Tutorial

5

# CiteSpace: Visualizing and Analyzing the Structure and Dynamics of Scientific Fields

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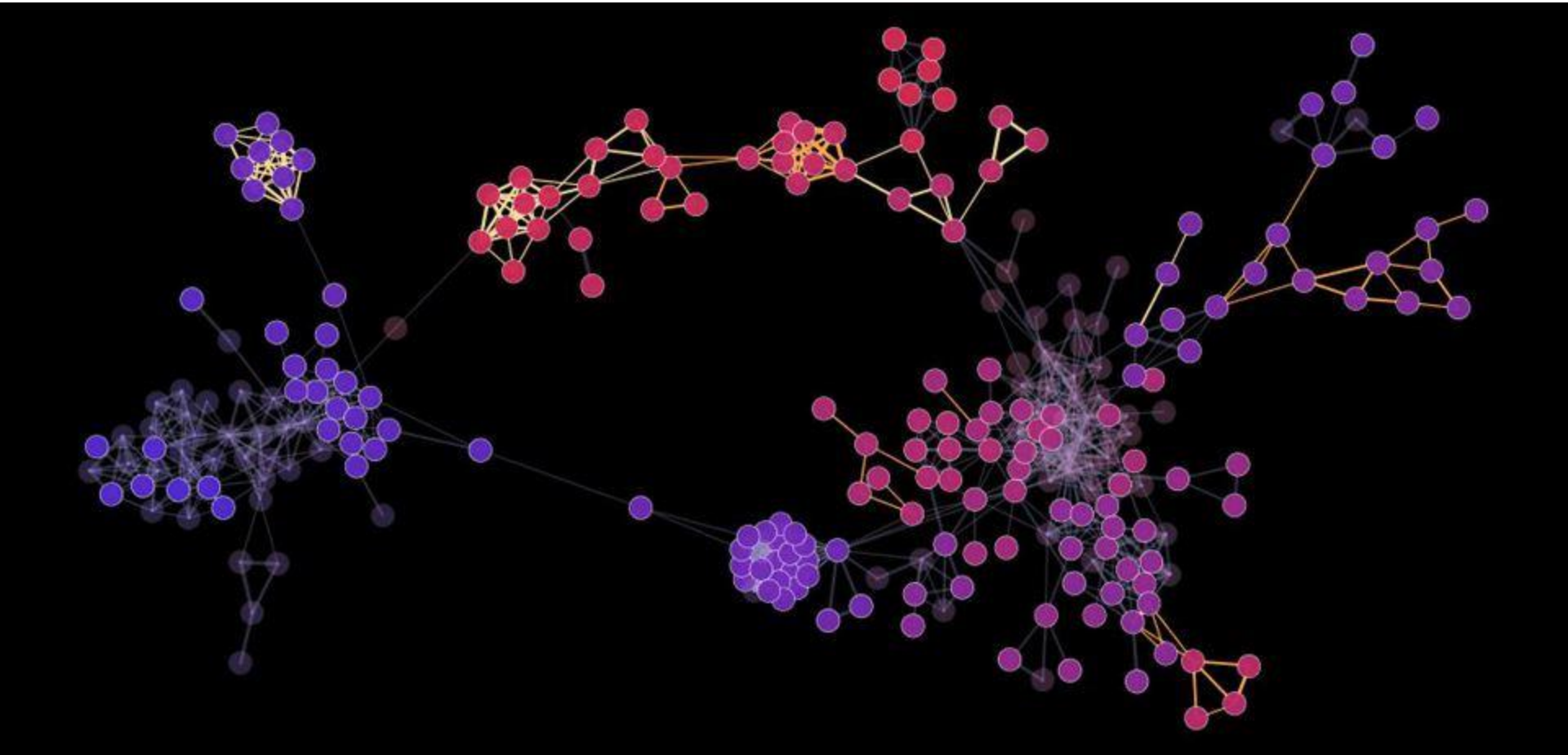
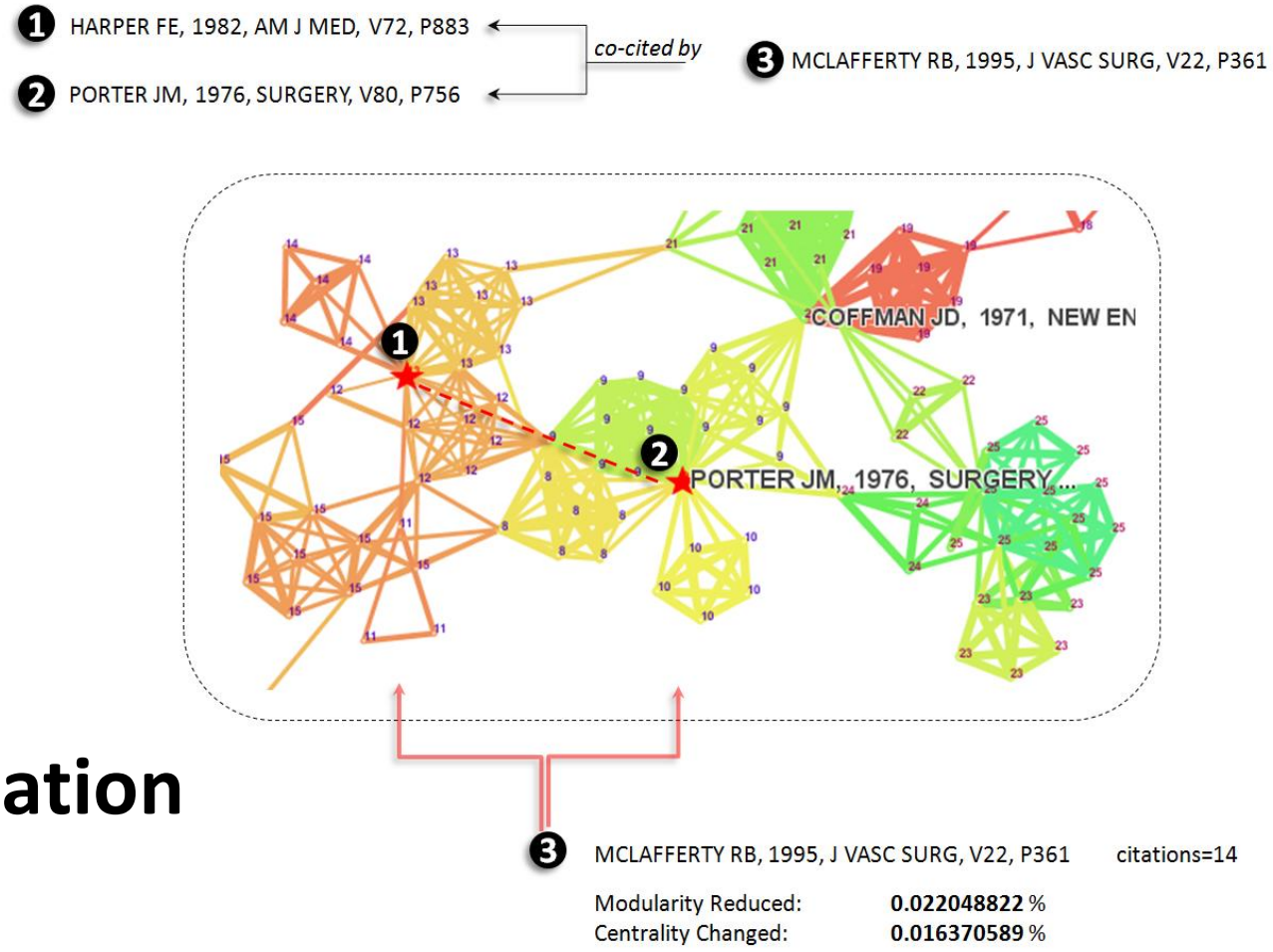


# Measuring Creativity

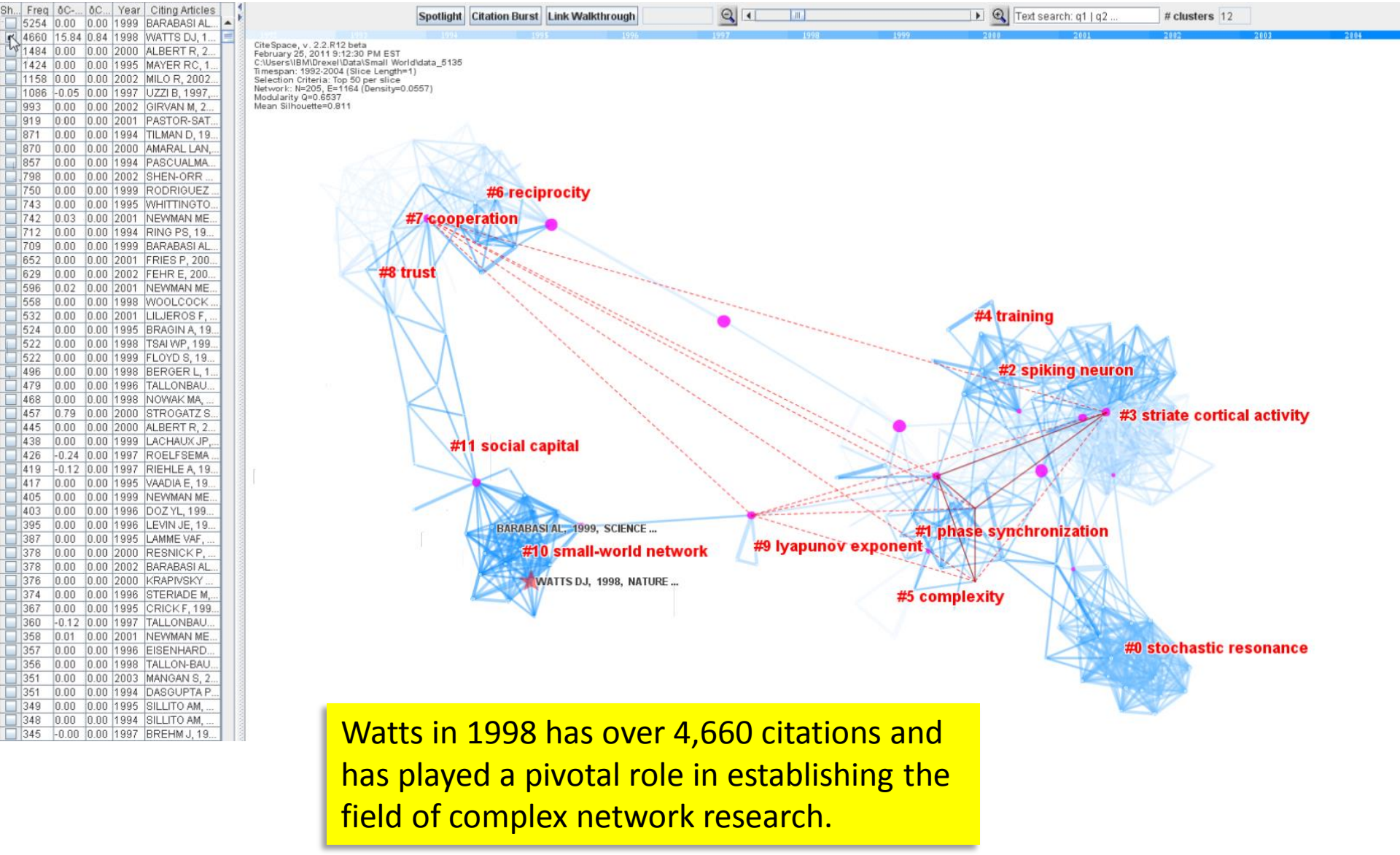
Identifying Potentially Transformative Work




# Structural Variation

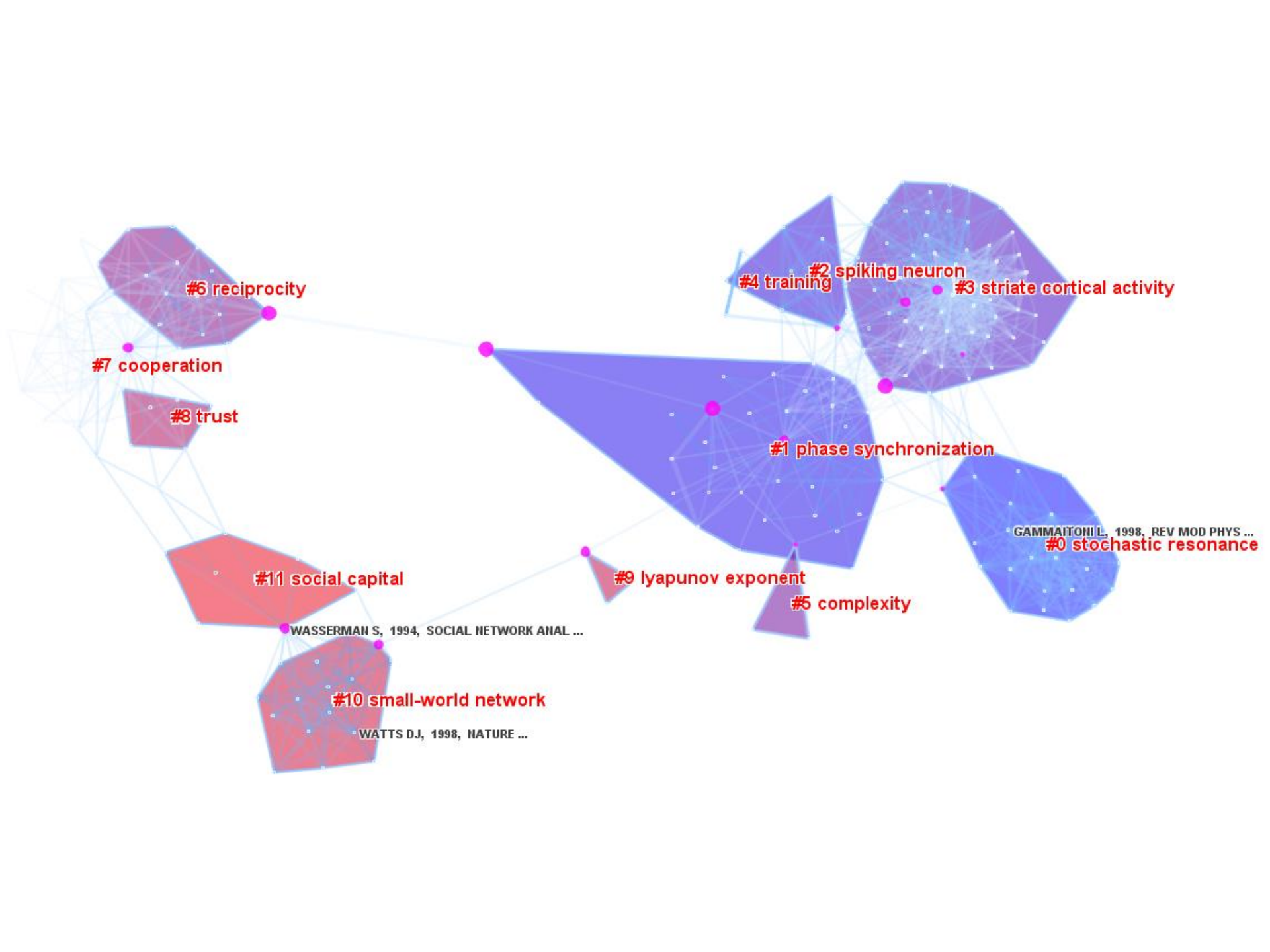
- Modularity
- Inter-Cluster Brokerage
- Centrality

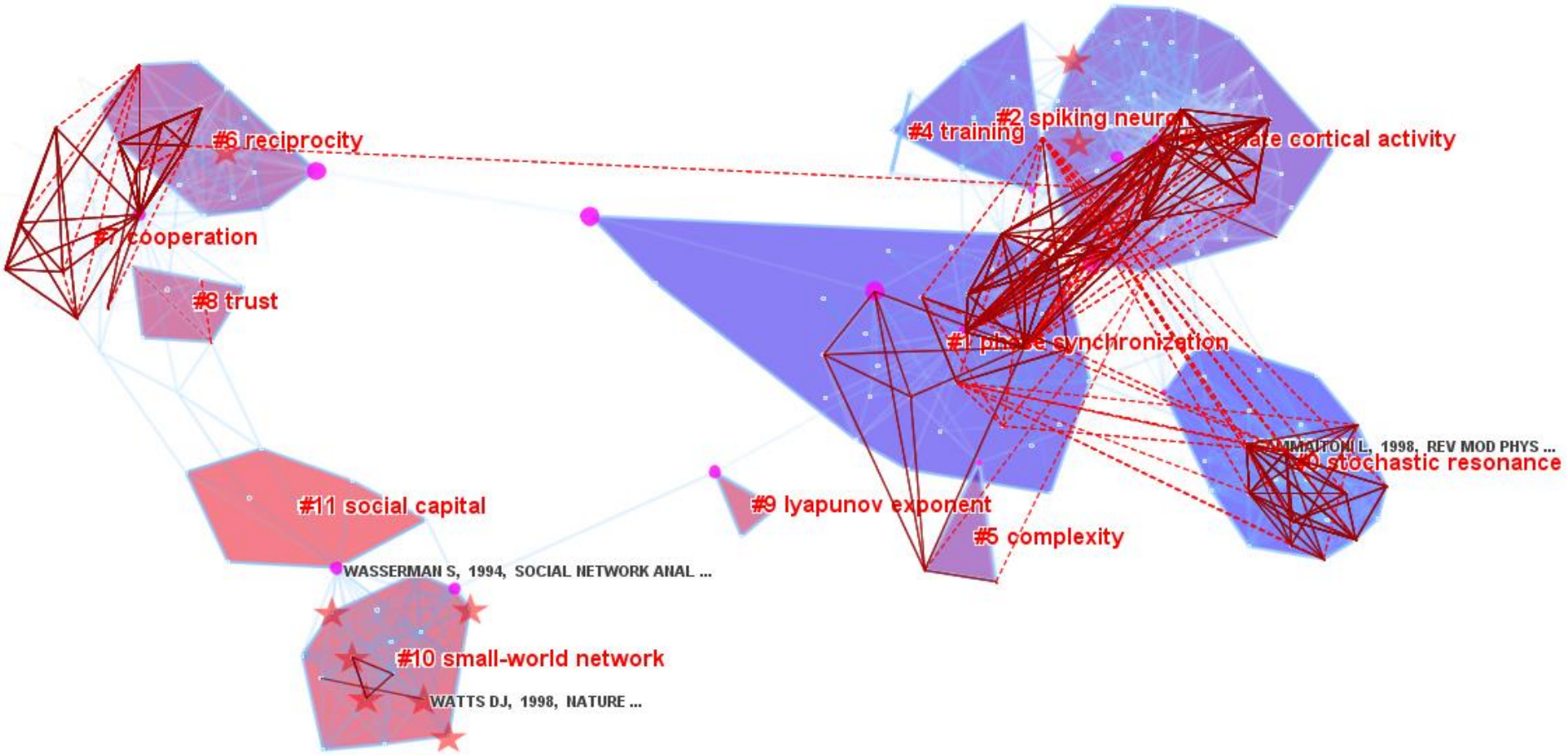
# Small World Networks




| Sh... | Freq | δC-... | δC... | Year | Citing Articles |
|---|---|---|---|---|---|
| | 5254 | 0.00 | 0.00 | 1999 | BARABASI AL... |
| | 4660 | 15.84 | 0.84 | 1998 | WATTS DJ, 1... |
| | 1484 | 0.00 | 0.00 | 2000 | ALBERT R, 2... |
| | 1424 | 0.00 | 0.00 | 1995 | MAYER RC, 1... |
| | 1158 | 0.00 | 0.00 | 2002 | MILO R, 2002... |
| | 1086 | -0.05 | 0.00 | 1997 | UZZI B, 1997,... |
| | 993 | 0.00 | 0.00 | 2002 | GIRVAN M, 2... |
| | 919 | 0.00 | 0.00 | 2001 | PASTOR-SAT... |
| | 871 | 0.00 | 0.00 | 1994 | TILMAN D, 19... |
| | 870 | 0.00 | 0.00 | 2000 | AMARAL LAN,... |
| | 857 | 0.00 | 0.00 | 1994 | PASCUALMA... |
| | 798 | 0.00 | 0.00 | 2002 | SHEN-ORR ... |
| | 750 | 0.00 | 0.00 | 1999 | RODRIGUEZ... |
| | 743 | 0.00 | 0.00 | 1995 | WHITTINGTO... |
| | 742 | 0.03 | 0.00 | 2001 | NEWMAN ME... |
| | 712 | 0.00 | 0.00 | 1994 | RING PS, 19... |
| | 709 | 0.00 | 0.00 | 1999 | BARABASI AL... |
| | 652 | 0.00 | 0.00 | 2001 | FRIES P, 200... |
| | 629 | 0.00 | 0.00 | 2002 | FEHR E, 200... |
| | 596 | 0.02 | 0.00 | 2001 | NEWMAN ME... |
| | 558 | 0.00 | 0.00 | 1998 | WOOLCOCK ... |
| | 532 | 0.00 | 0.00 | 2001 | LILJEROS F, ... |
| | 524 | 0.00 | 0.00 | 1995 | BRAGIN A, 19... |
| | 522 | 0.00 | 0.00 | 1998 | TSAI WP, 199... |
| | 522 | 0.00 | 0.00 | 1999 | FLOYD S, 19... |
| | 496 | 0.00 | 0.00 | 1998 | BERGER L, 1... |
| | 479 | 0.00 | 0.00 | 1996 | TALLONBAU... |
| | 468 | 0.00 | 0.00 | 1998 | NOWAK MA, ... |
| | 457 | 0.79 | 0.00 | 2000 | STROGATZ S... |
| | 445 | 0.00 | 0.00 | 2000 | ALBERT R, 2... |
| | 438 | 0.00 | 0.00 | 1999 | LACHAUX JP,... |
| | 426 | -0.24 | 0.00 | 1997 | ROELFSEMA ... |
| | 419 | -0.12 | 0.00 | 1997 | RIEHLE A, 19... |
| | 417 | 0.00 | 0.00 | 1995 | VAADIA E, 19... |
| | 405 | 0.00 | 0.00 | 1999 | NEWMAN ME... |
| | 403 | 0.00 | 0.00 | 1996 | DOZ YL, 199... |
| | 395 | 0.00 | 0.00 | 1996 | LEVIN JE, 19... |
| | 387 | 0.00 | 0.00 | 1995 | LAMME VAF, ... |
| | 378 | 0.00 | 0.00 | 2000 | RESNICK P, ... |
| | 378 | 0.00 | 0.00 | 2002 | BARABASI AL... |
| | 376 | 0.00 | 0.00 | 2000 | KRAPIVSKY ... |
| | 374 | 0.00 | 0.00 | 1996 | STERIADE M,... |
| | 367 | 0.00 | 0.00 | 1995 | CRICK F, 199... |
| | 360 | -0.12 | 0.00 | 1997 | TALLONBAU... |
| | 358 | 0.01 | 0.00 | 2001 | NEWMAN ME... |
| | 357 | 0.00 | 0.00 | 1996 | EISENHARD... |
| | 356 | 0.00 | 0.00 | 1998 | TALLON-BAU... |
| | 351 | 0.00 | 0.00 | 2003 | MANGAN S, 2... |
| | 351 | 0.00 | 0.00 | 1994 | DASGUPTA P... |
| | 349 | 0.00 | 0.00 | 1995 | SILLITO AM, ... |
| | 348 | 0.00 | 0.00 | 1994 | SILLITO AM, ... |
| | 345 | -0.00 | 0.00 | 1997 | BREHM J, 19... |

Watts in 1998 has over 4,660 citations and has played a pivotal role in establishing the field of complex network research.


#6 reciprocity
#7 cooperation
#8 trust
#11 social capital
WASSERMAN S, 1994, SOCIAL NETWORK ANAL ...
#10 small-world network
WATTS DJ, 1998, NATURE ...
#4 training
#2 spiking neuron
#3 striate cortical activity
#1 phase synchronization
#9 lyapunov exponent
#5 complexity
GAMMAITONI L, 1998, REV MOD PHYS ...
#0 stochastic resonance

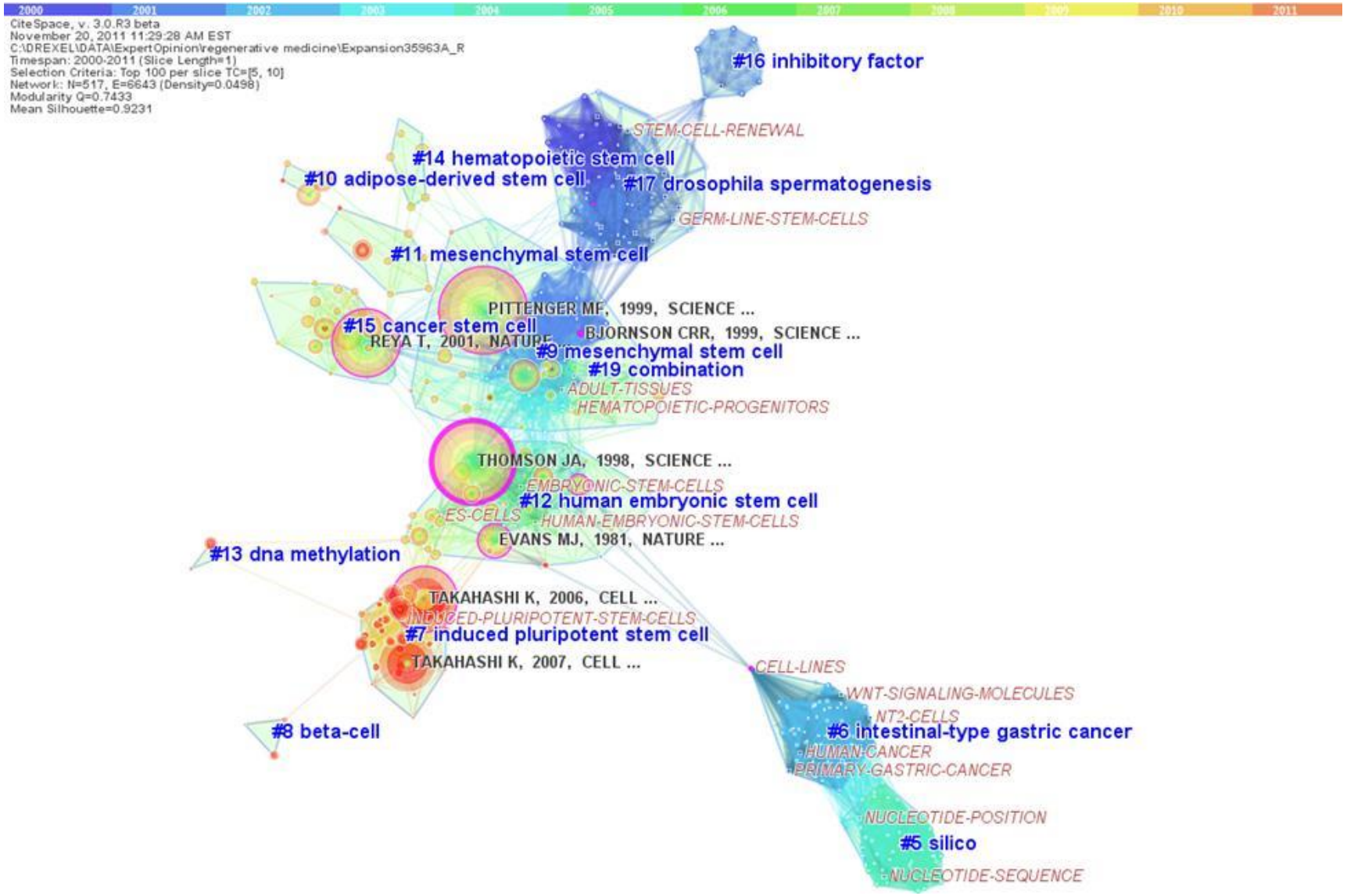



**A network of co-cited references derived from 5,135 articles published on small-world networks between 1990-2010. The network of 205 references and 1,164 co-citation links is divided into 12 clusters with a modularity of 0.6537 and the mean silhouette of 0.811. The red lines are made by the top-15 articles measured by the centrality variation rate.**

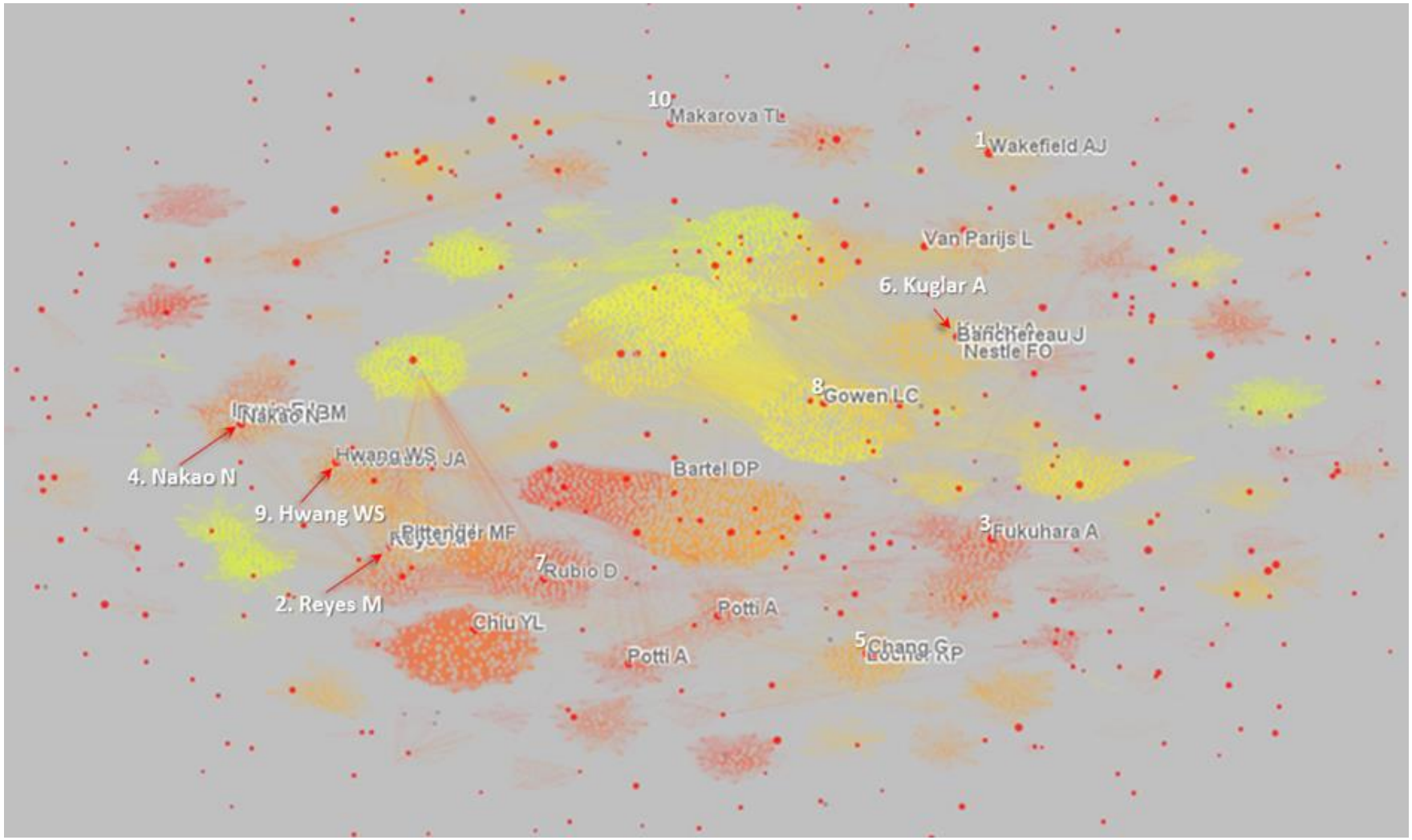
# Complex Network Analysis (1996-2004)

| Global Cites | ZINB | | | | NB | |
|---|---|---|---|---|---|---|
| | Count Model Negbin with log link | | Zero-Inflation Model Binomial with logit link | | | |
| Coauthors | **1.293** | **.000** | 0.062 | .077 | **1.306** | **.000** |
| Modularity Change Rate | **1.080** | **.014** | **0.012** | **.044** | **1.083** | **.025** |
| Weighted Cluster Linkage | **3.103** | **.000** | 1.304 | .906 | **3.160** | **.000** |
| Centrality Divergence | 0.391 | .237 | 385363.6 | .102 | 0.343 | .184 |
| Number of References | **1.013** | **.000** | **0.489** | **.027** | **1.013** | **.000** |
| Number of Pages | **0.970** | **.000** | 1.133 | .120 | **0.970** | **.000** |
| Dispersion Parameter (θ) | 0.536 | | | | 0.528 | |
| AIC | 31,768 | | | | 31,787 | |
| Vuong Test (ZINB >NB) | -2.7186, p-value=**0.0033** | | | | | |

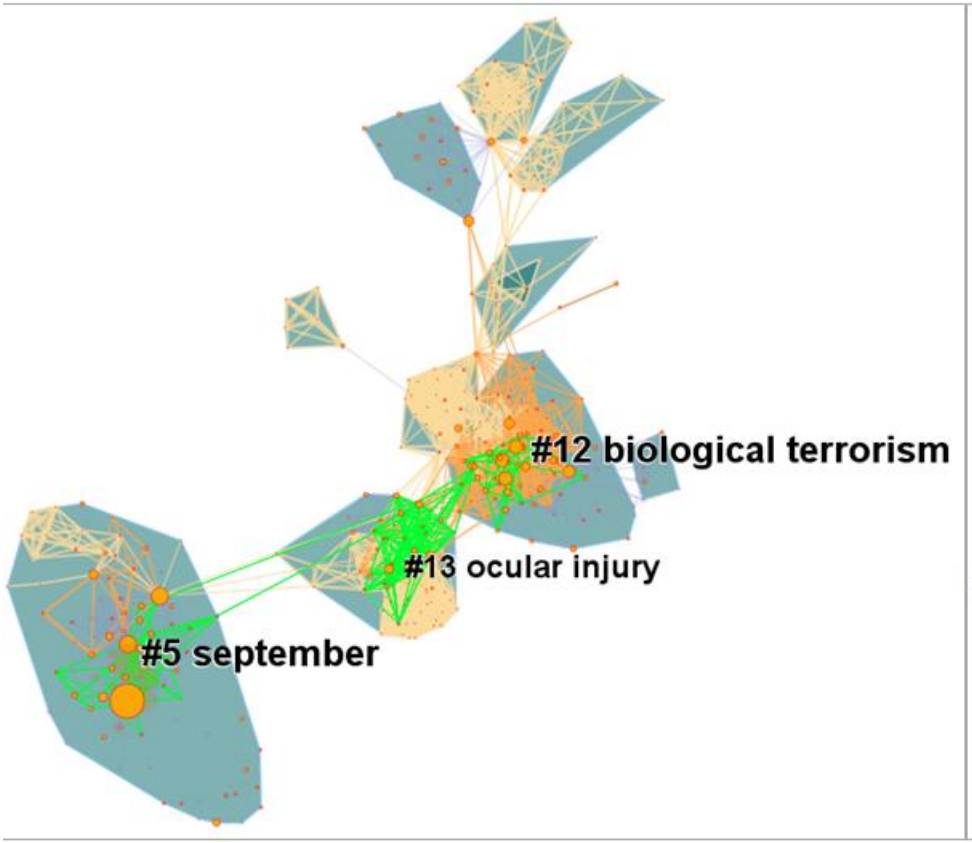
Chen, C., Hu, Z., Liu, S., Tseng, H. (2012) Emerging trends in regenerative medicine: A scientometric analysis in CiteSpace. Expert Opinions on Biological Therapy, 12(5), 593-608.

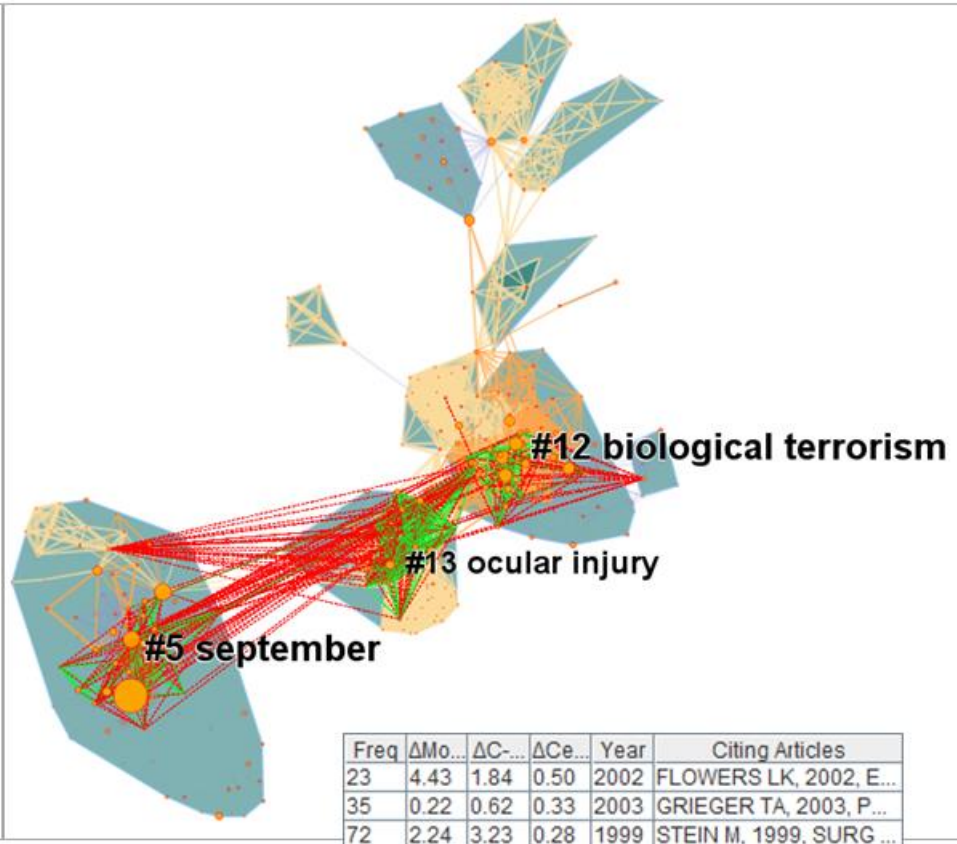


Chen, C., Hu, Z., Milbank, J., Schultz, T. (2013) A visual analytic study of retracted articles in scientific literature. Journal of the American Society for Information Science and Technology, 64(2), 234-253. DOI: 10.1002/asi.22755



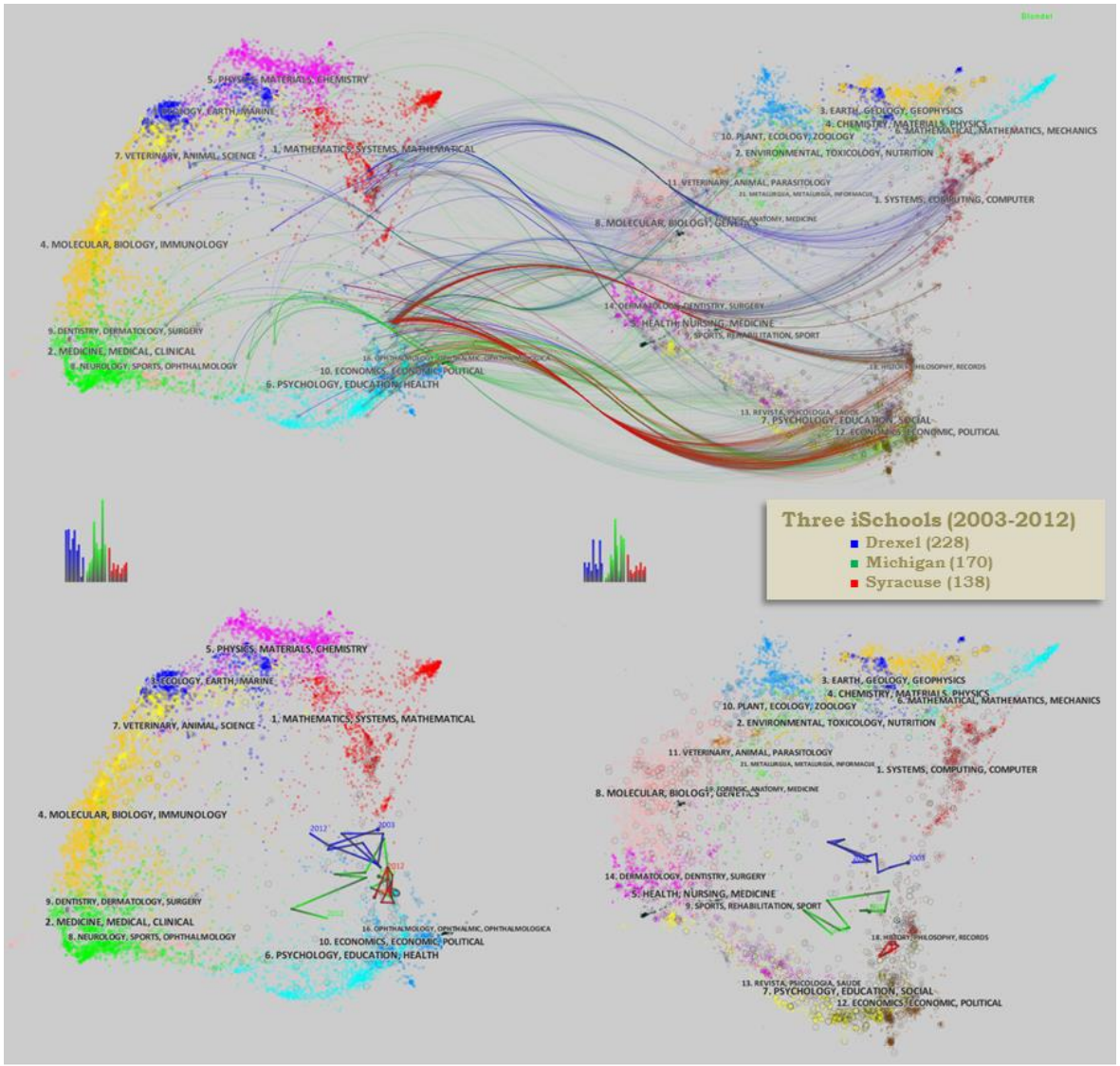
Chen, C. (2012) Predictive effects of structural variation on citation counts. Journal of the American Society for Information Science and Technology, 63(3), 431-449.




| Freq | ΔMo... | ΔC-... | ΔCe... | Year | Citing Articles |
|---|---|---|---|---|---|
| 23 | 4.43 | 1.84 | 0.50 | 2002 | FLOWERS LK, 2002, E... |
| 35 | 0.22 | 0.62 | 0.33 | 2003 | GRIEGER TA, 2003, P... |
| 72 | 2.24 | 3.23 | 0.28 | 1999 | STEIN M, 1999, SURG ... |
| 80 | 0.63 | 4.14 | 0.27 | 2002 | AHERN J, 2002, PSYC... |
| 23 | -0.20 | 1.45 | 0.26 | 2003 | FORD CA, 2003, ARCH... |

Chen, C., Leydesdorff, L. (In Press) Patterns of connections and movements in dual-map overlays: A new method of publication portfolio analysis. Journal of the American Society for Information Science and Technology.



# Questions and Discussions