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Is the cosmopolitanization of science emerging in China?

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Abstract

China is one among many other countries that have recognised the necessity in aligning national scientific progress with that of global development. As China is striding along the path of scientific development with determination and initial success, a key concern confronted by international scientific community is how China, a rising scientific power, will transform existing global scientific atlas. Based on a project carried out in six Chinese cities between 2006 to 2009, this paper mainly employs Ulrich Beck's cosmopolitan theory in examining China's life sciences' development in the last decade to investigate how Chinese stakeholders have developed a (cosmopolitan) sensibility to rival ways of scientific reasoning, and in what way, Chinese stakeholders have contributed to the cosmopolitanization of science.

Keywords

China; scientific development; global governance; cosmopolitanism; cosmopolitanization

Science has always been a significant factor in promoting and sustaining a nation's global status. In the 2006 National Science and Technology Assembly, Chinese President HU Jintao emphasised that 'confronted by increasingly fierce international competition, we can only seize the developmental initiatives and gain advantages by setting science and technology as our strategic priority.' During the period of 1995 to 2005, China's R&D expenditure has sustained an annual average growth rate of more than 18%. In the same period, publications included in science citation index enjoyed an annual growth rate of 17.9% (Mu and Qu, 2008: 321). In year 2007, Chinese government financial investment on R&D has already ranked 3rd in the world (OECD, 2007a).

China's recent efforts to encourage innovation, articulated in *The National Mid-term and Long-term Science and Technology Development Plan 2006-2020*, reminds many observers of China's previous political strategies centred on R&D. For example, a commentary published in *Science* immediately interpret the 2006-2020 plan as an effort 'to replicate the success of China's first S&T plan, a 1956 blueprint that led to the creation of scores of CAS institutes, produced the nation's first atom and hydrogen bombs, and sent up its first satellite'. This commentary concluded that China 'was determined to rekindle past glory' (Hao and Gong, 2006). To be sure, in the 1950s and currently, scientific advancement was aimed to boost China's political and economical status, but the strategies in advancement are quite opposite: fifty years ago, research achievements were made 'with the spirit of self-reliance and by working hard' (MOFA, 2003), while nowadays, scientists are encouraged to participate in Western academic activities and build up international collaborations.

Remarkable as this shift from self-reliance to transnational communication is (Larson, 2004), China is only one among many other countries that have recognised the necessity in aligning national scientific progress with that of global development. Many existing

literatures have explored different reasons for the increasing dependency on cross-border research collaboration, such as the global sourcing of research expertise, combating the inequality of health care, accelerate research efficiency, and the protection of public interests against scientific risks (Beck, 1996; Giddens, 1999; Horton, 2006; Mannings et al, 2008). Some have succinctly summarised the essence of contemporary scientific policy-making as ‘think locally, act globally’ (Wagner, 2008).

Many contemporary thinkers have suggested the increasing transnationalization of social interactions have fostered the development of a cosmopolitan attitude (Kwok-Bun, 2002; Mau et al, 2008). For example, as early as 1990, social anthropologist Ulf Hannerz has highlighted a growing number of individuals who have embraced ‘a *willingness* to engage with the other’ (1990: 239-241, emphasis added) and emphasised that ‘it is really the growth and proliferation of such [cross-border] cultures and social networks in the present period that generates more cosmopolitans now than there have been at any other time’. Theorist Ulrich Beck (2004[2006]) encapsulated current transnational exchange as the development of a ‘cosmopolitan *vision*’ among various actors. Global governance scholars Steffen Mau and his colleagues also suggests the emergence of ‘a particular *worldview* characterized by the capacity to mediate between different cultures, the recognition of increasing interconnectedness of political communities and the approval of political responsibility at the supranational and global level.’ (Mau et al, 2008:2, emphasis added)

Yet, amid the celebration of a seemingly flat world, further empirical work, especially studies from a developing country’s perspective, on how such ‘willingness’ (Hannerz, 1990), a ‘vision’ (Beck, 2004[2006]) or a ‘worldview’ (Mau et al, 2008) has influence global power balance and affects the constitution of global norms in practice (such as science) are still scarce. This has hampered us from comprehending fully the implication and challenges of intensified cross-border communication. After all, just as social theorist David Harvey bluntly point out upon reviewing cosmopolitan thinking in relation with political realities: ‘treating others with respect costs nothing... but the redistribution of real income and of political power does’ (Harvey, 2009: 115).

The linkage between a global mindset and its consequential actions may be of special strategic importance for global scientific progress. Taking the life sciences for example, which takes up approximately 20% of China’s R&D investment (Chen et al, 2007), few would dismiss China’s recent commitment in joining international endeavours, nor not welcome Chinese science to become ‘an integrate part of the fabric of global society’ (Doering, 2002). Yet what seems to have casted doubts or reservation over China’s scientific development is the lack of knowledge on how this global mindset has been translated into and impacted on actual research practice on the ground. Existing concerns may include: How would China, whose government is most devoted in supporting R&D, exacerbate ‘international investment competition’ (Salter, 2007: 280) and reconfigure the world’s scientific resource distribution? How would China, a country without Western public debate and public engagement tradition, contribute to global combat in fighting undue practices in cutting-edge research (Boesz and Lloyd, 2008)? On issues that may affect economic, scientific or social wellbeing of world society, such as patentability criteria (Herder, 2006) and professional codes of conducts, would China act in a revisionist fashion or a manner which supports the status quo?

All these questions convey one central concern: Chinese science may have been ‘globally networked’, but is China’s science ‘cosmopolitanized’? This is to say, as will be further specified in the next section, in addition to adopting a global ‘vision’, how would such an outlook affect China’s scientific decision-making? And in what ways would it influence

China's engagement in comparing, reflecting, criticizing and accommodating diverse interests among international community?

Empirical study directly addressing this question is scarce. Based on a project funded by the Wellcome Trust which took place in six Chinese cities between 2006 to 2009, this paper employs life sciences, especially that of stem cell research's development in the last decade as a case study to examine a) how global exchange in the past decade has shaped Chinese stakeholders' understanding of local scientific advancement in relation to world society, and b) how such outlook has influenced China's approach in cross-border communication and global scientific participation. In other words, this paper is to investigate how Chinese stakeholders have developed a (cosmopolitan) sensibility to rival ways of scientific reasoning, and in what way (if at all), Chinese stakeholders have contributed to the cosmopolitanization of science.

Cosmopolitanization of science

So what exactly does 'cosmopolitanization of science' incorporate? This study largely borrowed the concept from Ulrich Beck (2000, 2004[2006]: 72-73) with reference to other cosmopolitan theorists. As this paper is an empirical investigation rather than theoretical exploration, I will list here only three key aspects of cosmopolitanization that are essential to the analysis in this paper.

Firstly, the cosmopolitanization of science is the *process* of international research exchanges. That is to say, cosmopolitanization is *not* only particular actions that took place across national borders, *nor* does it denote a specific stage in the 'sequence' of social development stage. Rather, cosmopolitanization of science encapsulates a series of activities, a 'non-linear dialectical process' (Beck, 2004[2006]: 72-73), which took place both within and without nation-state. It is an interactive approach that shapes and is shaped by international scientific development.

Secondly, the cosmopolitanization of science does not parallel monologues in which members of the international scientific community simply talk *past* each other, but a conversation that leads to the adaptations and modifications from participants. From the point of local scientific practice, this means the 'globalization *from within*, globalization *internalized*' (Beck, 2002: 23, original emphasis). In other words, the cosmopolitanization of science is not 'a celebration of the beauty of a collection of closed boxes' (Appiah, 2005[2007]: 256) in which various research traditions are displayed as a mosaic of exhibits. Rather, it is a process in which foreign concerns, alternative laboratory practices and rival scientific perspectives are digested and accommodated into transforming research convention *inside* nation-state societies. From the point of international scientific community, this means an abandonment of seeking an 'all-embracing, one-size-fits-all global solution' (OECD, 2007b), but instead constitute global scientific governance on basis of 'diverse but practicing' world members (Conley, 2002).

Thirdly and most importantly, cosmopolitanization highlights the possible impact reflexive efforts from a variety of social levels have over the outcome of cross-border scientific exchange. This transnational exchange involved in cosmopolitanization is not the same as what Roudometof suggests as a process that is imposed on us and 'does not refer to qualitative feelings or attitudes of individuals, and it is not affected by what people think of it' (Roudometof, 2005: 118). Quite on the contrary, a key for local science to be cosmopolitanized is to have individual stakeholders being engaged in global communication 'not merely by employing new technologies and networks of communication, but also by using them self-consciously to create public spheres to pursue justice, create innovative

practices' (Bohman, 2007: 189) and promote shared future benefits (Giddens, 1999; Beck, 2008).

In short, the cosmopolitanization of science refers not only a willingness in being networked with the world, but also encompasses more substantive responsiveness in achieving a cooperative agenda that is agreeable to all parties at stake. Through such process, differences may not be resolved, but can be pacified (Appiah 2006: 69-85); regulatory framework may not be homogenized but harmonized (Boesz and Lloyd, 2008). In regards to China's scientific development, cosmopolitanization hosts the challenge of how China can take advantage of its local financial, political and social support while at the same time participating, among many other countries, in a careful negotiation of acceptable scientific limits and practices.

Method and structure

Data used in this paper forms one part of a larger study on China's governance of life science, with special focus on stem cell research. The project was funded by the Wellcome Trust carried out from 2006 to 2009¹. Part of this research has also been incorporated into the BIONET project, a European Commission Sixth Framework programme which examines the challenges facing collaborative governance on life science between China and the EU (www.bionet-china.org). By organizing workshops on different topics of life science with particular focus on EU-China scientific cooperation, BIONET has enriched this research by providing a great opportunity to conduct group observations: heated discussions between Chinese and Western scholars on regulatory issues; face-to-face debates between scientists and other stakeholders (policy-makers, ethicists, patients etc).

Apart from group observation, the main source of information for this research is obtained from media records, governmental documentations, site visits and interviews. This research employs a grounded theory approach (Charmaz, 2006: 130-1), in which data collection and social science literature reviews were repeatedly carried out at different stages of the study. In short, 22 stem cell research teams in six cities (Beijing, Tianjin, Shanghai, Hangzhou, Changsha, Guangzhou) were included in the site visits. 47 semi-structured interviews were conducted, including 38 scientists, 7 key bioethicists and 2 Ministry of Health officials who were involved in formulating life science regulations. Each interview lasted on average one hour. Interviews were all recorded and transcribed. Through detailed and repeated analysis of the data, the transcripts were then indexed into themes by identifying reoccurring concepts (Corbin and Strauss, 1990). Although it must be emphasised that this non-random sample of interviewees is not representative of the sciences as whole, nor even of the life sciences community, it is equally important to note that small amounts of data analyzed in greater qualitative depth may serve an important function by identifying core themes which may profit from more systematic analysis. This research should thus be interpreted as similar to other qualitative studies of professional science communities (such as Cao and Suttmeier, 2001 and Wainwright, 2006).

To examine the shifts and changes in Chinese stakeholders' approach in communicating with the international community, this paper is structured by roughly dividing the last decade into three phases. Phase I is from year 2000 to 2003. This is a period when China's burgeoning life science industry has just entered world stage. It is highlighted by the international debates of hybrid embryo created by Chinese scientist CHEN Xigu and

¹Themes in other parts of this research published elsewhere include the development of good governance in China (Zhang J, 2008), the regulation of China's stem cell research in the context of cosmopolitanization (Zhang J, 2009) and the organization of researchers and its relation to scientific productivity (Zhang J, 2010).

SHENG Huizhen. It is demonstrated that during this period, Chinese institutions were mostly compliant listeners in global dialogues. Chinese administrative moves were heavily influenced by Western criticism. Phase II is from year 2004 to 2006. This is a period when findings from Chinese research labs start to make regular appearance on international publications and conferences. Yet there were still strong scepticism toward Chinese research credibility, especially in terms of necessary regulatory oversight. One of the most high profile cases during this period is a correspondence published in *Nature* 2006 written by six most influential figures in China's life science circle. Rather than accepting foreign scepticism uncritically, during this period, Chinese scientists have taken up a more active communicative stance in elucidating the particularities of Chinese situation to others. Phase III is from year 2007 till today. What is most noticeable is a multi-level engagement with global communications. That is to say, based on their experiences and reflections upon participating in international conferences, peer-review, research collaboration and other exchange programs, Chinese scientists, both collectively and at individual level, have shown further commitment in abridging divergence and promote mutual trust with their international peers.

Dividing last decade into three phases is to help tracing out the development of China's communicative approaches. It is not to suggest such transitions are abrupt or clear-cut. In fact, China's interaction with global societies is a gradual and ongoing process. Subsequently, it is equally important to note that by extending current debate with empirical data, this research is to invite future discussion on such topic, rather than to formulate any final conclusion on China's role in the cosmopolitanization of science.

Phase I 2000-2003: Is hybrid embryos 'a big step forward' or the 'Wild East' biology?

Without delving too much into technical details and to suit the analysis of this paper, stem cell research may be best described as in vitro cultivation and differentiation of primitive cells (stem cells) into various specialized cells types. The appeal of studying stem cells lies not only in further revealing the mechanism of life development, but also in its profound implications for improving and expanding the field of regenerative medicines. The main focus of applied stem cell research has been developing cell therapies to replace diseased cells or damaged tissues. For these reasons, many countries, such as China, have marked stem cells as one of their strategic R&D areas.

According to China's most high profile science newspaper, *Science and Technology Daily* (Nie C-R, 2003), hybrid embryo research, which consist of fusing human somatic cell with animal gametes, was already a recurring conference theme in China in the second half of 2000. Yet it wasn't until 7 September 2001, when *People's Daily* reported scientist CHEN Xigu's research on creating the world's first human-rabbit hybrid embryo (Zhang and Chen, 2001) and CHEN's research subsequently attracted *international* criticism, that such research became centre of a *national* dispute.

At the time, CHEN Xigu, Sun Yat-sen University professor, transferred a skin cell nucleus from a 7 year old boy into a rabbit's denucleated egg and successfully created in total 109 hybrid embryo. The initial reportage appeared in *People's Daily* highly praised CHEN's achievement by stating that it 'pushed a big step forward in research on human embryonic stem cell and clone technique' (Zhang and Chen, 2001). This report also noted that CHEN emphasised his research was only preliminary for therapeutic cloning and he would 'never make any attempt in researching reproductive cloning'.

As will be mentioned again later in this paper, such practice was later accepted by the scientific community and was legalized by the UK in September 2007 (HFEA, 2007). Yet back in 2001, the scientific uncertainty and ethical issues on stem cell research were under heated discussion in the West. US government banned federal funding on stem cell research using embryos created after August 2001 (Borger, 2001), the British government was also planning to ban the creation of hybrids (Highfield, 2001). Thus, when CHEN's sudden success came in the news, it became 'the most controversial case at that time' (UNESCO, 2008). Despite the fact that CHEN's research was initially highly praised in China, it soon received much criticism and scepticism worldwide (Abbotdt and Cyranoski, 2001). Hybrid embryos research in China soon became a symbol for 'a morally bankrupt "Wild East" of biology' (Dennis, 2002).

As a consequence, a few days after *People's Daily* described CHEN's findings as the 'big step forward' in stem cell research, Chinese media's portray of this research dramatically changed. Four ethicists in Chinese National Human Genome Centre at Shanghai (CHGC) stated that 'such research blasphemes human dignity. It is an assault on bioethics' (You and Zhang, 2001). Chinese ethicists and regulators made a series of public statement reemphasising Chinese government's firm commitment in developing stem cell research "rational[ly]" and close monitored' (Wang Y-G, 2003). What is more, on 16 October 2001, China Human Genomic Centre (CHGC) at Shanghai issued 'Ethical Guideline on Human Embryonic Stem Cell Research (Recommended Draft)' (Ethical Committee of CHGC, 2001). In Article 14 of this Recommended Draft, all hybrid embryonic research were banned regardless of the circumstance. Although being an institutional guideline, before Ministry of Health (MOH) and Ministry of Science and Technology (MOST)'s joined endorsement of the national guideline in 2003, this CHGC Guideline enjoyed great authority in representing China's regulatory stance.

During the year followed, Chinese stakeholders felt pressure and necessity to initiate a national guideline over stem cell practice. Meanwhile, hybrid embryos research was more accepted by international scientific mainstream on the condition that human-animal hybrid embryos remain for research purpose and not for reproductive reasons. A corresponding regulatory relaxation can be also found in the *Ethical Guidelines for Research on Human Embryonic Stem Cells (SC Guideline)* issued by MOH and MOST in 2003, in which, unlike the 'total ban' approach of the Recommended Draft, only the fusion of human and animal gametes was banned. Research such as injecting human somatic cell into an animal egg to create embryos up to 14-days (such as CHEN's research) was allowed.

In 2003, SHENG Huizhen, Chief Scientist for national 973 Program, published her findings and research details on human-rabbit hybrid embryos in *Cell Research* (Chen Y et al, 2003). This was the first time such research was published in a peer-reviewed journal. As controversial as the research itself, existing documentations and interview data on the consequence of this groundbreaking paper also consists of contradictory account. Some say it won SHENG world recognition. Some say it caused SHENG years of trouble. To be sure, SHENG didn't receive as overwhelming criticism as CHEN did two years ago. In fact, SHENG's publication received full support from Shanghai local ethical review board. According to *Nature*, SHENG's research also received a number of praises from international scientific community (Dennis, 2003). But there were also opposition to such research and many scientists kept their reservation. Doubts towards SHENG's work also generated from a common depiction that she settled for *Cell Research*, an 'obscure' China-based English journal, because it was originally rejected by more prestigious and discreet Western-based journals (Mandavilli, 2006; Fox, 2007: 340). SHENG, the then Chief Scientist commissioned by China's national 973 Program, was shield from much immediate criticism arise from within China. Yet two years after the *Cell Research* publication, at the

end of the 973 program, SHENG's contract with Shanghai Second Medical University (now the Shanghai Jiaotong University, School of Medicine) was not renewed. Financial, personnel and material support were removed.

Hybrid embryo research is one of the early examples, although probably the most prominent one, in how *international* opinions substantially changed the course of China's domestic research directives. To some extent, Chinese stakeholders' (regulator, ethicists and scientists) attitudes towards international scepticism were least defensive. Chinese regulatory stance drifted along with different opinions rose from Western countries. Foreign censures on CHEN's work in 2001 triggered CHGC's proposal on a total ban of such research. As the international mainstream start to develop differentiated view according to different types of hybrid embryos, a parallel acquiescence on fusion of human somatic cell with animal gametes was also shown in China's ministerial guidelines. Yet as such research was still considered as disputable, a similar research done by SHENG didn't receive follow-up support from the government.

Such regulatory approach might have seemed to be 'productive' at the time, as it removed international scepticism on China regarding this specific practice. Yet Chinese stakeholders' efforts in listening to Western concerns, following Western opinions, avoiding confrontations contributed little in promoting international understanding of research practice in China, let alone addressing a deeper global ambiguity towards China's research credentials. More importantly, as we will return to in the third section, in the long run, passive assimilation of international criticism has proved to be not enough for China to establish effective governance.

Phase II 2004-2006: 'Sir- China already has clear stem-cell guidelines'

After the initial disputes over hybrid embryo research and doubts over China's research ability, research findings from China's stem cell labs have increasingly made their way to English-speaking journals and international forums in the period of 2004 to 2006. Most observers of China's science development have shown reserved optimism towards China's life science. On the one hand, many commentators expressed that they 'would not be surprised if in five to ten years China becomes one of the leading nations in... therapeutic cloning and related research' (Yang X-Z, 2004), or how research progress in China 'amazed' their Western peers (Tomlinson and Adam, 2005). The most notable example of international recognition of China's progress is from the Global Watch Mission organized by UK's Department of Trade and Industry (DTI), in which a small group of UK experts visited key stem cell labs in China. In the Mission's final report, China was characterised as having 'highly motivated and enthusiastic research teams' and supported by 'superb infrastructure and equipment' (DTI, 2004: 48). Chinese stem cell researchers in particular were described as 'at, or approaching, the forefront of international, stem cell research' (DTI, 2004: 6). Meanwhile on the other hand, many Chinese observers also highlighted regulatory, structural and financial hindrances Chinese stakeholders must overcome if the pace of scientific advancement is to be maintained (Yang X-Z, 2004; UKSCI, 2005b; Murray and Spar 2006). In short, perceptions towards China stem cell research capability remained ambivalent (which to some extent, still exist today). This ambivalence was best captured in a commentary published in *the New England Journal of Medicine*: 'In the future, China may be a powerhouse in the international stem cell sector... But that future is not yet here' (Murray and Spar 2006: 1194).

A most high profile initiative from Chinese stakeholders in responding to international scrutiny during this period was a correspondence published in *Nature*, 2006 (Cheng et al, 2006). This letter was written in response to Jim Giles's (2006: 9) *Nature* article reporting a

conference held in the UK in discussion of improving research collaboration protocols. In this article, among the several countries' governing approaches towards stem cell were mentioned, China was described as 'lack[ing] clear national policies, with different institutes following different rules.' This paper was published on March 2nd 2006.

On reading this article, five most distinguished Chinese scientists and one bioethicist decided to together write a response. In short, it was a group of highly influential Chinese scientific elites, includes QIU Renzong, founder of China's modern bioethics, and Linzhao CHENG, Chinese professor at Johns Hopkins University who was awarded by China's National Natural Science Foundation for promoting US-China research collaborations in life science. Six weeks after Jim Giles' article, on April 20th, the letter signed by the above group appeared in *Nature*, titled '*China already has clear stem cell guidelines*':

Sir -- As scientists and ethicists who care about stem-cell research in China, we disagree with the statement in your News story "Panel clarifies stem-cell rules" (*Nature* 440, 9; 2006) that "China lacks clear national policies, with different institutes following different rules".

In fact, China's government has issued several guidelines to regulate human stem-cell research. These include guidelines on human assisted-reproductive technologies, issued by the Ministry of Health in July 2003, and ethical guidelines for research on human embryonic stem cells, jointly issued by the Ministry of Science and Technology and the Ministry of Health in December 2003. Both explicitly prohibit human reproductive cloning, and the latter is similar in principle to the guidelines proposed by the US National Academies (<http://www.nap.edu/books/0309096537/html>).

It is true that national policies on human stem-cell research in China are not laws. With some further improvement, however, we think they are adequate, as nearly all scientific research in China relies on government funding. There have been cases in China where a few medical practitioners have used human fetal tissues or cells to treat patients, without required government approvals or appropriate clinical trials. We believe that this practice is against commonly accepted principles of modern scientific research. Infringements are a matter of law enforcement against unapproved medical practices, as in any lawful and civilized country, and should not be viewed as unethical examples of human stem-cell research in China.

In contrast to the earlier communicative manner characterized by simple compliance with Western criticism or avoidance of disagreement, this 2006 correspondence is more critical and involves more substantial attempts in abridging different opinions. The authors first clearly stated they '*disagree*' with depiction of China stem cell research in *Nature*'s Jim Giles article. But they also acknowledged Western scepticism by admitting that '*it is true that national policies on human stem-cell research in China are not laws*' and current regulations need '*further improvement*'. What made this communicative initiative especially constructive is that scientists defended their view of Chinese regulation as '*adequate*' by elucidating existing policies and highlighting the context of specific funding mechanisms. That is the two national guidelines issued in 2003 and the fact that '*nearly all scientific research in China relies on government funding*'. What is more, they re-evaluated the criticisms that deflated the Chinese position, namely scientific infringements. They argued that the existence of wrongful conduct is not unique to China. In fact, the need to combat misconduct has universal appeal. Thus, the end of the letter offers a point where future resolution between China with the rest of the world can be constructed.

Of course, six Chinese individuals' swift response to *Nature* arguing '*Sir- China already has clear stem-cell guidelines*' cannot encompass *all* scientific communicative features emerged

in the period between 2004 and 2006. Neither can it be *representative* of the then estimated 300 Chinese scientists working in stem cell research (UKSCI, 2005a). Yet this quoted case, with leading figures in China's stem cell research responding to high profile international journal, does indicate to us a change in Chinese stakeholders' attitude towards cross-border communications.

Firstly, it is useful to be reminded that Jim Giles' article was not a China-focused commentary, but rather a China-related reportage. Yet the six Chinese authors took the initiative in voicing out their different view and acted promptly by having a respondent ready in the April 20th issue of *Nature*. To some extent, this suggests a heightened responsiveness. Secondly, unlike semi-institutional and governmental actions that handled the hybrid embryo dispute, the six Chinese authors, albeit highly influential and held key positions, came together to publish the letter as individuals. With a full acknowledgement of this correspondent as a non-representative single event, I would still like to point out a possible *indication* of individual stakeholders' increasing awareness of their leverage in reshaping China's scientific image rather than solely relying on governmental actions. Thirdly, it is worth highlighting that the letter is not simple acceptance other's claim, in which China's particularity is undermined, nor a mere justification of Chinese situation, in which others' concerns are overlooked. The correspondence letter rather resembled more of a two-way conversation, in which both sides' opinions were acknowledged and reflected upon. Fourthly, as pointed out earlier, the *Nature* correspondence indicated a more substantial communicative effort in reaching out and harmonizing different views. That is, in this short letter, Chinese authors not only stated their opposition view, but also provided further information on research situation in China and related it with a wider international community. Certainly they were of general depictions, nevertheless, it denoted a constructive rather than defensive manner.

Phase III 2007 - today: Recalibrating 'China' and the 'International'

On 5 September 2007, the UK's HFEA sanctioned licensing hybrid embryo research on basis of the new draft fertility bill passed by parliament (HFEA, 2007). This meant the UK officially endorsed scientists conducting cytoplasmic hybrid research, which was identical to Chinese scientist SHENG and CHEN's previous study. In leading up to this HFEA decision, SHENG was among the few experts outside Great Britain that were consulted by the UK government and was given a prominent position in its *Government Proposals for the Regulation of Hybrid and Chimera Embryos* (www.parliament.uk). UK's overturn on hybrid embryo ban and the subsequent creation of UK's first hybrid embryo on April 1st, 2008 (Walsh, 2008) made Chinese stakeholders revisit China's early endeavour. While China's early initiative on hybrid embryo was once again widely celebrated, Chinese stakeholders were also reminded of the irony of their early uncritical approach in responding to Western scepticism, which resulted in a disruption of such research in China (Zhang S-M, 2008; Wang D-P, 2008). As one of the newspapers pointed out, on visiting SHENG, 'the research once directed by SHENG was already put to a halt, and the whole research building already looks empty' (Ji S, 2007).

Thus, it was not surprising that when I visited Stem Cell Centre at Zhejiang University early 2008, the deputy director there reviewed the changes in China's science communication initiatives by commenting on the case of hybrid embryo research:

SHENG Huizhen was so unacceptable in China at that time... When others doubt about our results, we'd go apologize without thinking, even when we've done nothing wrong! ... It used to be like this: before [in the 1980s to early 1990s], whenever there is a foreign researcher, be it a distinguished professor, a lecturer, or just a research fellow, comes to visit, all university administrators came out to

welcome him. At that time, you feel really proud, because it is just very symbolic of how China has shifted [from self-closed society] to opening to the wide world. Then [in the 1990s], it seems pathetic, since sometimes it seems as if our only goal is just to make visitors happy, satisfy their needs, so as to attract more visitors... Now, we have learnt a much more reasonable attitude towards foreign visitors: we still very much welcome anyone to come and visit. But we are more attentive in promoting our own interests. We now have many more foreign visitors. We are more conscious on what we want to receive and how... Nobody hosts *the tenet* or *the best practice* of science... Things should be built on mutual benefits... Most of the overseas-returns are more confident in global academic communications, for they know what it was like out there, they know what foreign experts, or their supervisors, were like. (Scientist16, original emphasis)

What is highlighted in this respondent's account is how Chinese scientist conceptualised and re-conceptualized over the relation between 'China' and the 'international community' as scientific exchange developed. At the beginning of China's reform and opening-up policy, Chinese universities reckoned that the best insurance for research advancement was to be connected with the outside world. What made Chinese scientists '*really proud*' was the symbolism of how 'international experience', as something 'higher' than national experience, would benefit China. Chinese institutions sought effortlessly for the approval from their Western counterparts: '*make visitors happy, satisfy their needs, so as to attract more visitors*'. It seemed that communication with the outside world itself had intrinsic value. However, as scientific research and governance evolved, such approval-seeking communication became no longer effective, and seemed 'pathetic'. Scientist16 deemed China's early response to hybrid embryos was one of such example, in which Chinese scientists accepting foreign opinions '*without thinking*' and ready to give apologies whenever scepticism arises from more developed countries, '*even when [they]ve done nothing wrong*'. The international exchange between Chinese scientists and their Western peers resembles more of monologue dominated by an imagined authority of *the* international view. Yet as a growing number of researchers have acquired global experience and gained understanding of '*what it was like out there*', Chinese institutions started to realise that '*nobody hosts the tenet or the best practice of science*'. In other world, neither is foreign/Western opinions monolithic nor does it automatically posts supremacy towards local needs. To some extent, transnational exchange became more conversational in which local scientists and foreign visitors were both keen in voicing out their views. Scientist16 indicated that currently his institute, a key research base in Southern China, has become '*more conscious*' and '*more attentive*' in communicating local particularities with the international visitors.

Scientist16 is not alone in denoting a re-conceptualization of 'China' and 'International' through transnational research exchange. Many scientist interviewed have shared a similar views (Scientist 02, 06, 14, 21, 26). One professor, who was a partner in both China-US as well as China-EU collaborations, said conventional narratives depicting 'China' and 'foreign countries' are flawed:

We used to always speak of how 'foreign countries (*guowai*)' do research, but situation vary greatly among the 'foreigns'... Not all 'foreigns' are at the same level or of same interests. One can't just say how China is compared with others. It depends on which 'foreign' one is talking about (Scientist 04).

Scientist04 echoed Scientist16's view that in comprehending and comparing world research practice, one cannot simply demarcating 'China' from the 'foreigns' as two polarities, for the diversities within these categories may be as great as divergence between them. In Scientist04's words, '*it depends on which "foreign" one is talking about*'. Or, as another

junior researcher put it, '*it's true that China has things to be improved. But many phenomena are not just Chinese. They are the same in and outside China* (Scientist29).'

This more critical attitude towards Western opinions and the decline of an imagined authority once attached to the 'International' community did not result in Chinese stakeholders' insensitivity in addressing global concerns. Quite on the contrary, as some scientific governance research on China has suggested 'the absence of state regulations in the field of clinical stem cell research and application has not led to a "Wild East" regulatory constellation, but rather to broad variations in often individualized regulatory strategies by a variety of stakeholders' (Chen H-D, 2009: 279). In recent years, governance participation and contribution in China seems to have been initiated at multiple levels.

At the ministerial level, during a joined event hosted by BIONET and UK Medical Research Council in London on 3 September, 2009, former Deputy Director-General of WHO, HU Qingli, stated that on recognizing an international expectation as well as domestic need for China to further improve its life science governance, China's Ministry of Health (MOH) had launched a series of research program and policy-consultation proceedings to prepare for future promulgation of directives. What is most noticeable is that, according to HU, for the first time, MOH extended its policy-making consultation base beyond established institutions and have included substantial discussions from domestic religious groups, women societies and other interest-related groups. The same initiative was also pointed out by renowned scientist WANG Yifei, another BIONET participant, who was commissioned in 2008 by MOH to conduct nation-wide survey among professional groups to better accommodate international ethical principles with Chinese particularities.

At a non-governmental collective level, the most prominent case is the development of China Spinal Cord Injury Network (ChinaSCINet). Founded in 2004, ChinaSCINet was initially a relatively loosely organized network containing 22 centres in China, mainly concerning using stem cells to treat spinal cord injury. Up to 2007, opinions on ChinaSCINet and clinical trials carried out by its members have been mostly sceptical if not negative (Enserink, 2006; Singer, 2006; Johnson, 2008). Apart from widely-shared doubts that conducting experimental therapies in China is to bypass stringent research regulations in more developed countries, there were also scientific disputes over its credibility and interpretation of clinical results (Watt, 2004, Cyranoski, 2005, 2006). Initially, the founder of the Network, Wise Young reportedly expressed his indifference in responding to international speculations on Network members' research practice by saying, '*as long as they [media/Network members] don't throw it into my face, I am not going to investigate*' (Qiu J, 2007: 59). Yet a couple of years later, in order to push their research forward, Young and his colleagues realised the need to ensure public confidence as well as professional reputation. Young and his colleagues started to invest their efforts in influencing professional culture '*from within*', namely by training and setting up internal standards within the Network (Cyranoski, 2007). Such efforts were recorded more in detail by *Lancet* correspondent Jane Qiu in 2009:

To ensure a high standard, all participating centres in ChinaSCINet must be certified with Good Clinical Practice—international guidelines on how clinical trials should be run, including procedures for informed consent and ethical reviews. As part of the capacity-building initiatives, ChinaSCINet organises regular training workshops, in which experts from around the world gather to teach and standardise the assessment of sensory and motor functions in patients with spinal-cord injury, cell transplantation, and other surgical methods, as well as rehabilitation techniques (Qiu J, 2009: 606).

In contrast to Young's initial indifference to external opinions, ChinaSCINet became keen on formulating '*international guidelines*', '*standardise... surgical methods as well as rehabilitation techniques*'. This group of scientists are not only keen on adherence to existing professional codes of conduct, but also '*regular[ly]*' organise events pooling expertise from within the Network so as to promote its own harmonization of research practice. Such initiatives have already yielded some result. A similar professional organization based on China's experience was replicated in the US, as the North American Spinal Cord Injury Network was launched in March 2009. Wise Young has also filled for US FDA approval to undertake a phase III trial in the North America based on previous studies carried out by ChinaSCINet. Stephen Minger from King's College London comments that 'Regardless of the outcome of the clinical trials, it will be a significant achievement to demonstrate that this can be done in China.....To have a stem-cell trial approved by the FDA based on studies in China would be rather extraordinary.' (Minger in Qiu J, 2009: 607)

In addition to institutional and collective efforts, at an individual level, Chinese scientists have also been identified as 'among the architects of the International Society for Stem Cell Research' (Henderson, 2007), which promulgated an international *Guidelines for the Clinical Translation of Stem Cell Research* (ISSCR, 2008). A changing perception on China's stem cell research is captured by *The Times*' science editor Mark Henderson's remark:

Chinese medical research still has a way to go to address all the concerns of Western scientists. But at least where stem cells are concerned, the Wild East has become an out-of-date cliché (Henderson, 2007).

When taking into account of China's engagement in transnational communication in earlier phases, this altered perception of China from a regulatory vacuum where anything goes to 'Wild East has become an out-of-date cliché' is not only due to an increase in the mutual knowledge between China and the International. It is also largely due to attentiveness in local stakeholders, such as Chinese scientists, ethicists, in disseminating, interpreting, and *making use of* such knowledge. There are four points worth highlighting:

Firstly, in the last decade, *international* opinions were not just 'views of the others' or 'opinion of the outsiders', but has been incorporated into China's domestic scientific regulation. In other words, Chinese governance on research has been shaped both by national factors and debates in the global scientific community in the three phases, albeit to varying degree and with different approaches.

Secondly, the awareness of global trends and different opinion from outside China has triggered scientists interviewed to re-conceptualise 'China' and the 'International' and to re-calibrated their research activities. Scientists interviewed did not presume there is a best canon to monitor research practice. Rather they exhibited a reflexive initiative of what Latour (2003: 36) noted as the 'heightened awareness' of how it is 'impossible' to attain 'full control' cross the diversity of social circumstance. This pushed Chinese stakeholders to compare, verify, reflect, accommodate and adapt one's action amongst a diversity of international perspectives, MOH's new policy-consultation initiatives, local research groups' conscious in promoting mutual interests with their global peers and researchers were such examples.

To some extent, China has 'internalized' some of the global experiences. To put it in another way, one could discern traces of international concerns been assimilated into China's governance on life science in the last decade. During the period between 2000 and 2003, regulatory adjustments were quite drastic. Domestic evaluation and attitude towards research

suggested a high correlation with Western opinions. Chinese policy and institutional support over hybrid embryos research submissively followed international discussion and passively avoiding cross-border confrontation. Yet data also suggests some change China's transnational communications in recent years. This leads to my third point:

Thirdly, as international exchanges develop, not only did interviewees become more analytical in receiving Western opinions, but they started to employ more constructive endeavours in responding to different views. Instead of blindly following Western criticisms '*without thinking*' (Scientist 16), communicative effort with the awareness of bridge-building can be seen from the case of *Nature*'s correspondence submitted by six key figures in Chinese life science field. But it is more noticeable recently when such endeavour can be found at different levels. Whereas in the hybrid embryo dispute, China's response was least defensive and avoided confrontation, in the case of ChinaSCINet's experimental therapy, scientists involved seemed to have become more open but persistent. That is to say, not only did they carried on with their research, but they also reached out to 'experts from around the world' (Qiu J, 2009: 606) to discuss their research and subsequently contribute to setting international standardization of such practice.

Fourthly, in contrast to the early phase, where institutions and ministries seemed to play a dominate role in responding to transnational scepticisms, currently, non-governmental groups (such as ChinaSCINet) as well as individual scientists have emerged as new agents in shaping international codes of conducts (such as therapeutic standards and ISSCR Guidelines).

Taking all of the above arguments together, to some extent, one could argue that there seems to be signs of cosmopolitanization emerging within China's scientific community. But it is equally important to bear in mind that 'cosmopolitanization' is a process in China, as in many other countries, that has just begun. Chinese stem cell scientists are still probing their way in how to best communicate in the international space with people coming from different value systems. It is still too soon to tell how the change in governance approach will affect scientific practice in the long-run. And it is still premature at this stage to evaluate to what extent the Chinese and international research communities interpenetrate in formulated mutually accepted principles.

Conclusion

The recognition of collaborative imperatives has brought together research teams from different parts of the world. Shared online databases, email, telephone, personnel exchange, international forums or academic publications, the variety of communication channels have almost announced the 'death of distance' (Cairncross, 1997) in the scientific world. As China is striding along the path of scientific development with determination and initial success, a key concern confronted by international scientific community is how China, a rising scientific power, will transform existing global scientific atlas. Is the world entering a Chinese century in the knowledge economy (Dahlman and Aubert, 2001)? Or is it true that 'China will only be able to truly compete with the West if it becomes more like us (the West)' (Hutton, 2007: 61)?

This study is not intended to provide a definite nor comprehensive answer to this question. But it contributes to current debate by investigating how cross-border scientific exchange has been reflected and acted upon by Chinese stakeholders. Empirical findings of this research do not support the revisionist-status-quo dichotomy. Rather it indicates to us a more complex process in which transnational communication has been more of a mutual learning experience. Data suggests Chinese stakeholders not only recognized the sameness and

differences of scientific norms among China and other parts of the world, they also, to various degrees, employed such knowledge into guiding their daily research practice. The Chinese experience is also indicative in how the practice of science has changed and how it calls for a corresponding shift in stakeholders' outlook. Data suggests that in the last decade, there emerged a fragmentation of social authorities and diversification of communication channels in mediating international scientific progress. China's life science has experienced a shift from government-led monolithic response to current individualised, sometimes network-based approach in influencing global norms. Consequently, in comprehending world R&D advancement, the question has become less of how *nation-states* see themselves as strategic competitors or collaborative partners, but more of how institutions, professional associations, companies, research groups or even individuals situate, present and promote themselves *beyond* national borders but among a global of actors. Traditional nation-state perspective may still be informative, but a sole reliance on such framing may no longer fully reflect the R&D reality.

The social space is what commonly perceived as 'messy'. This research's proposition of using the term 'cosmopolitanization' to encapsulate emerging phenomena in China's ongoing global exchanges is not to end this messiness nor does it intend to suggest a kind of 'balance' within this disorderliness. Quite on the contrary, cosmopolitanization is a process that takes place amid the clashes and conflicts between different social spheres. It affirms the continuity of divergence, the coexistence of differences and the reality of power imbalance. But it also signifies to us the possibility (in some of the Chinese sites the author visited, a reality) of how social actors re-conceptualize and reconstruct the connection between local and global practice and to translate such knowledge into day-to-day undertakings in pursuing shared interests.

It is important to note that this study is in no way suggesting an all-encompassing account of Chinese scientific ethos, nor is it suggesting a uniform description that *all* Chinese scientists or *all* Chinese regulators have employed the same communicative approach. To be sure, in many aspects China is still 'looking-up' to Western countries. But it is worthwhile to indicate that the 'cosmopolitanization of science', a seemingly theoretical logic seems to be coincided with the situation on the ground, as what was summarised by Scientist 16, 'we still very much welcome anyone to come and visit. But we are more attentive in promoting our own interests. We now have many more foreign visitors.' Chinese scientists interviewed seems to have grasp the idea that the best way to gain one's influence in a global conversation does not only lay in being an open-minded listener, but to also 'create the means by which they gain voice across borders' (Bohman, 2007:189) and are able to have their say heard.

So what are the implications of a cosmopolitanization process for China? And how will this research help us in comprehending China's scientific development? For stakeholders based in China, the development of the life sciences in the last decade alerts us to the fact that generous national investment, a permissive regulatory environment and governmental responses alone do not suffice in addressing the messy, nonlinear nature of contemporary innovation. Should China become a global scientific champion, infrastructures that constitute broader policy-making deliberations, encourage input from new entrants (such as ChinaSCINet) and facilitate free communication within and across conventional boundaries should be sustained and enhanced. For China observers and R&D stakeholders outside China, one important message from China's experience is that the old single-focus (mostly government-focus) approach in assessing China's scientific capacity has become obsolete. Few would deny the fact that the state is still a crucial actor in global negotiation and ensuring local compliance of global treaties. Yet the interconnectedness among states, or the local and the global, has become multifaceted. Subsequently, to perceive, evaluate or

influence scientific practice within China would also require the employment of a matching multi-layer paradigm.

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