THE RISE of the CHINESE KNOWLEDGE DIASPORA

Possibilities, Problems and Prospects for South and North

Anthony Welch
University of Sydney

and

Zhang Zhen,
University of Sydney,
and
Tianjin University

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I was a boy when i left home.
I came back as an old man.
I think i remember the country dialect
But my hair has turned white since i spoke it.

Children stare at me.
Nobody understands me.
They look at me and laugh, and say,
'Where do you come from, Milord?'
(*He, Zhizhang* 659-744)

Introduction: The Global Knowledge Network

Among others, Appadurai has pointed to the tensions in globalization, comprising both flows (of capital, labour, information and imagery) and disjunctures, including between the local and the global. Seductive media images from abroad may conjure up aspirations for lifestyles, or forms of modernity, which cannot be satisfied locally (Appadurai 2001:6), or at best for a small elite.

Major disjunctures within globalization discourses are evident in the discourses of economic globalization. National political leaders, for instance, particularly from the wealthiest nations, regularly tout the merits of cross-border capital flows, while actively seeking to restrict cross-national flows of labour. In recent years, the UK, Australia and the USA have all, for example, erected legal, and in some cases physical barriers to those fleeing oppression, or seeking a better life in another country, who are often demonised as illegals, or queue jumpers. In the Australian case, the national government went as far as legally excising certain offshore islands, so that even those who reached their apparent safety could still be denied the legal rights bestowed on anyone who landed on Australian soil.

At the same time as they erect barriers to the free flow of labour, however, many of these same wealthy nations have established or refined programmes that target the highly educated, who gain preferential treatment for migration purposes. It is precisely this group, of course, whose migration represents one of the most significant losses to the home country.

Such knowledge flows, the subject of the current paper, form an increasingly important part of what has been called the international knowledge system (Altbach 1987, 1994, 1995, 2002, Welch 2007c, Welch and Zhang 2005, 2008). A key feature of this global system is the disparity that exists between North and South. In effect, core regions and institutions within the global knowledge system are almost entirely within the North, while regions and institutions from the global South are restricted to peripheral status. Simply put, research universities are expensive to establish and to maintain, thus major research facilities, citation indexes, and patents continue to be dominated by wealthy, and largely English-language education systems.

> " By their very nature, science and technology have always demanded significant and ongoing investment to establish, maintain and expand the 'engine' of physical infrastructure – including laboratories, libraries and classrooms. They also need a rich (and expensive) fuel of textbooks, computers, equipment, and other supplies." (World Bank 2000:71)

The same report goes on to reveal that the North, for example, has something like ten times the proportion of research and development (R & D) personnel (scientists and technicians) per capita as the South (3.8%, compared to 0.4%), and spends about four times the proportion of GDP on R & D - 2.0% compared to 0.5% (World Bank 2000). More recent research shows that, for example, while total research and development spending for SE Asia was US$3.3 billion in 2002, the equivalent figure for the developed world was US$645.8 billion (World Bank 2006:116, Welch 2007c). In addition, the North registered some 97% of all patents registered in the USA and Europe, and, together with the newly industrialising countries of East Asia, accounted for 84% of all scientific articles published (World Bank 2000: 69). More recent research on patent patterns confirms these disparities – patents granted for SE Asia between 2000 and 2004 totalled 140, while the total for countries of the North was 104,170. The rate of patents per 100,000 people for SE Asia was 0.04%, compared with 19.58% for the developed world (Welch 2007c).

In addition, it is critical to underline that such measures as Science Citation Index (SCI), Social Science Citation Index (SSCI), Engineering Index (EI) and the like are skewed in favour of English-language journals, (thereby adding linguistic disadvantage to global disparities of wealth). The growth of English language as the primary medium for computing, book and journal publishing (Held 1999:346), and the growth of US distance education materials on the web (Wilson et al 1998, Keniston 1998, Mason 1998), now underpinned by the Global Agreement on Trade in Services

(GATS), that has helped to underwrite growth in trade in educational services (estimated by the WTO and the OECD at US$30 billion per annum), is a further illustration of the politics and economics of global knowledge flows (OECD 2004, Welch 2008). All cultures are not equal, as both the dominance of trade in educational services by OECD countries and English-language nations, and the asymmetric quality of the global knowledge network, reveals.

The stratified nature of this global knowledge network underlines the fact that flows of intellectuals are still very largely from the South to the North. As Solimano (2002) argues, the existing global inequality of knowledge creation and application is being exacerbated, as wealthy countries of the global North compete to attract research talent from poorer countries of the South, whose best and brightest then consolidate the already-strong knowledge base in the former (Hugo 2002), at the cost of the latter.

China's Universities in the Global Knowledge System

Where do China's universities stand within the global knowledge system? At one level, China's status as a developing country (albeit with a spectacular annual GDP growth rate of around ten percent since the onset of the 1990s), and the fact that its universities only emerged from the depredations of the Cultural Revolution some thirty years ago, would seem to confine its higher educational system to peripheral status. Several factors, however, complicate such a simplistic assessment.

Perhaps the first of these is the sheer size of the Chinese system. As is seen from Table 1 below, the Chinese higher education system now produces close to four million graduates annually, while it also sustains a huge range of scholarly publications, many with circulation figures that would have editors of journals in the global North salivating. Moreover, as seen below, significant progress has been made over the past decade or more in terms of its scientific achievements and visibility. If this system is a periphery, it is a giant one.

Secondly, the Chinese government is well aware of the significance of its universities, and overall research and development effort, for national economic growth and development, and has thus consciously sought to develop a select number of its more than 1,600 degree-granting institutions into leading institutions internationally. Based largely on the existing status hierarchy, the State Education Commission, (later the Ministry of Education) used vehicles such as its 211 Project to invest in around one-hundred key universities, with the goal of accelerating their progress to world-class

institutions of higher learning as early as possible within the twenty-first century. The concentration of additional resources into its national 'key' universities has further widened the gap between these institutions and their less-favoured cousins - seventy-two percent of Government-funded research programs are carried out within designated 211 universities. Within 211 universities, 87% of teaching staff hold doctoral degrees, while 96% of state key labs and 85% of state key disciplines are sited in such universities. The succeeding 985 Project was even more selective, and was scheduled to invest a total of some US$4 billion, particularly in the nation's leading universities, such as Peking University, Tsinghua, Fudan and others. More recent schemes also are limited to select key universities.

Thirdly, the ritualistic assertion that English is the language of global communication (Crystal 1997), and scientific research, belies the rising status of Mandarin. It is important to bear in mind, for example, that within the Asia-Pacific region, speakers of Chinese approximate the total of English-speakers – in both cases around one billion individuals. China's rising strategic, economic and cultural significance, together with its large diaspora (see below), is leading to significantly increased demand for educational services in Mandarin, as evident in the rising number of overseas students at its universities (now totalling over 100,000), the explosion of material on the web in that language, and the proliferation of *Confucius Institutes* (devoted to the study of Chinese language and culture) worldwide. Just one indication of this rise in demand is the fact that within a very short time of the announcement of the plan for the first one hundred such Institutes, which will largely be situated on campus at selected universities around the world, the target was lifted to five hundred.

Remaining Challenges

Notwithstanding the enormous progress made within China's higher education system, and the equally undoubted commitment on the part of its people and government to the importance of education (something that has long led Chinese families to make considerable sacrifices to ensure their children get the best education available), significant challenges remain.

One of the first of these arises from the massive growth in the system, particularly over the last decade or so. The following table charts enrolment growth within the system, especially during the final years of the last century and the earliest years of the twenty-first, when the national government, tiring of attempts to reform universities internally, but keen to widen access, simply decided to increase annual quotas. There are two significant trends evident from the data in the following table.

Firstly, rises in annual enrolments of between seventeen and thirty-four percent were mandated during those years, with dramatic effects on receiving institutions.

Table 1. *Number of Public HEIs and Enrolments 1990-2006*

Year	*Number of Institutio*	*New Students*	*Graduates*	*Student Enrolments*	*Percent Increase*
1990	1,075	609,000	614,000	1,206,300	--
1995	1,054	926,000	805,000	2,906,000	140.9%
1998	1,022	1,084,000	930,000	3,409,000	17.3%
1999	1,071	1,597,000	848,000	4,134,000	21.2%
2000	1,041	2,206,072	949,767	5,560,900	34.5%
2001	1,225	2,682, 800	1,036,300	7,190,700	29.3%
2002	1,396	3,205, 800	1,337,300	9,033,600	25.6%
2003	1,552	3,821,700	1,877,500	11,085,600	22.7%
2004	1,731	4,473,400	2,391,200	13,335,000	20.3%
2005	1,792	5,044,600	3,068,000	15,617,800	17.1%
2006	1,867	5,460,500	3,774,700	17,388,400	11.3%

Partly adapted from Yang and Ngok (2004). 1990 to 1999 figures *China Statistical Yearbook 2000*, and http://www.edu.cn/jiao_yu_fa_zhan_498/.

Later data from http://www.moe.edu.cn/edoas/website18/level2.jsp?tablename=1068

The second trend observable is the consequence in terms of the massive rises in totals of new students, enrolments and graduations: the latter has risen more than six-fold since 1990, while enrolments have risen by more than fourteen-fold, and new students by nine-fold. Such swift and dramatic quantitative expansion could not but have led to very substantial effects on universities across the country. The fact, however, that other resources, notably teachers, accommodation, library facilities and dormitories were not increased at anything like the same rate, if at all, had predictable effects, as the following table reveals.

Table 2. *Changing Student Staff Ratios, Chinese Universities 1985-2006.*

Year	Student Enrolment	FTE Academic Staff	Student:Staff Ratio
1985	1,703,000	344,000	4.95
1990	2,063,000	395,000	5.22
1995	2,906,000	401,000	7.24

1998	3,409,000	407,000	11.6
2000	5,560,900	462,772	16.3
2001	7,190,700	531,900	18.22
2002	9,033,600	618,400	19.1
2003	11,085,600	724,700	17.0
2004	13,335,000	858,400	16.22
2005	15,617,800	965,800	16.85
2006	17,388,400	1,076,000	17.93

1985, 1990 data http://www.edu.cn/20010101/22284.shtml (*Basic Statistics on Education*).

1995 data http://www.edu.cn/jiao_yu_fa_zhan_498/

1998-2006 data http://www.moe.edu.cn/edoas/website18/level2.jsp?tablename=1068

*Staff-Student Ratio from years 1998-2006 are adjusted figures, that take into account the teaching and supervision of graduate students and students in adult education.

The above table reveals that student –staff ratios worsened appreciably, as a result of the enrolment reforms, from around 5:1 in 1990 to almost 18:1 by 2006. Again, much of the change occurred during the late 1990s and early years of this century, as a direct result of the mandated changes in enrolments.

The effects of such a flood of enrolments on quality are undeniable. In addition, World Bank data show the proportion of GDP spent on education as a whole in China to be still only about three percent (World Bank 2003), and some have raised doubts as to the feasibility of current plans exist to raise it to 4% (Shen and Du 2000). This resource-squeeze effectively exerts a downward pressure on quality, which is directly at odds with the expressed desire by both government, and Chinese universities, to attain international levels of performance and attainment. The well-known Shang Hai Jiaotong index of the world's leading research universities lists the top Chinese University (Tsing Hua) as no more than twentieth in the Asia-Pacific region, and no higher than one hundred and fiftieth worldwide. On the same scale, Peking University fares somewhat worse – no better than twenty-fifth regionally, and no better than two-hundred worldwide. (http://sjtu.edu.cn/ranking.htm) At the same time, however, it must be said that China's persistent drive to increase its representation in major international citation indexes, is having an effect: a recent report indicated that 77,395 papers from China were recorded in the major international science and engineering citation indexes for 2002, propelling it into fifth place worldwide.

Brain Drain constitutes a further challenge to the Chinese university system, albeit here again, changes should be noted. A longstanding problem, current Ministry of Education data indicate that for the period 1978-2006, 1,076,000 Chinese students travelled abroad for study purposes. Of these, around 275,000 have returned, although the same figures claim that more than 580,000 are still completing their studies abroad. (www.cscse.edu.cn/Portal10/InfoModule_386/3905.htm) By 2010, the number of Chinese studying abroad is forecast to reach 200,000 (China Daily 2006b), but while earlier measures of return rates indicated no more than a quarter or so did in fact return, this is at last beginning to change, as more opportunities open up in a dynamic China. Nonetheless, the evidence suggests that China's very best and brightest may still be remaining abroad (Cao 2004).

The Rise of the (Chinese) Knowledge Diaspora

While peripatetic teachers such as Confucius (551-479 BCE) and Socrates (c470-39 BCE) have long been a feature of the landscape of higher learning (Welch 1998, 2005), global knowledge diasporas are a newer phenomenon, sustained by both increases in global migration flows, and the rise and increasing ubiquity and density of information and communication technologies.

In research terms, the current increase in trans-national talent flows has led to the creation of substantial knowledge diasporas, particularly in OECD countries, and a renewed focus on the differential effects of global migration, including by the highly-skilled. National Science Foundation data showing that only half of international doctoral or post-doctoral candidates in the USA return to their country of origin within two years, is likely to be replicated in Australia. Indeed, for those from China and India, who study in the USA, the figures are as low as ten to twelve percent. In the decade to the late 1990s, approximately half of the doctoral recipients from China sought and received opportunities for further study and employment in the United States (Johnson and Regets 1998). The impact on innovation, in the form of research productivity, and patent applications is also substantial (Özden and Schiff 2005).

Data from Saxenian show that, of Silicon Valley's Asian population in the late 1990s, seventy-seven percent of Indian residents held at least a masters degree, while for Chinese residents the figure was eighty-six percent, and Taiwanese eighty-five percent (Saxenian 2006, Kapur and Mc Hale 2005: 113). Australian and Canadian data show similar figures (Li 2005, Welch 2007b). In Australia, for example, which shows the highest nett brain gain of all OECD countries (Docquier and Abdeslam 2006: 180), the proportion of skilled migrants rose from 39.8 percent of the total in 1990-1, to 46.8 percent by 2003-4, (Parliamentary Library 2004, Welch 2007b) while for certain

groups, for example China-born migrants, it was more than half. Indeed, of long term Chinese immigrants to Australia, over eighty percent currently have degrees, and fall within the three highest occupational categories, while significant numbers have moved into academic posts, usually after taking their Ph. D. at an Australian university (Hugo 2005, Welch and Zhang 2005).

That the emphasis on the highly educated has become all the more important in recent times, is a further reflection of the change towards more knowledge-based economies (and, arguably, the further commodification of education). The global circulation of epistemic currents, including among diasporic communities, is also part of this new orientation, which challenges our notion of space and place (Tsolidis 2001).

As pointed out above, high quality research and teaching universities are expensive to produce and maintain, and are thus understandably concentrated in the wealthiest countries (Welch 2007, World Bank 2000). This skewing of research facilities, including scholarships and research or teaching assistantships (RAs and TAs), towards the wealthiest and generally English-speaking systems then becomes a magnet for the best and brightest from the global South. The effects are clear, as Robertson, among others, has recently underlined:

> "… 1 in 10 tertiary educated adults born in the developing world resided in America, Australia or Western Europe in 2001, … between 30 to 50 percent of the developing world's population of persons trained in science and technology live in the developed world" (Roberston 2007, see also Lowell et al, 2004, Lowell and Gerova, 2006: 6).

Of late, however, the hierarchical structure in knowledge distribution and dissemination has become less fixed, as the *loci* of power and growth are becoming multiple, and more dispersed (Meyer et al, 2001). This more multi-polar dimension of the global knowledge network means that the diaspora option can be instrumental in narrowing the North-south scientific gap (Brown, 2000; Meyer and Brown, 1999; Meyer at al 2001, Zweig & Fung, 2004). Knowledge transfer (via, for example, the United Nation's Transfer of Knowledge through Expatriate Nationals [TOKTEN] programme), while by no means wholly effective, is nonetheless integral to diaspora policy, which seeks to strengthen bonds between knowledge-intensive places and less intensive ones. For example, Choi (1995) observed that many Asian background academics in American higher education keep in close contact

with their countries of origin, maintaining scientific and academic relationships with colleagues and institutions at home.

From this perspective, the huge Chinese diaspora, estimated to be around 35 million worldwide, of whom many are highly skilled, can be seen as a key potential resource, rather than an instance of brain drain. For China, deploying the diaspora option is now a priority (Zweig and Fung 2002, Welch and Zhang 2005), representing a more nuanced response to issues of brain drain. Programmes such as the '985 Project' also had the explicit goal of recruiting top (Chinese) scholars from throughout the world, to work in China's leading universities, while the newer '111' programme, that is designed to recruit Chinese intellectuals from abroad to mainland universities, even on a periodic basis, represents a further strategy to deal with brain drain. Such knowledge bridges, built with overseas Chinese intellectuals, many of whom are keen to contribute to the homeland, from abroad, are in part responsible for China's rapidly rising scientific stature (see above, and Li 2005), notwithstanding some remaining structural impediments (Cao 2004, Shen 2000, Welch 2008).

These knowledge networks are part of the wider phenomenon of increased global mobility, especially by diasporic intellectuals, and the trans-national networks they establish, undergirded by the greater density and diffusion of information technology, are each tilting the balance towards countries such as Taiwan (Luo and Wang 2002), Israel, China and India, whose highly-skilled scientists and technologists, often with experience in Silicon Valley, are busily '.. creating far more complex and decentralised, two-way flows of knowledge, capital and technology' (Saxenian 2006: 6). (To foster such networks, the Taiwanese intellectual diaspora in Silicon Valley, for example, created the Monte Jade Science and Technology Association, the Chinese its equivalent (Yuan Hua Science and Technology Association), and Israelis the SIVAN group).

The Chinese Intellectual Diaspora – an Australian example

How do intellectual diasporas maintain connections to the motherland, and to other parts of the diaspora? A recent study focused on the growing, diverse Chinese knowledge diaspora in Australia, which although part of the North, with well-developed infrastructure and a relatively strong research presence internationally, occupies an *entrepôt* status, both attracting significant numbers of intellectuals, scholars and students, but also suffering its own form of brain drain, largely to the USA, and to a lesser extent to the UK and Europe (from each of which it also draws).

The study was conducted at a large research university in metropolitan Australia. One of the largest universities with a wide range of disciplines, the university also has a long history of China relations (Holenbergh 2005) and currently hosts over eight thousand international students, of which the largest component are mainland Chinese students. A rising numbers of its academic staff are also from the People's Republic of China (PRC).

Forms of Contact

Interviewees were virtually all interested in maintaining contact with Chinese scholars in general, and mainland scholars in particular. As the following figure shows, all interviewees established scientific communication with their mainland counterparts. Zhuang characterised this type of communication and collaboration as conducive to both developing the reputation of Chinese scholars, and fostering China's national competitiveness.

> *Of course, I hope Chinese can communicate and collaborate with one another at global level. For one thing, this can enhance the reputation of Chinese (scholars) in the international community. For another, it can strengthen China's competitiveness in the global economy. I would like to cooperate with Chinese scholars at home and abroad. To me, this kind of cooperation will be more beneficial.* (Zhuang, cross-disciplinary)

Table 3 *Interviewees' communication channels with mainland scholars and other Chinese intellectual diasporas*

		Personal Contact		Conferences & conventions		Publication		Staff/student exchange	
		MLS	OCS	MLS	OCS	MLS	OCS	MLS	OCS
Chen	Cross-discipline	+/-	-	+/-	-	-	-	+/-	-
Ding	Social Science	++	++	++	++	++	+	+	+/-
Li	Engineering	++	+	+	+	+	+	++	+
Shi	Health Science	+	++	++	++	+	+	+/-	-
Wang	Health Science	++	-	+	-	+	+	+	-

Zhuang	Cross-discipline	+/-	-	-	-	-	-	+/-	-

Legend : ++ = very important + = important +/- = somewhat important - = not important

: MLS = Mainland Scholar OCS = Overseas Chinese Scholar

Note: A communication channel was designated as 'very important' when it involved collaboration. It was designated 'important' when there was successive communications. It was designated 'somewhat important' when there evidence of sporadic communication, and 'not important' when no communication was evident.

The forms that communication took were quite diverse and included reciprocal visits, publication in mainland journals, and teaching. Such forms were considered important by interviewees.

The Value of Collaboration

All respondents confirmed the value of collaborations with other Chinese scholars. Li, for example, viewed mobility as conducive to expanding the scientific/professional network and an important medium for transmitting knowledge and expertise.

> *We receive at least 15 visiting scholars from China each year. Nearly every big research institute in China has sent their staff here to get trained. When they came back, they may bring back some of our academic findings… In the past ten years, about 30 students got their PhD degree here. They come from different parts of China. The impact has been spread. As our graduates settled around the world, so was the network.* (Li, Engineering)

Wang, too greatly appreciated his collaboration with mainland counterparts.

> *I enjoy the collaboration with Chinese counterparts. That is why I went back seven times last year…. In terms of contribution, uh… I don't think it is more or less because I am Chinese after all.* (Wang, Health Sciences)

Ding viewed the relationship between her and her alma mater as like that of a child and parent, hence her commitment to lecturing in her alma mater. Noting that mainstream English-language journals in her field had limited readership in China, she viewed Chinese journals as an important medium to disseminate academic findings to mainland peers.

> *Previously, I did not pay much attention to publishing papers in Chinese journals. Gradually, I found out that many Chinese scholars did not read articles in foreign journals. If I wanted the findings to have greater impact, I should publish in both English and Chinese journals. Now, I pay much attention to translating the article into Chinese and publishing in Chinese journals.* (Ding, Social Sciences)

A Culture Shared

Qualities of Chinese scholarship, industrious study habits, and courtesy were appreciated by the interviewees, as also the relative ease and familiarity of dealing with other Chinese.

> *When I talk with my former colleagues, we still communicate as old friends and colleagues. However, when I came back and talked to the junior staff or junior scientists, they paid very high respect to me. Obviously, this is because of the philosophy, the thousands of years of Confucianism.* (Wang, Health Sciences).

Clearly, sharing cultural and linguistic backgrounds contributed to closer scholarly communications. Such sentiments regarding a willingness to cooperate with the home country support other recent studies (Meyer et al, 2001). Interestingly, an important two-way relationship was evident between expatriate Chinese intellectuals and the mainland. On the one hand, diasporic intellectuals benefited from new research techniques, the rich array of English language literature, major conferences, and cutting-edge research communities. Equally evident among this group, was a commitment to utilize the resources of the various knowledge centres, including new communications technologies, to further develop the gigantic periphery of China. Respondents argued that, in this way, the gap between centres and peripheries could be reversed to an extent. Instead of the usual pattern of South enriching the knowledge resources of the North, the strength of the latter could contribute to the development of the former.

While earlier studies of Asian intellectual diaspora (Choi 1995) showed interests in collaborating with regions such as Taiwan, Hong Kong or Singapore, none in this study did so. Apart from political issues with Taiwan, another reason may be China's dramatic economic growth rate since 1990, and the greater opportunities that this conferred. While strong commitment was common,

outcomes were often weak. Although all interviewees kept in contact with the home country, several indicated that they did not have any concrete collaboration, or collaborative outcomes, from the professional contact with mainland peers. Interviewees described multiple channels of communication which contributed to a complex and uneven picture of scholarly relations.

Factors affecting Variations in Communication

The study deliberately embraced a range of dimensions within the sample, such as status, gender, shared research interests, and forms of leadership. All contributed to the quality of collaboration found.

Gender and Academic Rank

Consistent with research on the gendered quality of the academic profession (Stiver Lie and O'Leary 1990, Welch 2005), gender did influence patterns of collaboration. Female interviewees noted the importance of building up their career before forming collaborative relationships. This led to a certain paradox: the opportunity for, and scope of cooperation was determined by professional rank, while their promotion opportunities were based on their individual research abilities. Although each female interviewee expressed it differently, a common theme was the time and energy needed to build their career had impinged on their capacity to collaborate.

> *In the past five years, I have paid much attention to conducting individual research. This is for the consideration of professional development. I believe there will be more collaboration in the future, as I assume a senior position.* (Ding, social science)

> *During the past nine years, I have been working hard to build up my reputation. I did not have enough time and energy to collaborate with mainland scholars.* (Shi, health science)

Rank was particularly important among mainland scholars when contemplating collaboration with colleagues abroad. The following quote underlines a pattern whereby mainlanders tended to collaborate with Chinese expatriate scholars of higher rank, confirming the longstanding hierarchical quality in Chinese society, associated with its Confucian heritage.

> *Perhaps, they have different ideas of with whom and how to conduct cooperation. They would prefer collaborating with*

Professors. (Shen, Cross Discipline)

Research Interest

Both the different organization of research, and the differences in research development and outcomes, had an impact on the kinds and degrees of collaboration. Some interviewees saw the relatively less-developed status of their field in China as a constraint upon collaboration:

> *In the journals I read, I can see more and more Chinese names… I do not have any contact with them because of the difference in research interests. As for scholars, the communication is spontaneous if they share the common interest. It does not mean that I may contact you because you are Chinese.* (Chen, Cross-discipline)

> *In my specific field, China is lagging behind the developed countries. This is mainly because China is a developing country and problem concerned is to ensure its people adequate food and clothing.* (Shi, health science)

Others, such as Zhuang viewed the specific nature and organization of his research arena as a major constraint to extending collaboration with mainland scholars.

> *Because my field crosses two disciplines, I can hardly find anyone who is good at both. I am expert at one field but not the same in the other. So I hope to find someone who is at least quite competent at the second. It's not easy.* (Zhuang, cross-discipline)

Leadership

Leadership was certain seen as important, but in practice was experienced as both a positive and a negative. On the one hand, it can facilitate effective scholarly contacts between Chinese expatriate scholars and the home country, although not always, as the following quote reveals.

> *I discussed with some colleagues my intention to cooperate with their institution. They told me there was no job vacancy and just suggested I talk to another person. It was like ball rolling (buck*

> *passing). What I wanted was to see whether I would cooperate with them. I did not want to apply for a position there. So I felt disappointed… However, the president of C_2 University was more straightforward, "We have almost everything. What we are short of is high calibre personnel like you". I responded, "Although your university is not my Alma Mater, your university is my first priority".* (Health Sciences)

On the other hand, three interviewees (Shi, Zhuang and Chen) recalled less positive experiences when meeting mainland delegations, notably that there were no follow-up activities. As a result, the interviewees still were left unclear how to foster such collaboration with mainland institutions.

> *I have met one high-level delegation from China. The delegation head assured me that China needed quality personnel like me. But where can I find out the bridge for building the linkage? There is no answer.* (Shi, health science).

All in all, while communication between scholars with common interest was spontaneous, leadership support by mainland counterparts were seen as critical to successful collaboration. Too often, the problem is that, in practice, the mission of the delegation often ends with the conclusion of their visit.

Findings regarding the significance of academic status, research interest and relevance, for scientific collaboration bear out those of Choi (1995), who observed that more senior academics had easier access to, and utilization of, resources, which in effect gave them more opportunities for professional collaboration. She further argued that the lower levels of infrastructure found in less developed countries, make it difficult to support highly- specialized work, and can limit international collaboration. While according to some, the lack of specialization and differentiation in Chinese scientific community indicates the marginalization of Chinese scholarship, the substantially increased resources made available to key universities over the past decade, and the impressive priority accorded the development of higher education, have notably lifted research performance. marginalisation is still evident, as is further illustrated below.

Marginalization

As indicated above, the global knowledge network is still weighted towards the wealthier countries, principally restricted to OECD membership, and English-language environments (Altbach 1994, 2002, Crystal 1997). Neither places China within 'core' knowledge environments, at least yet. The concept of marginalization highlights an awareness of China's lack of access to the fruits of, and limited contribution to, the international knowledge network, in particular the often still-limited involvement by mainland scholars in scientific communication and collaboration with peers. It is also reflects perceptions of the lower quality of the Chinese scholars' work in a larger sense - connected to less access to resources, and the academic atmosphere and heritage within mainland Chinese scientific community.

Notwithstanding some differences, significant overall similarities in interviewees' perceptions of China's limited participation in international knowledge network emerged. Interviewees indicated that the most influential journals in the fields were from the North, in general, and the Unites States, in particular.

> *The most influential journals are from North America, mainly, with several from the European countries.* (Chen, cross-discipline)

Equally, interviewees pointed out that mainland scholars remained much less prominent in the internationally recognized journals in their fields.

> *Even with a growing number of Chinese contributors, the mainland scholars are quite limited as the contributors are overseas Chinese in the western academies.* (Shi, health science)

The inadequate quality of many (but not all) mainland scholars' work was given as the primary reason for not being able to a publication outlet for their research.

> *The Chinese academics, largely, find out what others did, copy the model and develop it into a model that suits the Chinese.* (Shi, Health Sciences)

> *Papers in Chinese journals seem to be quite simple. The*

> *discussion section lacks depth and comprehensiveness in comparing and contrasting one's findings with those of the others.* (Zhuang, cross-discipline)

Some interviewees also cited lack of access to the latest information in the fields as an important limitation on the quality of mainlanders' research.

> *Most … Chinese universities may not be able to subscribe to these journals because the lack of financial input.* (Zhuang, cross-discipline)

Language, too, contributed to the ongoing marginalisation of mainland scholars:

> *… for mainland scholars who have been educated domestically, I think it is quite difficult for them to get their papers published. To publish in those journals, it requires at least some years' accumulation both in language and in specialized knowledge.* (Chen, cross-discipline)

> *Here, we have a research team and the members can help you polish the language in the article. I don't think they have this type of support and there is no one to help with the language.* (Zhuang, cross-discipline)

Quantity and Quality

A trade off between quantity and quality was seen as problematic, by some respondents who argued that mainland scholars tended to publish more articles, rather than better ones.

> *Most Chinese academics … publish their articles because they want promotion. Writing papers is part of their task. My former colleagues told me it was not necessary to publish in internationally recognized journals, … second-class domestic journal was ok.* (Shi, Health Sciences)

Some respondents voiced concerns that Chinese academics tended to prioritize practical achievements over basic research. This is understandable in today's China, where chances to make

one's fortune and career have increased significantly, due to its stellar economic resurgence, and moves to a market economy. In such circumstances, basic research may not be the best way to get ahead.

> *In my specific field, the mainland scholars I met placed great emphasis on joint-degree programs, or inviting foreign academics to teach students in China. They were not interested in pure academic cooperation.* (Chen, cross-discipline)

> *In terms of research, I think my Alma Mater is lagging far behind as compared to Australia. Although there were new buildings and facilities, they were busy with daily treatment (i.e. clinics). They did not emphasize … research or have the funding to support research. They did not put research on their agenda.* (Shi, health science)

Differences in academic heritage and research style were also seen as significant

> *Because most Chinese academics were educated there, they inherited the old way to conduct research.* (Wang, health science)

However, all interviewees stated that the Chinese modes of research would likely change, as more and more overseas Chinese returned. The significance of Chinese with overseas experience was mentioned, too.

> *I think Chinese academics do quite well in academic research. The key point here is that they have a different way of writing papers. I believe the Chinese way of conducting research can be changed as more and more overseas Chinese return.* (Li, engineering)

> *Without attracting and utilizing more overseas Chinese academics, China can hardly keep up with international development. The group of personnel is the huge potential for China's development in science and technology.* (Shi, health science)

As mentioned, interviewees related the marginalization of Chinese scholarship to the fact they work in Australia, one of the centers of scientific activity. Lack of language proficiency and resources, as well as the traditional academic atmosphere and heritage, contributed to less active participation by mainland scholars' in the international scientific community. All interviewees believed, however, that experienced returnees with overseas degrees would provide a solution to the problem.

Stratification

The influence of limited resources on the invisibility of mainland scholars substantiate previous studies in the field. Research on the impact of world-economy on the international knowledge network reveals a direct, causal relationship between the two (Altbach, 1985, 1987, 1995, 2002; Choi, 1995; Teferra and Altbach 2003, Meyer and Brown 1999, Meyer et al, 2001, Welch 2008, 2007a). Despite China's rapid growth, the fruits of this growth have been very unequally distributed, thus segments of the economy remain mired in low literacy rates and considerable poverty. Growth and investment in higher education are also very unequally distributed; hence, while more mainland scholars will play a much more active role in the international knowledge network, these will stem almost exclusively from China's most eminent institutions. For the foreseeable future, then, most Chinese scholarship will retain its marginalized status.

Interviewees reflected considerable awareness of the extent of stratification, and uneven development, within Chinese higher education, and expressed considerable consensus regarding its effects. While Wang, and Shi, each praised the work conducted by academics of some Chinese universities

> *I visited the web site of C_1 University one day. Amazingly, there were so many higher-level papers published in Science and Nature. In China, top level is top, internationally top. But the medium level is quite low.* (Wang, Health Sciences)

> *To my knowledge, only C_1 has conducted relevant research. During my contact with Professor X, I find out that his ideas and research are cutting edge. However, when I went back my alma mater, I noticed that they advanced with moderate progress.* (Shi, Health Sciences)

, other interviewees pointed out how uneven was this development.

> … *China has been quite expert at certain skills in hard science. However, it lags far behind in many fields in soft science.* (Chen, cross-discipline)

Perhaps more so than in some other parts of the world, the stratification of the Chinese higher education system has been deliberately deepened in recent years by the national government, at the cost of lesser institutions. An important component of the 985 Project, for example, is having internationally trained professors at one's university. This explains both the existence of several research-oriented institutions, with excellent facilities and overseas educated academic staff, operating at the highest international level and, at the same time, a long tail of relatively weak institutions. In effect, the latter are a periphery within a periphery, and reflect the existence of centre and periphery at global and national level. While some research points to a number of universities in newly industrialized states such as China approaching the status of world-class research institutions, it remains the fact that the leading research-oriented universities in the North still occupy the top-tier. The underlying trend is towards a more multi-polar higher education structure, in the context of ever more intense competition. Within the supposed centre, too, there are centres and peripheries: the so-called Ivy League in the United States, Russell Group in the UK, and Group of Eight in Australia are examples of the former.

Conclusion

The findings regarding ways in which language proficiency, biased citation indices, and differences between Chinese and Western ways of conducting research, contribute to mainland scholars' differential status in the international scientific community support previous studies on academics in the third-world (Altbach, 2002, 2004, Welch 2005). These reveal that, since publication in prestigious scientific journals, mostly edited in the North, remains the *sine qua non* of academic validity, academics from the South are still placed at a significant disadvantage (Altbach, in Altbach and Umakoshi 2004, pp. 7-11).

Findings regarding the significance of the scientific knowledge and expertise of Chinese intellectual diasporas to China's development again supports the mainstream research on the diaspora option, which sees the exodus of the highly skilled as both a loss, and at the same time a potential gain, for the country of origin (Brown, 2000; Lowell, 2001; Meyer et al, 1997; Meyer & Brown, 1999; Meyer et al, 2001; Teferra, 2004; Wickramasekara, 2002; Zweig & Fung, 2004). This is all the more so in light of the deepening interconnectedness of the (research) world, in an era of thickening, and denser, global information and communications technologies.

The notion of the diaspora, embodying the key notion of interstices and in-betweenness, presents a challenge to the taken-for-granted status of the nation state in education. The development of global knowledge diasporas, further challenges this assumption. At the same time, they also herald novel ways of conducting research in both the natural and social sciences, that can contribute to R and D in both the homeland, and the new land. and forming knowledge bridges that can be of benefit to both sides of the relationship.

A recent National Science Foundation (NSF) paper on cyber infrastructure, for example, underlined the growing importance of what it termed trans-national “collaboratories”, and argued that countries who failed to move swiftly to take advantage of such opportunities, would be left behind. Such cyber infrastructure can significantly reduce constraints of distance, time, and discipline. Indeed, in an era of global communications where virtual research communities are of growing importance, research is intrinsically international: "Crucial data collections in the social, biological and physical sciences are now online and remotely accessible." (NSF 2002:1). While most evident perhaps in the sciences and engineering, the potential for such national and trans-national "collaboratories" is great in other fields also. While the Chinese knowledge diaspora could not hope to match the costs of developing the supercomputing needs, data storage capacity, and associated technical infrastructure (estimated by the NSF as not less than US$990 million per year), the potential for exploiting complex international neural knowledge networks is also great for other countries and regions (Kuznetsov 2006), and has the potential to shrink distance, enhance quality and reduce time taken for research initiatives. The benefits are to research communities across the Chinese knowledge diaspora.

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