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***LETTER TO THE EDITOR***

## COMMENTS ON TWO BIBLIOMETRIC PAPERS

The article by Mubeen [1] is a good study on citation analysis in as much it is based on a good sample 3659 citations from 418 journals that figured in 22 Ph D theses on chemistry and the data has been analysed from a number of angles. However, the article contains a few inaccuracies which are described below.

In table 2, the heading 'Journals', should have been 'Journal Articles'.

The author contends that the data in her article follows Bradford's law as the 418 journals can be grouped as

| | | |
|---|---|---|
| 5 x 1 | = | 5 |
| 5 x 8.6 | = | 43 |
| 5 x 8.6 x 8.6 | = | 370 |

which satisfies one of the conditions of Bradford's law, i.e. $1: \alpha: \alpha^2$.

The number of journals found in this study or any other cito-analytical study can be grouped in numerous ways that will satisfy the condition $1: \alpha: \alpha^2$. Surely, satisfying of this condition alone does not prove that the data follows Bradford's Law.

The number of journals in a Bradford distribution can be expressed mathematically as $a + ax + ax^2 = n$, where n stands for the total number of journals. We can write it in the form of a quadratic equation as $ax^2 + ax + a - n = 0$. With any value of a and n as positive integers, where $n \geq 3$, we can have numerous values of x that will satisfy the equation.

Let us take 418 as the number of journals that has figured in Mubeen's study.

Now: $ax^2 + ax + a - 418 = 0$ .................... (1)

Taking the value of starting from 1 to 139, we can have as many values of x that will satisfy the ratio $1: \alpha: \alpha^2$. For the purpose of demonstration we are taking about a dozen values.

Table 1

*Distribution of journals in three zones with various values of equation (1)*

| Value of a | Value of x | Ratio of journals $1: \alpha: \alpha^2$ | Journals in zone I | Journals in zone II | Journals in zone III | Total No. of journals |
|---|---|---|---|---|---|---|
| 1. | 19.9 | $1:1x19.9:1x19.9^2$ | 1 | 20 | 396 | 417 |
| 2. | 13.9 | $2:2x13.9:2x13.9^2$ | 2 | 28 | 386 | 416 |
| 3. | 11.3 | $3:3x11.3:3x11.3^2$ | 3 | 34 | 383 | 420 |
| 4. | 9.7 | $4:4x9.7:4x9.7^2$ | 4 | 39 | 376 | 419 |
| 5. | 8.6 | $5:5x8.6:5x8.6^2$ | 5 | 43 | 370 | 418 |

contd.

Table 1 (contd.)

| Value of a | Value of x | Ratio of journals 1: $\alpha$: $\alpha^2$ | Journals in zone I | Journals in zone II | Journals in zone III | Total No. of journals |
|---|---|---|---|---|---|---|
| 6. | 7.8 | 6:6x7.8:6x7.8$^2$ | 6 | 47 | 365 | 418 |
| 7. | 7.2 | 7:7x7.2:7x7.2$^2$ | 7 | 50 | 363 | 420 |
| 8. | 6.7 | 8:8x6.7:8x6.7$^2$ | 8 | 54 | 359 | 421 |
| 9. | 6.3 | 9:9x6.3:9x6.3$^2$ | 9 | 57 | 357 | 423 |
| 10 | 5.9 | 10:10x5.9:10x5.9$^2$ | 10 | 59 | 348 | 417 |
| 50 | 2.26 | 50:2.26x50:2.26$^2$x50 | 50 | 113 | 255 | 418 |
| 100 | 1.35 | 100:100x1.35: 100x1.35$^2$ | 100 | 135 | 182 | 417 |
| 139 | 1 | 139:139x1:139x1$^2$ | 139 | 139 | 139 | 417 |

Whether or not, a particular set of data follows Bradford's law demands satisfaction of two conditions–(i) the number of citations in each zone should be approximately equal and (ii) the number of periodicals in the three zones should be in the ratio 1: $\alpha$: $\alpha^2$. In the article by Mete and Deshmukh [2] the number of citations in the three consecutive zones are 346, 348, and 342 and the number of periodicals 6,25, and 101 which almost accurately follows the ratio 1: a: a$^2$ as 6: 6x4: 6x4 $^2$. We can say that the data set of Mete and Deshmukh's article follows Bradford's law. In Mubeen's article the number of citations in three consecutive zones are 1159, 1407, and 1093 which are far from being equal, and, therefore, does not satisfy Bradford's law.

Now, let us see, how the situation changes with the change in multiplier.

Table 2

*Distribution of citations in different zones with different multipliers*

| Multiplier | Journals in three zones | | | Citations in zone I | Citations in zone II | Citations in zone III | Total citations |
|---|---|---|---|---|---|---|---|
| 5 | 5 | 43 | 370 | 1159 | 1407 | 1093 | 3659 |
| 6 | 6 | 47 | 375 | 1245 | 1412 | 1002 | 3659 |
| 7 | 7 | 50 | 363 | 1327 | 1378 | 954 | 3659 |

Table 2 shows that the vast difference between the number of periodicals in the first and second zone with multipliers 5 and 6 reduces greatly with the multiplier 7. The number of citations in the third zone is found to be substantially less compared to the first two zones in all the three cases which happens in many cases leading to the droop in the curve [3]. Hence, we see that the data set of Mubeen follows Bradford's law with the multiplier 7.

Both the articles have provided rank list of journals (vide Table 5 in Mubeen's article, and Table 3 in Mete and Deshmukh's article) where the ranking of the journal has been done wrongly. Whenever more than one item occupies the same rank, the number of items gets added to decide the next rank. For example, if three periodicals occupy the same rank, say, 12th, then the periodical coming next will have the 15th rank. Brookes [4] has shown that the ranking of a journal in a Bradford distribution follows the equation

$$R(n) = k \log_e n \qquad (2)$$

where $R(n)$ = cumulative total of citations contributed by the sources ranking from 1 to n,
$n$ = rank of the journal, and
$k$ = a constant

The value of k can be computed taking the rank of any particular journal and the corresponding cumulative number of citations. In Mete and Deshmukh's paper [2], the correct rank of Library Trends is 26 (wrongly ranked as 19th in the paper) and the corresponding cumulative number of citations is 655. Now, putting these values in the equation (2), we get

$$R(26) = k \log_e 26$$
$$655 = k.3.259$$
Therefore, $k = 200.982$

With this value of k, we get the cumulative total of citation of the last periodical listed in the Table, i.e. Japan Economic Report (rank 63), as 832.8 which almost exactly fits into the observed value of 832. The ranking as given in the two tables will never satisfy the equation.

## REFERENCES

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4. BROOKES (B C). The derivation and application of the Bradford-Ziff distribution. *Journal of Documentation.* 1968; 24, 4; 247-265.

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