as the highest number of champion works. The BRIC countries (Brazil, Russia, India and China) almost club together with champion works being in the range 30–45. Interestingly, Iran and Egypt have 135,290 and 95,413 papers respectively, but do not have any paper with 1000 citations yet.

Muthu *et al.*[3], reporting on the highly cited papers from India and China during 1998–2007, found 776 papers from India and 2260 from China that have received 100 or more citations. However, as regards to papers with 1000 or more citations, it is seen that China and India are more or less closely positioned with 43 and 36 papers respectively.

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Characterizing the funded scientific collaboration network

Collaborative innovation, which can be naturally explored by the collaboration networks[1,2], emerges as a typical pattern of modern scientific innovation. Nowadays, more than half of the scientific articles indexed by *Web of Science* (*WoS*) are supported by science funding[3]. As the fundamental resource, science funds provide financial foundation for many aspects of basic research, including international collaborative innovation. With the comprehensive extraction of funding information in the article database, the large-scale study of science funding has become available in recent years[3–7]. Thus, based on a large sample data in 2009–2011, we construct the funded scientific collaboration networks of the main countries/territories to reflect the innovation structure of international collaboration in basic research supported by science funding.

The data include 1,871,699 funded research articles in *Science Citation Index* (*SCI*) *Expanded* and *Social Sciences Citation Index* (*SSCI*) of the *WoS* during 2009–2011. While we set countries/territories as the analysing unit and then abstract 40 major countries/territories which have more than 10,000 funded papers, we construct the funded scientific collaboration network based on the collaborative relationships among these countries/territories. In the network the nodes are countries/territories, and the links are the funded collaborative relationships between two countries/territories. The relationships can be categorized as follows: (1) The country/territory on one side of the link is supported by one or more science fund(s). (2) The countries/territories on both sides of the link are supported by one or more science fund(s) at the same time. (3) The countries/territories on both sides of the link are supported by different science funds. Regardless of any form, the funding promotes collaborative research directly or indirectly, and its financial resources could be interacted by regular or unofficial pathway.

Figure 1 shows the funded scientific collaboration network of the major countries/territories in 2009–2011, where the thickness of the links is an indication of collaboration strength (i.e. the number of

Table 1. The high-strength collaboration links (top 20) in the funded scientific collaboration network of the main countries/territories during 2009–2011

Rank	Node 1	Node 2	Link strength
1	USA	PRC	35,034
2	USA	Germany	27,799
3	USA	England	25,139
4	USA	Canada	24,598
5	USA	France	18,064
6	USA	Japan	15,243
7	USA	Italy	13,795
8	Germany	England	13,509
9	USA	SK	12,675
10	Germany	France	11,877
11	USA	Spain	11,692
12	USA	Australia	11,675
13	England	France	10,139
14	USA	The Netherlands	9,794
15	USA	Switzerland	9,166
16	Germany	Switzerland	8,927
17	Germany	Italy	8,601
18	France	Italy	8,042
19	Germany	The Netherlands	7,976
20	PRC	Japan	7,780

Ranks are according to the descending order of link strength. PRC, People's Republic of China; SK, South Korea.

Figure 1. The funded scientific collaboration network of the main countries/territories in 2009–2011.

Table 2. The high *h*-degree countries/territories (*h*-degree > 6)

Rank	Country/territory	*h*-degree
1	USA	27
2	Germany	21
3	England	20
4	France	18
5	Italy	16
6	Spain	15
7	Canada	14
8	The Netherlands	14
9	Japan	13
10	Australia	13
11	Sweden	13
12	Switzerland	13
13	PRC	13
14	Russia	11
15	Belgium	10
16	Scotland	10
17	Denmark	10
18	Poland	10
19	SK	9
20	India	9
21	Austria	9
22	Brazil	9
23	Finland	9
24	Norway	9
25	Czech Republic	8
26	Taiwan	7
27	Israel	7
28	Portugal	7
29	Greece	7

Here we use a numerical transform to calculate the *h*-degree. The *h*-degree of India is 9, which means that the researchers of the country had more than $9 \times 100 = 900$ funded collaborative articles with the researchers of nine other countries/territories during 2009–2011. In collaboration networks, the nodes with high *h*-degree mean that they maintain stronger links with other nodes. Thus they are the important nodes which have the capacity to control and organize networks[9].

collaborations). The graph contains the links whose collaboration strength is not less than 5000 and the 22 nodes which they link.

In the network the core standing of USA is clear-cut. USA maintains strong collaboration with most other major countries/territories and these partnerships constitute the backbone of the network. Table 1 indicates that USA participates in all the collaboration links whose strengths are ranked in the top 7. In the collaboration links whose strengths are in the top 20, 60% is related to USA. In addition, the European traditional scientific powers such as Germany, England and France, also have many high-strength collaborations with other countries/territories. Overall, the collaborations among the Western powers are close, and those among the developing countries appear to be relatively weak. In Asian countries, only the strength of collaboration links between China and Japan ranks 20th (Table 1). The funded researchers from developing countries tend to seek partners from the Western countries. This is partly because the scientific and technological powers, like USA, dominate in most scientific fields. On the other hand, it is also possibly because the cost of long-distance collaboration can be guaranteed by the funding.

The collaboration network is a typical weighted network. Its link strength represents the collaboration strength and has a significant analytical value. Therefore, the method for measuring the nodes of weighted networks, *h*-degree, could be further applied[8,9] (Table 2). The *h*-degree of a node in a weighted network is *h* if *h* is the largest number such that this node has *h* links such that the weight of each link is greater than or equal to *h*. In the collaboration network it is equivalent to Schubert's partnership ability index[10,11].

Table 2 shows that USA and the European traditional scientific powers have outstanding performance in both the breadth and strength of collaboration. Some emerging countries, such as China, may have great total collaboration. The strength of collaboration links between China and USA ranks first. However, compared with Europe or America, the range of main Chinese partners is narrow, resulting in relatively low *h*-degree. For these countries, the policy-makers of funding ought to consider whether an in-depth scientific collaboration of a wider range should be encouraged, in order to avoid the over-reliance on a few countries in the future development of science.

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Plastics – a formidable threat to unique biodiversity of Pichavaram mangroves

Plastics pose a serious threat especially to coastal ecosystems and marine life. Accumulation of plastic waste in coastal zones is spiralling at an alarming rate and has resulted in unnoticed loss of diversity. One such case is the Pichavaram mangroves and the associated wetlands (11°25′N; 74°47′E) situated at the mouth of the Vellar, Coleroon and Uppanar rivers in Cuddalore District, Tamil Nadu, India. The mangroves cover an area of 1100 ha, with 51 islets ranging from