

WOLFGANG GLÄNZEL & RONALD ROUSSEAU: Erdős Distance and General Collaboration Distance

For those among you who are not particularly acquainted with mathematics we recall that Paul Erdős (Pál Erdős in Hungarian) is the most proficient mathematician ever. His publication list contains more than 1500 items, which is more than Euler's. Erdős was born in Budapest in 1913 and died in Warsaw in 1996. Because he had more than 500 collaborators mathematicians started counting the Erdős distance (E-distance for short), defined as the length of the shortest collaborator link to Erdős. Erdős himself has E-distance zero; those mathematicians that have at least one article published in collaboration with Erdős have E-distance 1; those that collaborated with a collaborator of Erdős have E-distance 2 and so on.

Clearly if one's E-distance is 4 or more it becomes difficult to find out the exact value. Luckily, since the end of last year MathSciNet has a special feature allowing one to find out immediately. Actually much more is possible as one can find out the shortest collaboration distance between any two mathematicians who have at least one article in MathSciNet. One can reach this feature by doing an author search and then clicking the "MR CD" button. Of course, it is possible that there is no collaboration link between the two scientists.

Out of curiosity we introduced the names of a number of informetricians or well-known scientists in our field (such as Benoit Mandelbrot and Herbert Simon). Remember that a prerequisite is that this colleague must have been active as a mathematician. We introduced the following names: A.L. Barabasi, J. Bar-Ilan, A. Bookstein, O.L. Burrell, C.H.O. Ding, L. Egghe, H. Eto, W. Glänzel, S.D. Haitun, F.F. Leimkuhler, B.B. Mandelbrot, M.E.J. Newman, D. de Solla Price, R. Rousseau, A. Schubert, H. S. Sichel, H.A. Simon, M. Thelwall, and A.I. Yablonsky. All these scientists are present in the MathSci database. Yet some of them have no collaborators, or just one who in turn had no collaborators: these are Eto, Haitun, Price, Sichel and Thelwall. Consequently they have no Erdős number within mathematics. Of course, going out of the field of mathematics might give them an Erdős number. For example: as Mike Thelwall has a joint article with Ronald Rousseau, his Erdős number is at most four.

Results are presented in the following Table. Shortest paths passing via Erdős are shown in bold. E-distances are shown in square brackets after the name of the scientist.

Table 1 "Pseudo-Erdős distances" among informetricians

	BAL	BJ	BA	BO	DC	EL	GW	LF	MB	NM	RR	SA	SH	YA
Barabasi, AL [4]	0	5	7	7	6	6	2	7	2	5	6	1	6	6
Bar-Ilan, J [3]	5	0	5	7	6	6	5	7	5	5	6	5	5	6
Bookstein, A [3]	7	5	0	7	7	6	6	9	6	6	6	6	7	7
Burrell, OL [5]	7	7	7	0	7	6	7	8	6	6	7	7	7	7
Ding, CHO [4]	6	6	7	7	0	5	6	8	6	5	4	6	6	7
Egghe, L [4]	6	6	6	6	5	0	6	8	5	6	1	6	6	7
Glänzel, W [3]	2	5	6	7	6	6	0	8	3	5	6	1	6	6
Leimkuhler, FF [6]	7	7	9	8	8	8	8	0	6	8	7	8	8	8
Mandelbrot, BB [3]	2	5	6	6	6	5	3	6	0	4	6	2	4	6
Newman, MEJ [3]	5	5	6	6	5	6	5	8	4	0	5	5	6	7
Rousseau, R [3]	6	6	6	7	4	1	6	7	6	5	0	6	7	7
Schubert, A [3]	1	5	6	7	6	6	1	8	2	5	6	0	6	7
Simon, HA [4]	6	5	7	7	6	6	6	8	4	6	7	6	0	5
Yablonsky, AI [4]	6	6	7	7	7	7	6	8	6	7	7	7	5	0

Note that this table is of course symmetric. Recall that it is said that just six steps separate us from any other person on the planet (for an acquaintances network). Clearly for this subset of informetricians-mathematicians shortest collaboration distances range from 1 to 9.

The following Figure finally visualizes the pseudo-Erdős distances in a two-dimensional projection of our informetric network. Distances

Mandelbrot has the shortest average distance to other authors in the group (<5), Leimkuhler the longest (finite) one (>7). The average distance among all authors of in the group is about 6. This again substantiates the small world property since we have to keep in mind that all distances are established through the authors' mathematical work alone. Paths connecting authors might otherwise become essentially

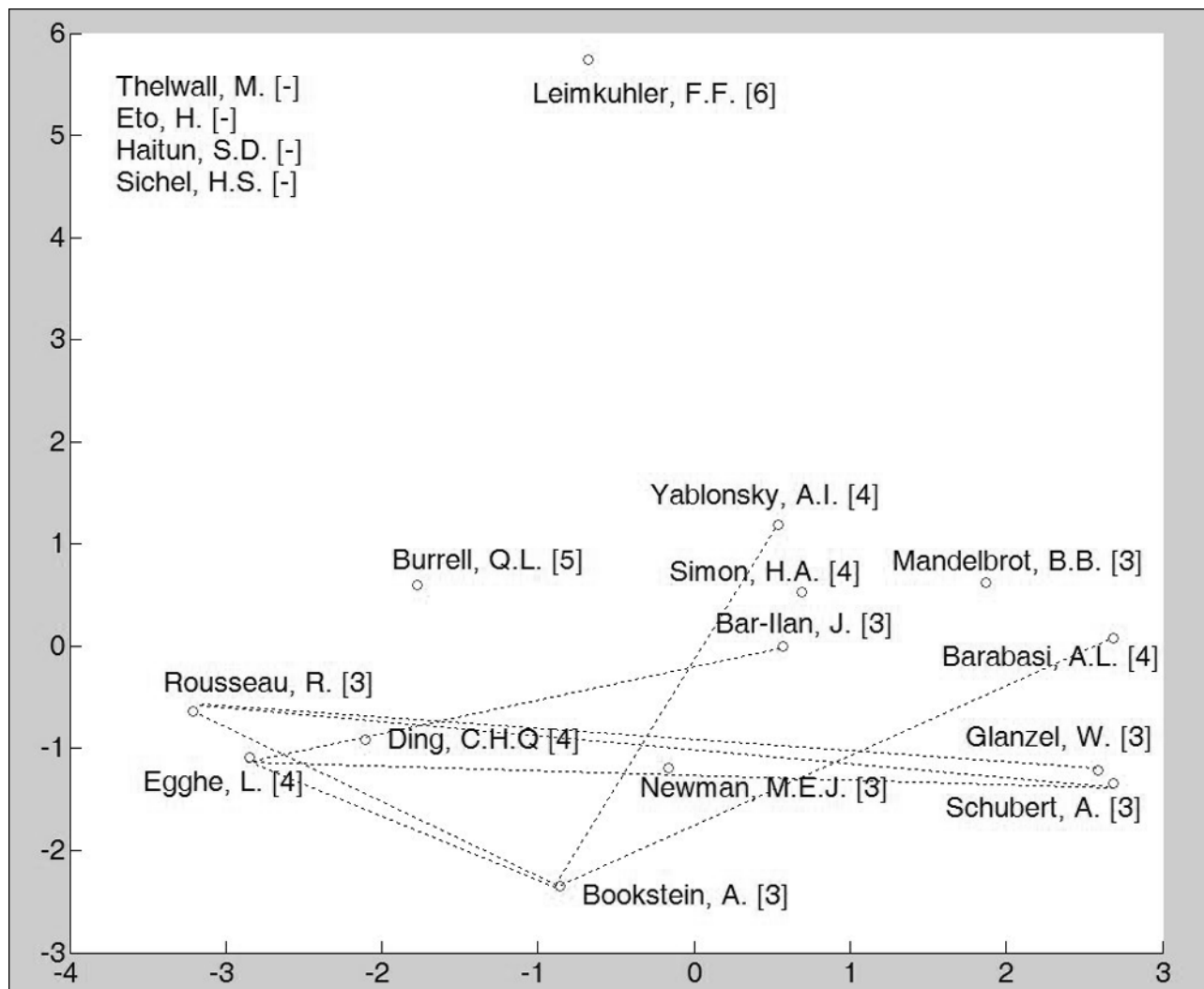


Figure 1 Graphic presentation of the network of informetricians established through their mathematical work

therefore do not proportionally show the length of the above paths. The group consisting of Thelwall, Eto, Haitun and Sichel is symbolically separated from all other authors of the group since their distance to all authors is infinite. Also Derek de Solla Price belongs to this group of isolates. Authors connected by dotted lines have the shortest link with each other via Erdős. Leimkuhler and Bookstein, on one hand, and Rousseau/Egghe and Schubert/Glänzel/Barabási, on the other hand, form diametrically opposite authors.

shorter if all publications are taking into account as this piece co-authored by Rousseau and Glänzel illustrates.

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■ References

<http://www-history.mcs.st-and.ac.uk/history/Mathematicians/Erdos.html>