

## The Emergence of an Asian Research Area

by [Philip S Cho](#)

Scientific collaboration has emerged as a key dimension for constructing the meta-geography of Asia. More than just physical topography, Asia has always been a conceptual framework whose imagined boundaries shift along with changing discourses on politics, economics, race, and culture. In the early 20<sup>th</sup> century, pan-Asian regionalism was a shared political identity against Western domination, uniting humanist intellectuals from China, Japan, and Korea with those as far as India, the Philippines and even Cuba. By the end of the Cold War, rapidly developing tiger economies defined an exceptionalist Asia through greater economic regionalization, integration, and interdependence, embodied by pan-Asian organizational bodies such as APEC. At present, a pressing issue is whether scientific and technological collaboration is redefining Asia as an emerging research area that may one day parallel the European Research Area.

A team of computer and social scientists at NUS recently published a series of three complementary papers to develop new data mining tools and analytical metrics to study the contemporary integration of inter-Asian science and technology networks. Their findings empirically show increasing regional integration through scientific collaboration and Singapore's key role as a catalyst. Metric analysis further reveals that this process of regional integration through collaborative scientific networks has been driven by what the NUS team has coined as *research facilitation* - indirect, or mediated third-party introductions leading to triadic closures among co-authorship networks.

Data was gathered through a novel software pipeline that extracted and matched author and institutional affiliation information from the PDFs of scientific papers<sup>1</sup>. This involved first identifying authors and affiliations using a conditional random field and connecting authors to their affiliations using a support vector machine. The software was then benchmarked in three separate experiments drawn from different sources such as the ACL Anthology, the ACM Digital Library, and a set of cross-disciplinary scientific journal articles acquired by querying Google Scholar.

The NUS team then introduced a series of research facilitation or RF-Metrics to quantitatively measure the evolution of inter-Asian co-authorship networks over time, at the levels of individual authors, proximate groups, or recursive chains of introductions leading to new ones<sup>2</sup>. Analysis of transitive triads of individual authors provides better resolution for studying how social networks of scientists dynamically evolve, compared to ratios of publication output by country dyads. As a case study, RF-Metrics were applied to analyze the development of the Human Genome Organization's Pan Asian

SNP Consortium (PASNP). Headquartered at the Genome Institute of Singapore, the PASNP was the first inter-Asian genomics consortium of 40 institutions in 11 Asian countries studying both the genetic diversity and unity of Asian populations as a single rather than the dual migratory wave.

Over the period of collaboration from 2004 to 2011, 4,261 PASNP researchers formed an increasingly dense network of newly formed connections through co-authored publications. However, the majority of collaborations within the consortium were among researchers in the same country.

Research facilitation played different roles depending on the professional status of researchers and whether they came from countries having established or developing scientific infrastructure. Principal investigators ranked highly as research facilitators, but did not necessarily mediate connections that led to new collaborations over time. Middle-level leaders of close-knit research groups who collaborated frequently also ranked highly and facilitated connections that led to successive chains of new first-time relationships over several years. For example, the top research facilitator, who was the director of an institution, mediated 2.4 times more first-time collaborations than the 14<sup>th</sup> ranked researcher, who headed a small lab group. However, nearly 80% of the new collaborations facilitated by the lab group leader in turn generated successive branches of newly facilitated collaborations, which led to greater integration of a larger network.

Consortium members in different countries also showed distinct patterns of research facilitation. Researchers in developed countries such as Japan had a consistently high rate of publication, but ranked low as research facilitators. In contrast, researchers in emerging countries such as China not only increased their publication rate by more than 150%, but also closed nearly twice the ratio of potential triads compared to developed countries. Researchers who collaborated frequently facilitated first-time connections among a wider network, reducing the geodesic distance to form a peripheral small-world around a dense core.

Treating the concept of Asia critically, as a social construction rather than a natural one, the NUS team lastly assessed the historical significance of developing inter-Asian scientific networks<sup>3</sup>.

The PASNP Consortium served as an ideal case study of a collaborative scientific network whose members reflexively asserted an Asian regional identity. The consortium was as much a political as scientific enterprise, expressing the self-perceived rise of Asia as a research area and the shared ancestral origins of all populations in the region. Since the early 20<sup>th</sup> century, new computational technologies have been the foundation for different biological arguments to flexibly assert pan-Asian identities as both an abstract and material population of bodies. The PASNP brought together an assemblage of biochip manufacturers such as Affymetrix, algorithms such as Structure, and networks of geneticist and anthropologists to redraw the map of Asia.

<sup>1</sup> Huy Hoang Nhat Do, Muthu Kumar Chandrasekaran, Philip S. Cho, Min-Yen Kan, "Extracting and matching authors and affiliations in scholarly documents," *JCDL '13*, July 22–26, 2013, Indianapolis, Indiana, USA. (<http://dl.acm.org/citation.cfm?id=2467703>)

<sup>2</sup> Philip S. Cho, Huy Hoang Nhat Do, Muthu Kumar Chandrasekaran, Min-Yen Kan, "Identifying research facilitators in an emerging Asian Research Area," *Scientometrics*. October 2013, Volume 97, Issue 1, pp 75-97. (<http://link.springer.com/article/10.1007%2Fs11192-013-1051-3#page-1>)

<sup>3</sup> Philip S. Cho, Nathan Bullock, Dionna Ali. "The Bioinformatic Basis of Pan-Asianism," *East Asian Science, Technology and Society* (2013) July(2): 283-309. (<http://easts.dukejournals.org/content/7/2/283.full>)