US EPA ARCHIVE DOCUMENT
Draft Bibliometric Analysis
for the U.S. Environmental Protection Agency/Office of Research
and Development’s Fellowship Program (Fellowships Awarded in
1995 and 1996 Only)

This is a bibliometric analysis of the papers authored by the 244 individuals who received a Science To Achieve Results (STAR) or Greater Research Opportunity (GRO) Fellowship in 1995 or 1996 from the U.S. Environmental Protection Agency (EPA). For this analysis, 1,257 papers were reviewed, and they were published from 1996 to 2006. These publications were cited 16,280 times in the journals covered by Thomson’s Web of Science\(^1\) and Scopus\(^2\). Of these 1,257 publications, 1,019 (81.07%) have been cited at least once in a journal.

Searches of Thomson Scientific’s Web of Science and Scopus were conducted to obtain times cited data for the fellows’ journal publications. The analysis was completed using Thomson’s Essential Science Indicators (ESI) and Journal Citation Reports (JCR) as benchmarks. ESI provides access to a unique and comprehensive compilation of essential science performance statistics and science trends data derived from Thomson’s databases. For this analysis, the ESI highly cited papers thresholds as well as the hot papers thresholds were used to assess the influence and impact of the fellows’ papers. JCR is a recognized authority for evaluating journals. It presents quantifiable statistical data that provide a systematic, objective way to evaluate the world’s leading journals and their impact and influence in the global research community. The two key measures used in this analysis to assess the journals in which the EPA fellows’ papers are published are the Impact Factor and Immediacy Index. The Impact Factor is a measure of the frequency with which the “average article” in a journal has been cited in a particular year. The Impact Factor helps evaluate a journal’s relative importance, especially when compared to other journals in the same field. The Immediacy Index is a measure of how quickly the “average article” in a journal is cited. This index indicates how often articles published in a journal are cited within the same year and it is useful in comparing how quickly journals are cited.

The report includes a summary of the results of the analysis, an analysis of the 1,257 fellows’ papers analyzed by ESI field (e.g., chemistry, environment/ecology, engineering), an analysis of the journals in which the fellows’ papers were published, a table of the highly cited researchers who were in the fellowship program, and a list of the patents and patent applications for the former fellows.

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\(^1\) Thomson Scientific’s Web of Science provides access to current and retrospective multidisciplinary information from approximately 8,830 of the most prestigious, high impact research journals in the world. Web of Science also provides cited reference searching.

\(^2\) Scopus is a large abstract and citation database of research literature and quality Web sources designed to support the literature research process. Scopus offers access to 15,000 titles from 4,000 different publishers, more than 12,850 academic journals (including coverage of 535 Open Access journals, 750 conference proceedings, and 600 trade publications), 27 million abstracts, 245 million references, 200 million scientific Web pages, and 13 million patent records.
SUMMARY OF RESULTS

1. More than one-sixth of the fellows’ publications are highly cited papers. A review of the citations indicates that 217 (17.26%) of the fellows’ papers qualify as highly cited when using the ESI criteria for the top 10% of highly cited publications. This is 1.7 times the number expected. Thirty-one (2.47%) of the fellows’ papers qualify as highly cited when using the ESI criteria for the top 1%, which is 2.5 times the number expected. Seven (0.56%) of these papers qualify as very highly cited when using the criteria for the top 0.1%, which is 5.6 times the number anticipated. None of the papers actually meet the 0.01% threshold for the most highly cited papers, which is not surprising given that the expected number of papers that would meet this threshold for this analysis is 0.12.

2. The fellows’ papers are more highly cited than the average paper. Using the ESI average citation rates for papers published by field as the benchmark, in 15 of the 22 fields in which the EPA fellows’ papers were published, the ratio of actual to expected cites is greater than 1, indicating that the fellows’ papers are more highly cited than the average papers in those fields. For all 22 fields combined, the ratio of total number of cites to the total number of expected cites (16,280 to 10,479.32) is 1.55, indicating that the fellows’ papers are more highly cited than the average paper.

3. One-third of the fellows’ papers are published in high impact journals. Four hundred seventy-seven (477) of the 1,257 papers were published in the top 10% of journals ranked by JCR Impact Factor, representing 37.95% of EPA fellows’ papers. This number is 3.8 times higher than expected. Four hundred nineteen (419) of the 1,257 papers appear in the top 10% of journals ranked by JCR Immediacy Index, representing 33.33% of EPA fellows’ papers. This number is 3.3 times higher than expected.

4. Twenty of the fellows’ papers qualify as hot papers. Using the hot paper thresholds established by ESI as a benchmark, 20 hot papers, representing 1.59% of the fellows’ papers, were identified in the analysis. Hot papers are papers that were highly cited shortly after they were published. The number of fellows’ hot papers is 16 times higher than the 1.26 hot papers expected.

5. The authors of the fellows’ papers cite themselves much less than the average author. Eight hundred forty-four (844) of the 16,280 cites are author self-cites. This 5.18% author self-citation rate is well below the accepted range of 10-30% author self-citation rate.

6. None of the fellows are included in ISIHighlyCited.com, which is a database of the world’s most influential researchers who have made key contributions to science and technology during the period from 1981 to 1999. This result is not surprising given that the 1995-1996 fellows probably began their careers in the late 1990s.

7. There were 13 patents issued and 31 patent applications filed by 1995-1996 EPA fellows. Ten (76.90%) of the 13 patents have been referenced by 22 other patents.
Highly Cited Fellows’ Publications

All of the journals covered by ESI are assigned a field, and to compensate for varying citation rates across scientific fields, different thresholds are applied to each field. Thresholds are set to select highly cited papers to be listed in ESI. Different thresholds are set for both field and year of publication. Setting different thresholds for each year allows comparable representation for older and younger papers for each field.

The 1,257 fellows’ research papers reviewed for this analysis were published in journals that were assigned to 22 of the 22 ESI fields. The distribution of the papers among these 22 fields and the number of citations by field are presented in Table 1.

<table>
<thead>
<tr>
<th>ESI Field</th>
<th>No. of Citations</th>
<th>No. of Fellows’ Papers</th>
<th>Average Cites/Paper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural Sciences</td>
<td>288</td>
<td>28</td>
<td>10.28</td>
</tr>
<tr>
<td>Biology &amp; Biochemistry</td>
<td>1,528</td>
<td>95</td>
<td>16.08</td>
</tr>
<tr>
<td>Chemistry</td>
<td>897</td>
<td>58</td>
<td>15.46</td>
</tr>
<tr>
<td>Clinical Medicine</td>
<td>849</td>
<td>44</td>
<td>19.29</td>
</tr>
<tr>
<td>Computer Science</td>
<td>12</td>
<td>3</td>
<td>4.00</td>
</tr>
<tr>
<td>Economics &amp; Business</td>
<td>131</td>
<td>25</td>
<td>5.24</td>
</tr>
<tr>
<td>Engineering</td>
<td>323</td>
<td>60</td>
<td>5.38</td>
</tr>
<tr>
<td>Environment/Ecology</td>
<td>4,573</td>
<td>358</td>
<td>12.77</td>
</tr>
<tr>
<td>Geosciences</td>
<td>1,838</td>
<td>170</td>
<td>10.81</td>
</tr>
<tr>
<td>Immunology</td>
<td>151</td>
<td>14</td>
<td>10.78</td>
</tr>
<tr>
<td>Materials Science</td>
<td>4</td>
<td>1</td>
<td>4.00</td>
</tr>
<tr>
<td>Mathematics</td>
<td>10</td>
<td>1</td>
<td>10.00</td>
</tr>
<tr>
<td>Microbiology</td>
<td>864</td>
<td>57</td>
<td>15.16</td>
</tr>
<tr>
<td>Molecular Biology &amp; Genetics</td>
<td>328</td>
<td>22</td>
<td>14.91</td>
</tr>
<tr>
<td>Multidisciplinary</td>
<td>1,415</td>
<td>29</td>
<td>48.79</td>
</tr>
<tr>
<td>Neuroscience &amp; Behavior</td>
<td>25</td>
<td>3</td>
<td>8.33</td>
</tr>
<tr>
<td>Pharmacology &amp; Toxicology</td>
<td>394</td>
<td>38</td>
<td>10.34</td>
</tr>
<tr>
<td>Physics</td>
<td>108</td>
<td>14</td>
<td>7.71</td>
</tr>
<tr>
<td>Plant &amp; Animal Science</td>
<td>2,343</td>
<td>181</td>
<td>12.94</td>
</tr>
<tr>
<td>Psychiatry/Psychology</td>
<td>16</td>
<td>4</td>
<td>4.00</td>
</tr>
<tr>
<td>Social Sciences, General</td>
<td>182</td>
<td>51</td>
<td>3.57</td>
</tr>
</tbody>
</table>
There are 217 (17.26% of the papers analyzed) highly cited EPA fellows’ papers in 15 of the 22 fields—Agricultural Sciences, Biology & Biochemistry, Chemistry, Clinical Medicine, Computer Science, Economics & Business, Engineering, Environment/Ecology, Geosciences, Microbiology, Multidisciplinary, Pharmacology & Toxicology, Physics, Plant & Animal Science, and Social Sciences—when using the ESI criteria for the top 10% of papers. Table 2 shows the number of fellows’ papers in those 15 fields that meet the top 10% threshold in ESI.

Table 2. Number of Highly Cited Fellows’ Papers by Field (top 10%)

<table>
<thead>
<tr>
<th>ESI Field</th>
<th>Citations</th>
<th>No. of Papers</th>
<th>Average Cites/Paper</th>
<th>% of Fellows’ Papers in Field</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural Sciences</td>
<td>77</td>
<td>2</td>
<td>38.50</td>
<td>7.14%</td>
</tr>
<tr>
<td>Biology &amp; Biochemistry</td>
<td>815</td>
<td>12</td>
<td>67.92</td>
<td>12.63%</td>
</tr>
<tr>
<td>Chemistry</td>
<td>478</td>
<td>7</td>
<td>68.28</td>
<td>12.07%</td>
</tr>
<tr>
<td>Clinical Medicine</td>
<td>645</td>
<td>10</td>
<td>64.50</td>
<td>22.73%</td>
</tr>
<tr>
<td>Computer Science</td>
<td>12</td>
<td>2</td>
<td>6.00</td>
<td>66.67%</td>
</tr>
<tr>
<td>Economics &amp; Business</td>
<td>82</td>
<td>3</td>
<td>27.33</td>
<td>12.00%</td>
</tr>
<tr>
<td>Engineering</td>
<td>191</td>
<td>12</td>
<td>15.92</td>
<td>20.00%</td>
</tr>
<tr>
<td>Environment/Ecology</td>
<td>2,531</td>
<td>54</td>
<td>46.87</td>
<td>15.08%</td>
</tr>
<tr>
<td>Geosciences</td>
<td>1,035</td>
<td>30</td>
<td>34.50</td>
<td>17.65%</td>
</tr>
<tr>
<td>Microbiology</td>
<td>241</td>
<td>7</td>
<td>34.43</td>
<td>12.28%</td>
</tr>
<tr>
<td>Multidisciplinary</td>
<td>1,390</td>
<td>21</td>
<td>66.19</td>
<td>72.41%</td>
</tr>
<tr>
<td>Pharmacology &amp; Toxicology</td>
<td>28</td>
<td>1</td>
<td>28.00</td>
<td>2.63%</td>
</tr>
<tr>
<td>Physics</td>
<td>59</td>
<td>1</td>
<td>59.00</td>
<td>7.14%</td>
</tr>
<tr>
<td>Plant &amp; Animal Science</td>
<td>1,640</td>
<td>49</td>
<td>33.47</td>
<td>27.07%</td>
</tr>
</tbody>
</table>
Thirty-one (2.47%) of the papers analyzed qualify as highly cited when using the ESI criteria for the top 1% of papers. These papers cover nine fields—Agricultural Sciences, Biology & Biochemistry, Chemistry, Clinical Medicine, Engineering, Environment/Ecology, Geosciences, Multidisciplinary, and Plant & Animal Science. Table 3 shows the 31 papers by field that meet the top 1% threshold in ESI. The citations for these 31 papers are provided in Tables 4 through 12. There were 7 (0.56%) very highly cited fellows’ papers in the fields of Environment/Ecology, Multidisciplinary, and Plant & Animal Science. These papers, which meet the top 0.1% threshold in ESI, are listed in Table 13. None of the fellows’ papers actually meets the top 0.01% threshold in ESI, which is not surprising given that the expected number of papers to meet this threshold for this analysis is 0.12.

Table 3. Number of Highly Cited Fellows’ Papers by Field (top 1%)

<table>
<thead>
<tr>
<th>ESI Field</th>
<th>Citations</th>
<th>No. of Papers</th>
<th>Average Cites/Paper</th>
<th>% of Fellows’ Papers in Field</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural Sciences</td>
<td>55</td>
<td>1</td>
<td>55.00</td>
<td>3.57%</td>
</tr>
<tr>
<td>Biology &amp; Biochemistry</td>
<td>208</td>
<td>1</td>
<td>208.00</td>
<td>1.05%</td>
</tr>
<tr>
<td>Chemistry</td>
<td>311</td>
<td>2</td>
<td>155.50</td>
<td>3.45%</td>
</tr>
<tr>
<td>Clinical Medicine</td>
<td>265</td>
<td>1</td>
<td>265.00</td>
<td>2.27%</td>
</tr>
<tr>
<td>Engineering</td>
<td>55</td>
<td>1</td>
<td>55.00</td>
<td>1.67%</td>
</tr>
<tr>
<td>Environment/Ecology</td>
<td>994</td>
<td>8</td>
<td>124.25</td>
<td>2.23%</td>
</tr>
<tr>
<td>Geosciences</td>
<td>116</td>
<td>2</td>
<td>58.00</td>
<td>1.18%</td>
</tr>
<tr>
<td>Multidisciplinary</td>
<td>882</td>
<td>6</td>
<td>147.00</td>
<td>20.69%</td>
</tr>
<tr>
<td>Plant &amp; Animal Science</td>
<td>685</td>
<td>9</td>
<td>76.11</td>
<td>4.97%</td>
</tr>
<tr>
<td><strong>Total = 3,571</strong></td>
<td><strong>Total = 31</strong></td>
<td></td>
<td><strong>115.19</strong></td>
<td><strong>2.47%</strong></td>
</tr>
</tbody>
</table>
### Table 4. Highly Cited Fellows’ Paper in the Field of Agricultural Sciences (top 1%)

<table>
<thead>
<tr>
<th>No. of Cites</th>
<th>First Author</th>
<th>Paper</th>
</tr>
</thead>
</table>

### Table 5. Highly Cited Fellows’ Paper in the Field of Biology & Biochemistry (top 1%)

<table>
<thead>
<tr>
<th>No. of Cites</th>
<th>First Author</th>
<th>Paper</th>
</tr>
</thead>
</table>

### Table 6. Highly Cited Fellows’ Papers in the Field of Chemistry (top 1%)

<table>
<thead>
<tr>
<th>No. of Cites</th>
<th>First Author</th>
<th>Paper</th>
</tr>
</thead>
</table>

### Table 7. Highly Cited Fellows’ Paper in the Field of Clinical Medicine (top 1%)

<table>
<thead>
<tr>
<th>No. of Cites</th>
<th>First Author</th>
<th>Paper</th>
</tr>
</thead>
</table>
### Table 8. Highly Cited Fellows’ Paper in the Field of Engineering (top 1%)

<table>
<thead>
<tr>
<th>No. of Cites</th>
<th>First Author</th>
<th>Paper</th>
</tr>
</thead>
</table>

### Table 9. Highly Cited Fellows’ Papers in the Field of Environment/Ecology (top 1%)

<table>
<thead>
<tr>
<th>No. of Cites</th>
<th>First Author</th>
<th>Paper</th>
</tr>
</thead>
<tbody>
<tr>
<td>384</td>
<td>Nagel SC</td>
<td>Relative binding affinity serum modified access (RBA-SMA) assay predicts the relative in vivo bioactivity of the xenoestrogens bisphenol A and octylphenol. <em>Environmental Health Perspectives</em> 1997;105(1):70-76.</td>
</tr>
<tr>
<td>76</td>
<td>Bowling DR</td>
<td>C-13 content of ecosystem respiration is linked to precipitation and vapor pressure deficit. <em>Oecologia</em> 2002;131(1):113-124.</td>
</tr>
</tbody>
</table>

### Table 10. Highly Cited Fellows’ Papers in the Field of Geosciences (top 1%)

<table>
<thead>
<tr>
<th>No. of Cites</th>
<th>First Author</th>
<th>Paper</th>
</tr>
</thead>
</table>
### Table 11. Highly Cited Fellows’ Papers in the Field of Multidisciplinary (top 1%)

<table>
<thead>
<tr>
<th>No. of Cites</th>
<th>First Author</th>
<th>Paper</th>
</tr>
</thead>
<tbody>
<tr>
<td>271</td>
<td>vom Saal FS</td>
<td>Prostate enlargement in mice due to fetal exposure to low doses of estradiol or diethylstilbestrol and opposite effects at high doses. <em>Proceedings of the National Academy of Sciences of the United States of America</em> 1997;94(5):2056-2061.</td>
</tr>
</tbody>
</table>

### Table 12. Highly Cited Fellows’ Papers in the Field of Plant & Animal Science (top 1%)

<table>
<thead>
<tr>
<th>No. of Cites</th>
<th>First Author</th>
<th>Paper</th>
</tr>
</thead>
</table>
### Bibliometric Analysis of 1995-1996 EPA Fellows' Journal Articles

<table>
<thead>
<tr>
<th>No. of Cites</th>
<th>First Author</th>
<th>Paper</th>
</tr>
</thead>
</table>

### Table 13. Very Highly Cited Fellows’ Papers (top 0.1%)  

<table>
<thead>
<tr>
<th>ESI Field</th>
<th>No. of Cites</th>
<th>First Author</th>
<th>Paper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multidisciplinary</td>
<td>271</td>
<td>vom Saal FS</td>
<td>Prostate enlargement in mice due to fetal exposure to low doses of estradiol or diethylstilbestrol and opposite effects at high doses. <em>Proceedings of the National Academy of Sciences of the United States of America</em> 1997;94(5):2056-2061.</td>
</tr>
</tbody>
</table>
Ratio of Actual Cites to Expected Citation Rates

The expected citation rate is the average number of cites that a paper published in the same journal in the same year and of the same document type (article, review, editorial, etc.) has received from the year of publication to the present. Using the ESI average citation rates for papers published by field as the benchmark, in 15 of the 22 fields in which the EPA fellows’ papers were published, the ratio of actual to expected cites is greater than 1, indicating that the fellows’ papers are more highly cited than the average papers in those fields (see Table 14). For all 22 fields combined, the ratio of total number of cites to the total number of expected cites (16,280 to 10,479.32) is 1.55, indicating that the fellows’ papers are more highly cited than the average paper.

Table 14. Ratio of Actual Cites to Expected Cites for Fellows’ Papers by Field

<table>
<thead>
<tr>
<th>ESI Field</th>
<th>Total Cites</th>
<th>Expected Cite Rate</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural Sciences</td>
<td>288</td>
<td>135.71</td>
<td>2.12</td>
</tr>
<tr>
<td>Biology &amp; Biochemistry</td>
<td>1,528</td>
<td>1,380.47</td>
<td>1.11</td>
</tr>
<tr>
<td>Chemistry</td>
<td>897</td>
<td>610.08</td>
<td>1.47</td>
</tr>
<tr>
<td>Clinical Medicine</td>
<td>849</td>
<td>474.51</td>
<td>1.79</td>
</tr>
<tr>
<td>Computer Science</td>
<td>12</td>
<td>6.88</td>
<td>1.74</td>
</tr>
<tr>
<td>Economics &amp; Business</td>
<td>131</td>
<td>112.65</td>
<td>1.16</td>
</tr>
<tr>
<td>Engineering</td>
<td>323</td>
<td>199.94</td>
<td>1.62</td>
</tr>
<tr>
<td>Environment/Ecology</td>
<td>4,573</td>
<td>3,022.58</td>
<td>1.51</td>
</tr>
<tr>
<td>Geosciences</td>
<td>1,838</td>
<td>1,104.98</td>
<td>1.66</td>
</tr>
<tr>
<td>Immunology</td>
<td>151</td>
<td>257.55</td>
<td>0.59</td>
</tr>
<tr>
<td>Materials Science</td>
<td>4</td>
<td>2.68</td>
<td>1.49</td>
</tr>
<tr>
<td>Mathematics</td>
<td>10</td>
<td>5.54</td>
<td>1.80</td>
</tr>
<tr>
<td>Microbiology</td>
<td>864</td>
<td>608.03</td>
<td>1.42</td>
</tr>
<tr>
<td>Molecular Biology &amp; Genetics</td>
<td>328</td>
<td>459.47</td>
<td>0.71</td>
</tr>
<tr>
<td>Multidisciplinary</td>
<td>1,415</td>
<td>116.60</td>
<td>12.14</td>
</tr>
<tr>
<td>Neuroscience &amp; Behavior</td>
<td>25</td>
<td>67.82</td>
<td>0.37</td>
</tr>
<tr>
<td>Pharmacology &amp; Toxicology</td>
<td>394</td>
<td>414.40</td>
<td>0.95</td>
</tr>
<tr>
<td>Physics</td>
<td>108</td>
<td>121.94</td>
<td>0.88</td>
</tr>
<tr>
<td>Plant &amp; Animal Science</td>
<td>2,343</td>
<td>1,142.08</td>
<td>2.05</td>
</tr>
<tr>
<td>Psychiatry/Psychology</td>
<td>16</td>
<td>50.96</td>
<td>0.31</td>
</tr>
<tr>
<td>Social Sciences, General</td>
<td>182</td>
<td>174.05</td>
<td>1.04</td>
</tr>
</tbody>
</table>
### Bibliometric Analysis of 1995-1996 EPA Fellows' Journal Articles

**Table 1. ESI Field Cites and Expected Cite Rate**

<table>
<thead>
<tr>
<th>ESI Field</th>
<th>Total Cites</th>
<th>Expected Cite Rate</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Space Science</td>
<td>1</td>
<td>10.40</td>
<td>0.10</td>
</tr>
<tr>
<td>TOTAL</td>
<td>16,280</td>
<td>10,479.32</td>
<td>1.55</td>
</tr>
</tbody>
</table>

**JCR Benchmarks**

*Impact Factor.* The *JCR* Impact Factor is a well known metric in citation analysis. It is a measure of the frequency with which the “average article” in a journal has been cited in a particular year. The Impact Factor helps evaluate a journal’s relative importance, especially when compared to others in the same field. The Impact Factor is calculated by dividing the number of citations in the current year to articles published in the 2 previous years by the total number of articles published in the 2 previous years.

Table 15 indicates the number of fellows’ papers published in the top 10% of journals, based on the *JCR* Impact Factor. Four hundred seventy-seven (477) of 1,257 papers were published in the top 10% of journals, representing 37.95% of the fellows’ papers. This indicates that more than one-third of the fellows’ papers are published in the highest quality journals as determined by the *JCR* Impact Factor, which is 3.8 times higher than the expected percentage.

**Table 15. Fellows’ Papers in Top 10% of Journals by JCR Impact Factor**

<table>
<thead>
<tr>
<th>Fellows’ Papers in that Journal</th>
<th>Journal</th>
<th>Impact Factor (IF)</th>
<th>JCR IF Rank</th>
</tr>
</thead>
<tbody>
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Table 16 indicates the number of fellows’ papers published in the top 10% of journals, based on the JCR Immediacy Index. Four hundred nineteen (419) of the 1,257 papers appear in the top 10% of journals, representing 33.33% of the fellows’ papers. This indicates that one-third of the fellows’ papers are published in the highest quality journals as determined by the JCR Immediacy Index, which is 3.3 times higher than the expected percentage.

Table 16. Fellows’ Papers in Top 10% of Journals by JCR Immediacy Index

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**Bibliometric Analysis of 1995-1996 EPA Fellows' Journal Articles**

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### Bibliometric Analysis of 1995-1996 EPA Fellows' Journal Articles

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### Hot Papers

*ESI* establishes citation thresholds for hot papers, which are selected from the highly cited papers in different fields, but the time frame for citing and cited papers is much shorter—papers must be cited within 2 years of publication and the citations must occur in a 2-month time period. Papers are assigned to 2-month periods and thresholds are set for each period and field to select 0.1% of papers. There were no hot papers identified for the current 2-month period (i.e., March-April 2007), but there were a number of hot papers identified from previous periods.

Using the hot paper thresholds established by *ESI* as a benchmark, 20 hot papers, representing 1.59% of the fellows’ papers, were identified in five fields—Agricultural Sciences, Engineering, Environment/Ecology, Geosciences, and Plant & Animal Science. The number of fellows’ hot papers is 16 times higher than expected. The hot papers are listed in Table 17.

#### Table 17. Hot Papers Identified Using *ESI* Thresholds

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### Author Self-Citation

Self-citations are journal article references to articles from that same author (i.e., the first author). Because higher author self-citation rates can inflate the number of citations, the author self-citation rate was calculated for the fellows’ papers. Of the 16,280 total cites, 844 are author self-cites—a 5.18% author self-citation rate. Garfield and Sher\(^3\) found that authors working in research-based disciplines tend to cite themselves on the average of 20% of the time. MacRoberts and MacRoberts\(^4\) claim that approximately 10% to 30% of all the citations listed fall into the category of author self-citation. Kovacic and Misak\(^5\) recently reported a 20% author self-citation rate for medical literature. Therefore, the 5.18% self-cite rate for the fellows’ papers is well below the range for author self-citation.

### Highly Cited Researchers

A search of Thomson’s *ISIHighlyCited.com* revealed that none of the former fellows are highly cited researchers, which is to be expected because most of these individuals began their careers in the late 1990s. *ISIHighlyCited.com* is a database of the world’s most influential researchers who have made key contributions to science and technology during the period from 1981 to 1999.

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Patents

There were 13 patents issued to and 31 patent applications filed by EPA 1995-1996 fellows. Ten (76.90%) of the 13 patents have been referenced by 22 other patents. These patents and patent applications, along with the patents that reference them, are listed in Table 18.


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<td>6,951,598 Flugge, LA</td>
<td>Branham KD</td>
<td>Hydrophobically modified cationic acrylate copolymer/polysiloxane blends and use in tissue</td>
<td>10/4/05 Referenced by 1 patent: (1) 7,101,460 Soft paper product including beneficial agents</td>
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<td>5,951,875 Kanel, JS</td>
<td>Guelcher SA</td>
<td>Adsorptive bubble separation methods and systems for dewatering suspensions of microalgae and extracting components therefrom</td>
<td>9/14/99 Referenced by 1 patent: (1) 6,524,486 Microalgae separator apparatus and method</td>
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<td>Method for rupturing microalgae cells</td>
<td>12/14/99 Referenced by 3 patents: (1) 7,081,567 Transgenic Dunaliella salina as a bioreactor (2) 7,056,723 Method for the recovery and purification of poxviruses from infected cells (3) 6,337,020 Method and device for purifying waste water comprising an additional sludge treatment by ozonation</td>
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<td>Method for dewatering microalgae with a bubble column</td>
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<td>7/7/98 Referenced by 1 patent: (1) 6,936,459 Medium for the production of betacarotene and other carotenoids from Dunaliella salina (ARL 5) and a strain of Dunaliella salina for production of carotenenes using the novel media</td>
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<td>Application No. 2004/0084162</td>
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### Bibliometric Analysis of 1995-1996 EPA Fellows' Journal Articles

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<td>Adkins RL, Guelcher S</td>
<td>Novel unsaturated macromers for preformed stabilizers and polymer polyols</td>
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<td>Beckman EJ, Hollinger JO, Doll BA, Guelcher SA, Zhang J</td>
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<td>Application No. 2006/0057027</td>
<td>Hudak AT, Tierney DM, Wang DD, Grenz RL, Rohrdanz RR, Alejandro KC, Galloway RK</td>
<td>Fluid collection and testing device</td>
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<td>Method for burn-in testing</td>
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**Papers Not Verified**

Seven papers cited in this analysis as either a highly cited paper or hot paper (see Tables 19 and 20) have not yet been verified as a publication of the EPA fellow (i.e., the fellow has not replied to the inquiry asking if the publication is correctly attributed to the former EPA fellow).
### Table 19. Highly Cited Fellows’ Papers That Have Not Yet Been Verified

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### Table 20. Hot Papers That Have Not Been Verified

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<td>Interaction of environmental chemicals with the estrogen and progesterone receptors from the oviduct of the American alligator. <em>Environmental Health Perspectives</em> 1996;104(12):1318-1322.</td>
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* This paper was both highly cited and hot.