

Table 1: Contributions by Type of Documents

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Type of Contributions</th>
<th>Total No. of Contributions</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Research Articles</td>
<td>364</td>
<td>70.134</td>
</tr>
<tr>
<td>2</td>
<td>News &amp; Views</td>
<td>28</td>
<td>5.394</td>
</tr>
<tr>
<td>3</td>
<td>Review Articles</td>
<td>24</td>
<td>4.624</td>
</tr>
<tr>
<td>4</td>
<td>Hypothesis Articles</td>
<td>30</td>
<td>5.780</td>
</tr>
<tr>
<td>5</td>
<td>Rapid Communications</td>
<td>12</td>
<td>2.312</td>
</tr>
<tr>
<td>6</td>
<td>Education Articles</td>
<td>10</td>
<td>1.926</td>
</tr>
<tr>
<td>Sl. No.</td>
<td>Type of Document</td>
<td>Count</td>
<td>Percentage (%)</td>
</tr>
<tr>
<td>--------</td>
<td>---------------------------</td>
<td>-------</td>
<td>----------------</td>
</tr>
<tr>
<td>7</td>
<td>Forum Articles</td>
<td>12</td>
<td>2.312</td>
</tr>
<tr>
<td>8</td>
<td>Essays</td>
<td>7</td>
<td>1.348</td>
</tr>
<tr>
<td>9</td>
<td>Reflections</td>
<td>7</td>
<td>1.348</td>
</tr>
<tr>
<td>10</td>
<td>Tributes</td>
<td>5</td>
<td>0.963</td>
</tr>
<tr>
<td>11</td>
<td>Mini Reviews</td>
<td>3</td>
<td>0.578</td>
</tr>
<tr>
<td>12</td>
<td>Book Reviews</td>
<td>3</td>
<td>0.578</td>
</tr>
<tr>
<td>13</td>
<td>Pioneers of Astrobiology</td>
<td>3</td>
<td>0.578</td>
</tr>
<tr>
<td>14</td>
<td>Others</td>
<td>11</td>
<td>2.119</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>519</strong></td>
<td><strong>100.000</strong></td>
</tr>
</tbody>
</table>

Table 1 shows the contribution by type of documents published in the astrobiology from 2012 to 2017. The highest numbers of contributions are research articles 364 (70.134%). Followed by hypothesis articles 30 (5.780%), news & views 28 (5.394%), review articles 24 (4.624%), rapid communications and education articles 10 (1.926%), forum articles 12 (2.312%), essays and reflections 7 (1.348%), tributes 5 (0.963%). Minimum contributions are mini reviews 3 (0.578%), book reviews 3 (0.578%), pioneers of astrobiology 3 (0.578%) and others 11 (2.119%).

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Year</th>
<th>Total No. of Contributions</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
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<td>2012</td>
<td>112</td>
<td>21.579</td>
</tr>
<tr>
<td>2</td>
<td>2013</td>
<td>96</td>
<td>18.497</td>
</tr>
<tr>
<td>3</td>
<td>2014</td>
<td>67</td>
<td>12.909</td>
</tr>
<tr>
<td>4</td>
<td>2015</td>
<td>84</td>
<td>16.184</td>
</tr>
<tr>
<td>5</td>
<td>2016</td>
<td>70</td>
<td>13.487</td>
</tr>
<tr>
<td>6</td>
<td>2017</td>
<td>90</td>
<td>17.341</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>519</strong></td>
<td><strong>100.000</strong></td>
</tr>
</tbody>
</table>

Table 2: Research Contributions by Year

Table 2 show the growth of research articles published in the Astrobiology from 2012 to 2017. Altogether, there are 519 research articles. The highest number of research contributions 112 (21.579%) were published in 2012, while the lowest number 67 (12.909%) of research contributions were published in the year of 2014.
<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Author</th>
<th>Total</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Single Author</td>
<td>72</td>
<td>13.872</td>
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<tr>
<td>2</td>
<td>Two Authors</td>
<td>87</td>
<td>16.763</td>
</tr>
<tr>
<td>3</td>
<td>Three Authors</td>
<td>60</td>
<td>11.560</td>
</tr>
<tr>
<td>4</td>
<td>Four Authors</td>
<td>66</td>
<td>12.716</td>
</tr>
<tr>
<td>5</td>
<td>Five Authors</td>
<td>54</td>
<td>10.404</td>
</tr>
<tr>
<td>6</td>
<td>Six Authors</td>
<td>42</td>
<td>8.092</td>
</tr>
<tr>
<td>7</td>
<td>Seven Authors</td>
<td>31</td>
<td>5.973</td>
</tr>
<tr>
<td>8</td>
<td>Eight Authors</td>
<td>22</td>
<td>4.238</td>
</tr>
<tr>
<td>9</td>
<td>Nine Authors</td>
<td>20</td>
<td>3.853</td>
</tr>
<tr>
<td>10</td>
<td>Ten Authors</td>
<td>10</td>
<td>1.926</td>
</tr>
<tr>
<td>11</td>
<td>Eleven Authors</td>
<td>10</td>
<td>1.926</td>
</tr>
<tr>
<td>12</td>
<td>Twelve Authors</td>
<td>6</td>
<td>1.156</td>
</tr>
<tr>
<td>13</td>
<td>Thirteen Authors</td>
<td>7</td>
<td>1.348</td>
</tr>
<tr>
<td>14</td>
<td>Fourteen Authors</td>
<td>5</td>
<td>0.963</td>
</tr>
<tr>
<td>15</td>
<td>Eighteen Authors</td>
<td>4</td>
<td>0.770</td>
</tr>
<tr>
<td>16</td>
<td>Fifteen Authors</td>
<td>3</td>
<td>0.578</td>
</tr>
<tr>
<td>17</td>
<td>Seventeen Authors</td>
<td>3</td>
<td>0.578</td>
</tr>
<tr>
<td>18</td>
<td>Twenty six Authors</td>
<td>3</td>
<td>0.578</td>
</tr>
<tr>
<td>19</td>
<td>Twenty Authors</td>
<td>2</td>
<td>0.385</td>
</tr>
<tr>
<td>20</td>
<td>Twenty two Authors</td>
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<td>0.192</td>
</tr>
<tr>
<td>21</td>
<td>Twenty three Authors</td>
<td>1</td>
<td>0.192</td>
</tr>
<tr>
<td>22</td>
<td>Twenty four Authors</td>
<td>1</td>
<td>0.192</td>
</tr>
<tr>
<td>23</td>
<td>Twenty five Authors</td>
<td>1</td>
<td>0.192</td>
</tr>
<tr>
<td>24</td>
<td>Twenty eight Authors</td>
<td>1</td>
<td>0.192</td>
</tr>
<tr>
<td>25</td>
<td>Twenty nine Authors</td>
<td>1</td>
<td>0.192</td>
</tr>
<tr>
<td>26</td>
<td>Thirty seven Authors</td>
<td>1</td>
<td>0.192</td>
</tr>
<tr>
<td>27</td>
<td>Forty nine Authors</td>
<td>1</td>
<td>0.192</td>
</tr>
<tr>
<td>28</td>
<td>Seventy Authors</td>
<td>1</td>
<td>0.192</td>
</tr>
<tr>
<td>29</td>
<td>Seventy three Authors</td>
<td>1</td>
<td>0.192</td>
</tr>
<tr>
<td>30</td>
<td>Seventy five Authors</td>
<td>1</td>
<td>0.192</td>
</tr>
</tbody>
</table>
Table 3 shows 447 (86.127%) papers have been written in joint authorship. It is seen that only 72 (13.872%) of the publications were single authored articles. Followed by two authors 87(16.763%), three authors 60 (11.560%), four authors 66(12.716%), five authors 54 (10.404%), six authors 42(8.092%), etc. The lowest number 1(0.192%) of contributions was made by twenty two, twenty three, twenty four, twenty five, twenty eight, twenty nine, thirty seven, forty nine, seventy three, seventy five and seventy eight authors.

Table 4: Author’s Productivity

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Year</th>
<th>Total No. of Papers</th>
<th>Total No. of Authors</th>
<th>AAPP*</th>
<th>Productivity per Author</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2012</td>
<td>112</td>
<td>536</td>
<td>4.785</td>
<td>0.208</td>
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<tr>
<td>2</td>
<td>2013</td>
<td>96</td>
<td>511</td>
<td>5.322</td>
<td>0.187</td>
</tr>
<tr>
<td>3</td>
<td>2014</td>
<td>67</td>
<td>597</td>
<td>8.910</td>
<td>0.112</td>
</tr>
<tr>
<td>4</td>
<td>2015</td>
<td>84</td>
<td>393</td>
<td>4.678</td>
<td>0.213</td>
</tr>
<tr>
<td>5</td>
<td>2016</td>
<td>70</td>
<td>368</td>
<td>5.257</td>
<td>0.190</td>
</tr>
<tr>
<td>6</td>
<td>2017</td>
<td>90</td>
<td>643</td>
<td>7.144</td>
<td>0.139</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>519</td>
<td>3048</td>
<td>5.872</td>
<td>0.170</td>
</tr>
</tbody>
</table>

Notes: *Average Authors per Paper (AAPP) = Number of authors/Number of papers. Productivity per author = Number of papers/Number of authors.

Table 4 shows the data related to author’s productivity. The total average number of authors per paper is 5.872 and the average productivity per author is 0.170. The highest number of author’s productivity (643, 0.139%) was in 2017. The minimum number of author’s productivity (597, 0.112%) was in 2014.

Table 5: Most Prolific Authors

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name</th>
<th>No. of Contributions</th>
<th>Country</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
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<td>Charles S. Cockell</td>
<td>14</td>
<td>UK</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Gerda Horneck</td>
<td>13</td>
<td>USA</td>
<td>2</td>
</tr>
<tr>
<td>No.</td>
<td>Name</td>
<td>No.</td>
<td>Country</td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>-----------------------</td>
<td>-----</td>
<td>------------------</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Ralf Moeller</td>
<td>13</td>
<td>Germany</td>
<td></td>
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<tr>
<td>4</td>
<td>Frances Westall</td>
<td>13</td>
<td>France</td>
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<td>5</td>
<td>Petra Rettberg</td>
<td>11</td>
<td>Germany</td>
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<td>6</td>
<td>Wayne L. Nicholson</td>
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<td>USA</td>
<td></td>
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<td>7</td>
<td>Mark A. Sephton</td>
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<td>UK</td>
<td></td>
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<tr>
<td>8</td>
<td>Jorge L. Vago</td>
<td>9</td>
<td>The Netherlands</td>
<td></td>
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<td>9</td>
<td>Christopher P. McKay</td>
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<td>USA</td>
<td></td>
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<tr>
<td>10</td>
<td>Valeria Souza</td>
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<td>Steven A. Benner</td>
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<td>Kasthuri Venkateswaran</td>
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<td>Alison Olcott Marshall</td>
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<td>USA</td>
<td></td>
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<td>15</td>
<td>Howell G.M. Edwards</td>
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<td>UK</td>
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<td>René Heller</td>
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<td>Germany/Canada</td>
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<td>Elke Rabbow</td>
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<td>Alfonso F. Davila</td>
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<td>Andrew C. Schuerger</td>
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<td>Laura M. Barge</td>
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<td>Victoria S. Meadows</td>
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<td>Ian Hutchinson</td>
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<td>Gian Gabriele Ori</td>
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<td>México</td>
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</tr>
<tr>
<td>43</td>
<td>Helmut Lammer</td>
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<td>44</td>
<td>Isik Kanik</td>
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<td>45</td>
<td>Izabella Gołębiowska</td>
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<td>Poland</td>
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<td>46</td>
<td>Jack D. Farmer</td>
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<td>USA/Austria</td>
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<td>47</td>
<td>James F. Kasting</td>
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<tr>
<td>48</td>
<td>Jane McArthur</td>
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<td>UK</td>
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<td>10</td>
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<td>50</td>
<td>Jarno Peschier</td>
<td>4</td>
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<td>10</td>
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<tr>
<td>51</td>
<td>Three author contributions</td>
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<td>11</td>
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<tr>
<td>52</td>
<td>Two author contributions</td>
<td>443</td>
<td></td>
<td>12</td>
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<td>53</td>
<td>One author contributions</td>
<td>1898</td>
<td></td>
<td>13</td>
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<tr>
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<td></td>
<td><strong>Total</strong></td>
<td><strong>3048</strong></td>
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</tr>
</tbody>
</table>
Table 5 shows that a total of 3048 authors have contributed 519 research contributions over a period of six years (2012-2017). The most prolific contributor Charles S. Cockell (UK) who stood in the first position, he contributed the highest number (14) of publications. This is followed by Gerda Horneck (United States), Ralf Moeller (Germany) and Frances Westall (France) those stood in second highest contributions with 13 publications; Petra Rettberg (Germany) 11 publications; Wayne L. Nicholson (USA) with 10 publications; Mark A. Sephton (UK), Jorge L. Vago (The Netherlands), Christopher P. McKay (USA) with 9 publications; Valeria Souza (México) and Steven A. Benner (USA) with 8 publications; Besides, there are four who have contributed 7 research articles each; nine authors by six contributions; seven authors by five papers; nineteen authors by four papers. And the remaining 397 contributions by three authors, 443 by two authors and 1898 contributions have been contributed by single authors.

Table 6: Authorship by Country

<table>
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<tr>
<th>Sl. No.</th>
<th>Country</th>
<th>No. of Contributions</th>
<th>Percentage (%)</th>
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<tr>
<td>5</td>
<td>France</td>
<td>221</td>
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<td>Spain</td>
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<td>8</td>
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<td>9</td>
<td>China</td>
<td>80</td>
<td>2.624</td>
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<td>10</td>
<td>Canada</td>
<td>74</td>
<td>2.427</td>
</tr>
<tr>
<td>11</td>
<td>Japan</td>
<td>70</td>
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<tr>
<td>12</td>
<td>Russia</td>
<td>55</td>
<td>1.804</td>
</tr>
<tr>
<td>13</td>
<td>México</td>
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<tr>
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<td>Switzerland</td>
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<td>25</td>
<td>Greece</td>
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<td>0.360</td>
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<td>0.164</td>
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<td>30</td>
<td>New Zealand</td>
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<td>31</td>
<td>Romania</td>
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<td>32</td>
<td>Hong Kong</td>
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<td>33</td>
<td>USA/UK</td>
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<td>34</td>
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<td>38</td>
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<td>Korea</td>
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<tr>
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<td>Portugal</td>
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<td>Finland</td>
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<tr>
<td>50</td>
<td>Saudi Arabia</td>
<td>1</td>
<td>0.032</td>
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</table>
Table 6 shows the distribution of authors by country. The 519 research contributions were contributed by 3048 authors from 51 countries. The highest number of authors 1152 (37.795%) were from the USA, followed by Germany 283 (9.284%), UK 232 (7.611%), Austria 231 (7.578%), France 221 (7.250%), Spain 100 (3.280%), Italy 84 (2.755%), The Netherlands 82 (2.690%), China 80 (2.624%), Canada 74 (2.427%), Japan 70 (2.296%), Russia 55 (1.804%), México 45 (1.476%), Switzerland 38 (1.246%), Sweden 37 (1.213%), Brazil 32 (1.049), Poland 24 (0.787%), Norway 20 (0.656%), Belgium 20 (0.656%), Australia 9 (0.623%), Ukraine 18 (0.590%), India 13 (0.426%), Czech Republic 12 (0.393%), Denmark 11 (0.360%), Greece 11 (0.360%), Taiwan 7 (0.229%), etc., The lowest numbers of contributions 1 (0.0754%) were from twelve countries. And the 23 (0.754%) are place not mentioned.

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Institutions/Universities</th>
<th>No. of Contributions</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<tr>
<td>3</td>
<td>Others</td>
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<td>4</td>
<td>Institutions Not Mentioned</td>
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<td>Total</td>
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<td>3048</td>
<td>100.00</td>
</tr>
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</table>

Table 7: Contributions by Institution

Table 7 shows the type of institutions with which the authors of the articles were affiliated. Out of 3048 contributions, the highest number i.e. 1580 (51.837%) were from authors affiliated with academic institutions; whereas the lowest number i.e. 71 (2.329%) has been contributed by other institutions. The second highest number i.e. 1349 (44.0258%) were from research institutions. And 48 (1.574%) of the contributions were not mentioned their affiliated institutions.
Table 8: Degree of Author Collaboration

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Year</th>
<th>Single Authored Paper (Ns)</th>
<th>Multi Authored Papers (Nm)</th>
<th>Total (Nm+Ns)</th>
<th>Degree of Collaboration</th>
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<td>2012</td>
<td>30</td>
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<td>112</td>
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<tr>
<td>2</td>
<td>2013</td>
<td>8</td>
<td>88</td>
<td>96</td>
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<tr>
<td>3</td>
<td>2014</td>
<td>5</td>
<td>62</td>
<td>67</td>
<td>0.925</td>
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<tr>
<td>4</td>
<td>2015</td>
<td>8</td>
<td>76</td>
<td>84</td>
<td>0.904</td>
</tr>
<tr>
<td>5</td>
<td>2016</td>
<td>10</td>
<td>60</td>
<td>70</td>
<td>0.857</td>
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<tr>
<td>6</td>
<td>2017</td>
<td>11</td>
<td>79</td>
<td>90</td>
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<tr>
<td>Total</td>
<td></td>
<td>72</td>
<td>447</td>
<td>519</td>
<td>0.861</td>
</tr>
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</table>

Degree of Collaboration

The extent of Degree of Author Collaboration in the astrobiology research has been measured with the help of the formula devised by K. Subramaniam²,

The formula is where

\[ C = \frac{Nm}{Nm + Ns} \]

\[ C = \text{Degree of Collaboration in a discipline} \]

\[ Nm = \text{Number of multiple authored papers} \]

\[ Ns = \text{Number of single authored papers} \]

Accordingly, the Degree of Collaboration has been calculated as follows:

\[ C = \frac{447}{72 + 447} = \frac{447}{519} = 0.861 \]

As a result, the average degree of author collaboration in the Astrobiology is 0.861, which clearly indicates its dominance upon multi-author contributions.
Findings and Conclusion

In this article, I present an overview of global collaborative research trends in Astrobiology. Eight topics are considered: contributions by research article contributions by year, authorship patterns, author’s productivity, identify most prolific authors, authorship by country; contributions by institution and degree of author collaboration.

➢ There are 519 research contributions by 3048 authors. The highest numbers of contributions are research articles 364 (70.134%). Followed by hypothesis articles 30 (5.780%), news & views 28 (5.394%), review articles 24 (4.624%), rapid communications and education articles 10 (1.926%), forum articles 12 (2.312%), essays and reflections 7 (1.348%), tributes 5 (0.963%). Minimum contributions are mini reviews 3 (0.578%), book reviews 3 (0.578%), pioneers of astrobiology 3 (0.578%) and others 11 (2.119%).

➢ Altogether, there are 519 research articles. The highest number of research contributions 112 (21.579%) were published in 2012, while the lowest number 67 (12.909%) of research contributions were published in the year of 2014.

➢ 447 (86.127%) papers have been written in joint authorship. It is seen that only 72 (13.872%) of the publications were single authored articles. Followed by two authors 87 (16.763%), three authors 60 (11.560%), four authors 66 (12.716%), five authors 54 (10.404%), six authors 42 (8.092%), etc. The lowest number 1 (0.192%) of contributions was made by twenty two, twenty three, twenty four, twenty five, twenty seven, twenty eight, twenty nine, thirty seven, forty nine, seventy, seventy three, seventy five and seventy eight authors.

➢ The total average number of authors per paper is 5.872 and the average productivity per author is 0.170. The highest number of author’s productivity (643, 0.139%) was in 2017. The minimum number of author’s productivity (597, 0.112%) was in 2014.

➢ A total of 3048 authors have contributed 519 research contributions over a period of six years (2012-2017). The most prolific contributor Charles S. Cockell (UK) who stood in the first position, he contributed the highest number (14) of publications. This is followed by Gerda Horneck (United States), Ralf Moeller (Germany) and Frances
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➢ The 519 research contributions were contributed by 3048 authors from 51 countries. The highest number of authors 1152(37.795%) were from the USA, followed by Germany 283(9.284%), UK 232(7.611%), Austria 231(7.578%), France 221(7.250%), Spain 100(3.280%), Italy 84(2.755%), The Netherlands 82(2.690%), China 80(2.624%), Canada 74(2.427%), Japan 70(2.296%), Russia 55(1.804%), México 45(1.476%), Switzerland 38(1.246%), Sweden 37(1.213%), Brazil 32(1.049), Poland 24(0.787%), Norway 20(0.656%), Belgium 20(0.656%), Australia 9(0.623%), Ukraine 18(0.590%), India 13(0.426%), Czech Republic 12(0.393%), Denmark 11(0.360%), Greece 11(0.360%), Taiwan 7(0.229%), etc., The lowest numbers of contributions 1(0.0754%) were from twelve countries.

➢ Out of 3048 contributions, the highest number i.e. 1580(51.837%) were from authors affiliated with academic institutions; whereas the lowest number i.e. 71(2.329%) has been contributed by other institutions. The second highest number i.e. 1349(44.0258%) were from research institutions. And 48(1.574%) of the contributions were not mentioned their affiliated institutions.

➢ As a result, the average degree of author collaboration in the Astrobiology is 0.861, which clearly indicates its dominance upon multi-author contributions.

The multi-author collaborations are leading role from early onwards. The Astrobiology has been accepting articles from all over the world as of today, there are 51 countries contributing research articles to the journal. It is getting world-wide popularity and identification by publishing scholarly articles from authors across the world. The journal encourages contribution about professional policies, practices, principles and progress in the Astrobiology fields.
REFERENCES


**BIO-DATA**

Dr. K. Thavamani, is presently working as Selection Grade Library Assistant in the Regional Medical Library, The Tamil nadu Dr. M.G.R. Medical University, Chennai – 32. I have been trained by Indian Institute of Technology Madras, Library IIT(M) Chennai. I have been two decades of experience in the field of Library and Information Science (LIS). I hold PhD (LIS) from Bharathidasan University, Trichy, and Master Degree in LIS from Annamalai University, Chidambaram, and Master Degree in Political Science from Presidency College, (University of Madras) Chennai, Tamil Nadu.

I have been participated and presented papers in more than 50 International, National and Regional Conferences/ Seminars/ workshops, and published many research papers in Conference proceedings. And also Published more than 45 research papers in peer reviewed international (35) and national (10) journals, and also contributed 7 chapters in edited books.

Life time Library professional body members in SALIS, MALA APLA, IALA and ILA.