

Finn Aaserud

A Complementary Relationship: Niels Bohr and China*

Niels Bohr's relations with China go back at least to 1937, when he finally made his long-planned trip around the world. Before, there had been only one Chinese physicist visiting Bohr's institute since its establishment in 1921. The guest was P.Y. Chou – Zhou Peiyuan 周培源 (1902–1993) in Chinese – who visited in 1929 and was later to become a prominent physicist in China. As was his habit on long trips, in 1937 Niels Bohr (1885–1962) brought one of his sons in addition to his wife Margrethe (1890–1984). Their oldest surviving son, Hans (1918–2010), who was 19 years old at the time, wrote a fairly detailed diary (in Danish) during the trip, which in 2008 was published privately by the Bohr family (cf. Bohr 2008).

From 19 to 20 May the three sailed from Nagasaki in Japan to Shanghai in China. In his diary Hans Bohr reports that on their departure a Japanese physicist colleague bid farewell with the words: “Now you are going across to the country from where we have all our culture in Japan.” This was quite a statement at a time of considerable tension between the two countries.

Niels, Margrethe and Hans stayed in China from 20 May to 7 June, visiting Shanghai, Hangzhou, Nanjing, and Beijing. One of Bohr's pastimes was to record colour movies with the camera that he had received as a gift on his trip around the world from Kodak in the United States.¹



Niels Bohr and his family at the Great Wall of China, 1937



Bohr presenting his research in China, 1937

* The contribution in hand is a slightly modified version of the speech, Finn Aaserud, Director of the Niels Bohr Archive in Copenhagen, delivered on the occasion of the Niels Bohr Donation Ceremony at the *Copenhagen Business Confucius Institute* on 17 April 2015. Six sets of the Chinese language version of *Niels Bohr Collected Works* (Chin. title: *Ni'ersi Bo'er ji* 尼耳斯 玻尔集) were donated as gifts to selected European and Chinese institutions.

¹ The film has been digitized and can be watched on application at the website of the Niels Bohr Archive.

The three did considerable sightseeing and shopping. Furthermore, Niels Bohr met a number of physicist colleagues and gave several talks on nuclear physics and complementarity. The only reference to Chinese philosophy in Hans's diary is from his father's talk at one of the dinners that they were invited to:

Father gave his thanks and spoke about what a great pleasure it was for him and us to come to this country, which all children around the world dream about, about the origin of science in this country, and about the deep philosophy that in its own way had arrived at difficulties similar to those now encountered in physics.

No doubt, Bohr had several discussions with both physicists and philosophers in China that are not reported in Hans's diary.



Colleagues across cultures: Niels Bohr at a meeting with Chinese physicists in China, 1937

Controversial Connections: Continuing the Cooperation

The connection with China was continued by Niels Bohr's physicist son Aage Bohr (1922–2009), whose work in nuclear physics in the 1950s brought him a Nobel Prize in 1975. Aage visited China in 1962, when the political situation there had changed dramatically since his father's visit, and when the relationship between China and the West was severely hampered by the Cold War. As Chinese historians of science have recently described (Yin 2012; Yin/Wang 2013), the visit led to an unprecedented agreement with the Chinese Academy of Sciences, according to which young scientists from China would be allowed to make extended visits to Bohr's institute in Copenhagen.

This was not unproblematic. In the conservative Danish Press, Aage Bohr and his institute were accused of helping Mao's China, which was not yet a member of the United Nations, to make an atomic bomb. Aage Bohr, on the other hand, rightly considered his efforts as a continuation of his father's efforts beginning in the Second World War to establish an "open world" among nations, which he considered necessitated precisely by the existence of the atomic bomb.

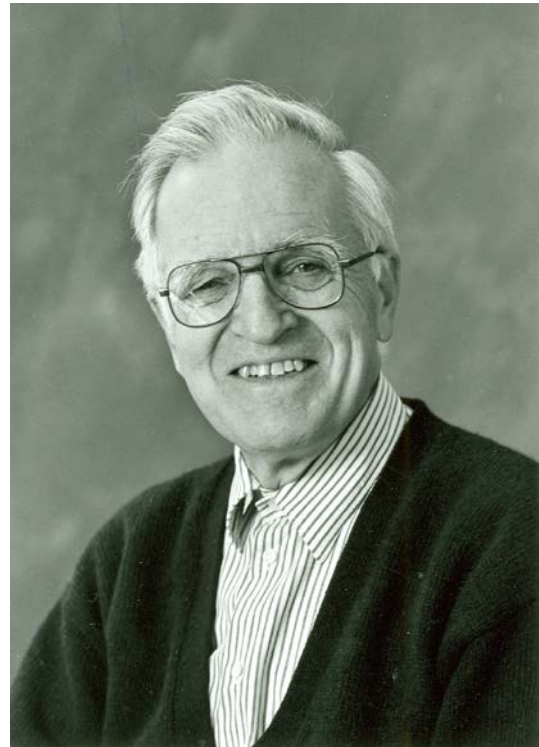
One of the first two Chinese physicists to arrive in Copenhagen in 1963 was Yang Fujia 杨福家, incidentally a close friend of Professor Ge Ge 戈革 (1922–2007), who would later translate the *Niels Bohr Collected Works* into Chinese, and whom I will return to. Yang Fujia is presently serving on the new Scientific Advisory Board of the Niels Bohr Archive.

Aage's 1962 visit signified a generational change in Copenhagen, as Niels Bohr died while his son was in China. Upon his return, Aage took over the directorship of the institute that, as mentioned, had been created for his father in 1921.

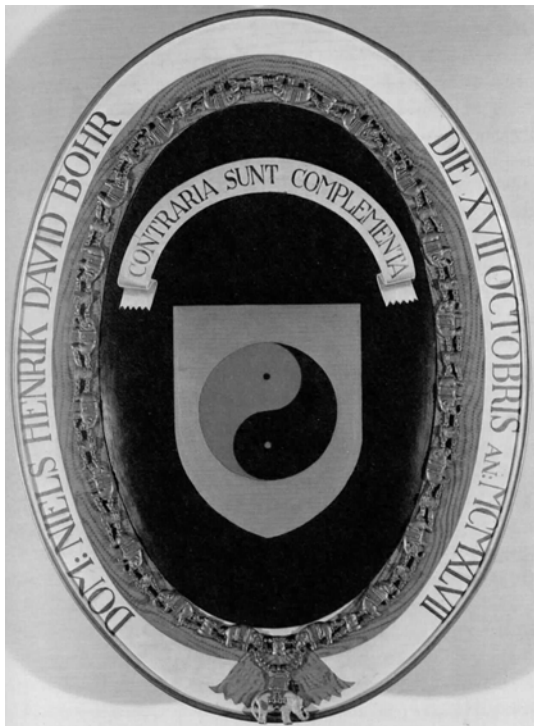
After Aage Bohr's visit, there was a thaw in the relationship between China and Bohr's institute, as can be seen from the growing number of Chinese visitors. Whereas from 1937 to 1960 there had been only two more such visitors, in the 1960s as many as eight Chinese physicists visited Bohr's institute, some for substantial periods of time.

Complementarity: Oriental Influences?

Niels Bohr presented his famous complementarity idea for the first time in 1927. After it had been originally formulated as a basis for the interpretation of the new and revolutionary quantum mechanics, which constituted a significant break with classical physics, Bohr sought to expand the idea to other fields, such as psychology, biology, and sociology. Beginning in the 1950s he sometimes connected the idea to Oriental philosophy, relating in particular his famous and often-repeated statement that "we are both actors and spectators in the great drama of life" to Oriental thinking. The clearest indication that Bohr related his complementarity idea to Chinese philosophy is his decision to use the yin-yang symbol as the coat of arms for the highly prestigious Danish Order of the Elephant, usually given exclusively to royalty, which the Danish king bestowed upon him in 1947 on his ascent to the throne.



*Following in his father's footsteps:
Physicist Aage Bohr*

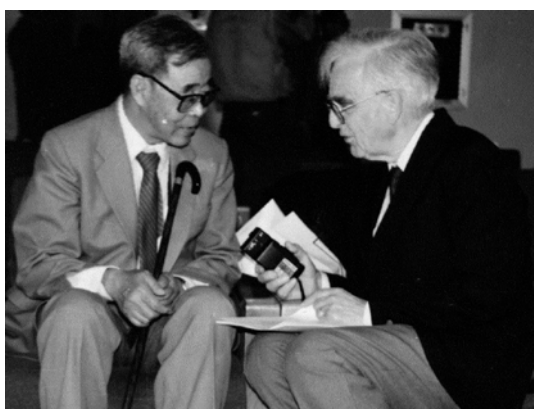


Yin and yang at the center: Niels Bohr chose to include the ancient Chinese symbol in his coat of arms, when he received the Danish Order of the Elephant in 1947

Much has been speculated with regard to the relationship between complementarity and Oriental philosophy. Was Bohr influenced by such thinking already when he formulated the idea, or did his suggestion of a relationship come only gradually? Are Oriental people more apt to accept the idea, as Bohr's collaborator Léon Rosenfeld (1904–1974) has suggested, not being corrupted by Aristotle's philosophy? Is there indeed a clear relationship between Bohr's complementarity concept and the ideas of the old Chinese philosophers? In his talks and publications, the Chinese translator of Niels Bohr's *Collected Works* answers all of these questions with a resounding "No!" He even claims that he has been unable to find Bohr's statement about actors and spectators anywhere in the works of Chinese philosophers (Ge 1999) Historians of science disagree about the answers to the above question, and the issue will probably not ever be resolved.

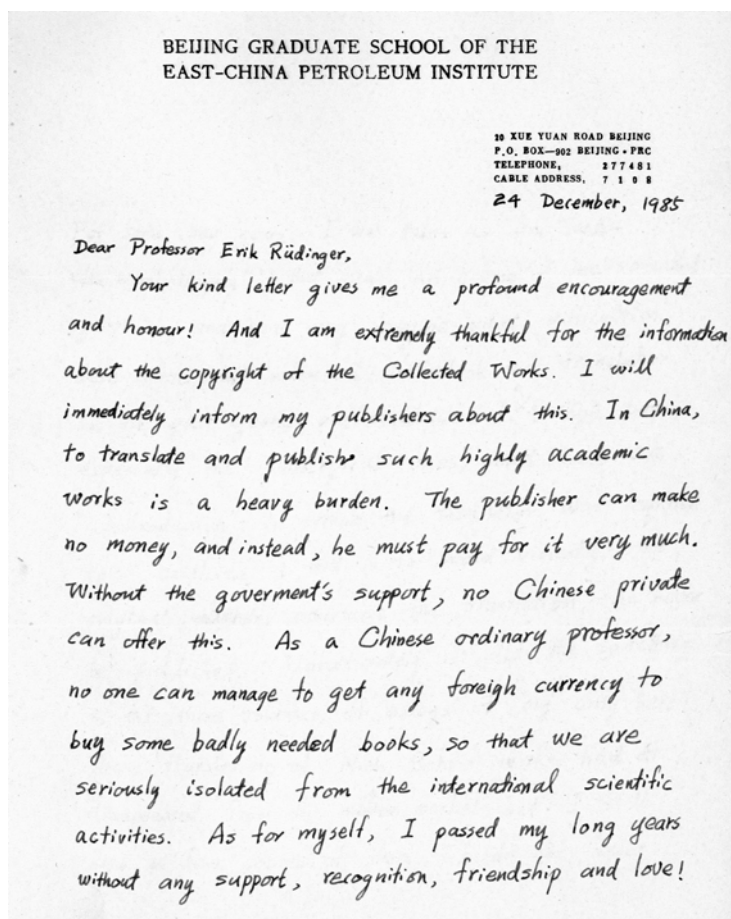
Of Collected Works and Bronze Statues: Promoting Niels Bohr in China

In spite of his view that Bohr's complementarity idea cannot be seen as originating from Oriental philosophy, Ge Ge found Bohr's personality and mode of thinking in harmony with traditional Chinese culture, which may be part of the explanation for his lifelong dedication to Niels Bohr and his work, and his great effort to translate



Professor Ge Ge, the Chinese translator of Niels Bohr's Collected Works, with the physicist's son, Hans Bohr, who once went to China with his father

and publish the only non-English edition of the *Niels Bohr Collected Works* in existence today. The first volume in English had appeared in 1972, and Ge Ge was able to publish a Chinese translation in 1986, fourteen years later. Prior to this he got in touch by letter with my predecessor as Director of the Niels Bohr Archive, Erik Rüdinger (1934–2007), who in this position was also General Editor of the *Bohr Collected Works*. The letter reproduced here is the first of many letters from Ge Ge that have been retained at the Niels Bohr Archive. It expresses well his courage, independence – and his impatience.



Independent, courageous, impatient: One of Ge Ge's many letters to Erik Rüdinger, Director of the Niels Bohr Archive

Although the publication of the *Collected Works* in Chinese started late in relation to the English-language publication, it did not take many years until Ge Ge had translated all the volumes so far published and expressed impatience about receiving the next volume to be published, so that he could continue his translation. Ge Ge's enthusiasm not only led to the *Collected Works* being published with impressive promptness in China, but no doubt provided additional motivation for the Director of the Niels Bohr Archive to prepare the volumes faster. In this way, Ge Ge had an influence even on the publication of the original edition.

Ge Ge paid three rather extensive visits to the Niels Bohr Archive, in order to consult the archival materials there and to acquaint himself with the publication of the *Collected Works* which he had started translating. The first visit, from September 1988 to February 1989, took place shortly before I took over as Director of the Niels Bohr Archive. As the correspondence between them shows, Ge Ge was greatly venerated by my predecessor as the Archive's Director, Erik Rüdinger, who hosted this visit. At the next two visits, from September 1991 to March 1992 and from March to September 1994, I had the privilege of being Ge Ge's host my-



Remembered in bronze: Statue of Niels Bohr at the East China Petroleum Institute in Beijing



Memorial room for Niels Bohr at the East China Petroleum Institute

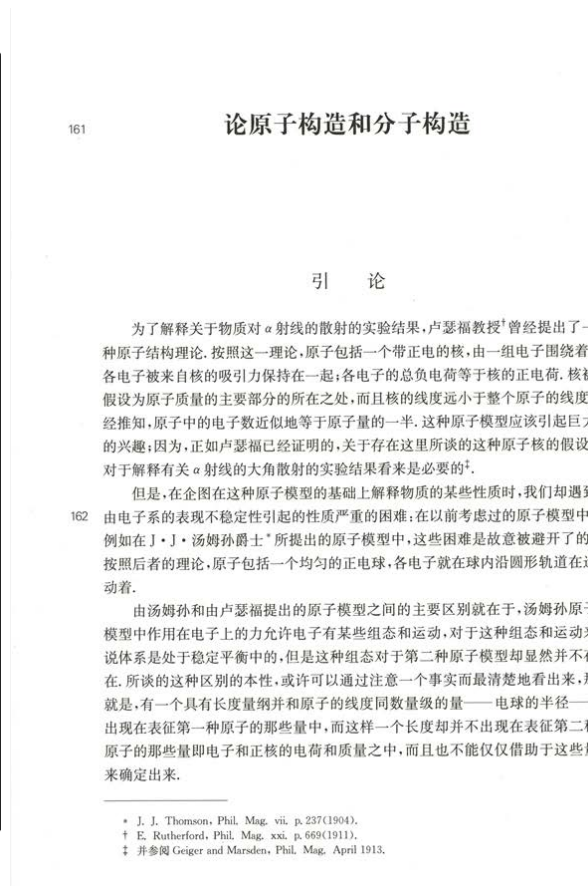
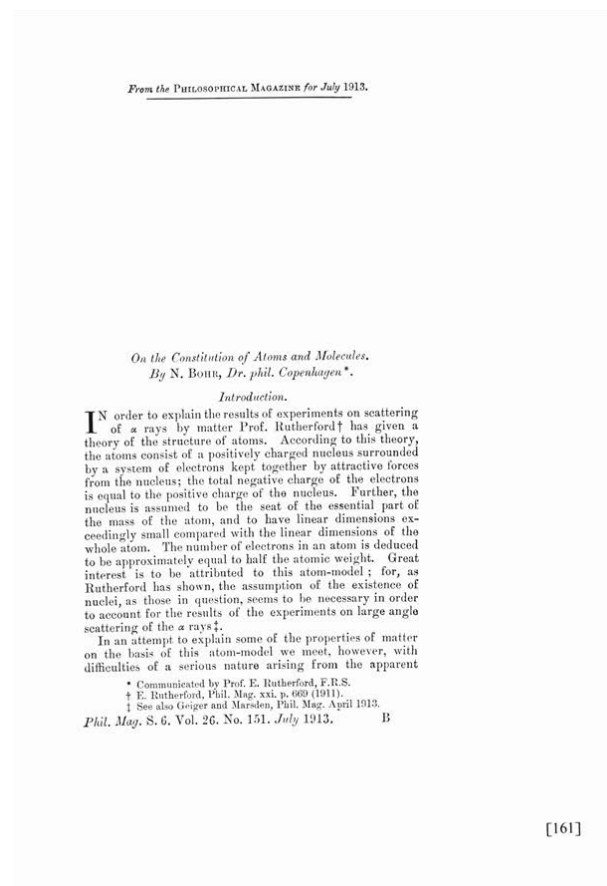
self. It was an educational experience also for me to learn from Ge Ge about his extensive knowledge of Chinese culture.²

Ge Ge's promotion of Bohr in China went beyond publishing the translation of the *Collected Works*. At the 100th anniversary for Niels Bohr's birth in 1985, Ge Ge arranged for a statue of Bohr to be made and set up at the East China Petroleum Institute, where Ge Ge was professor of physics. The bronze statue was impressively made by the Chinese artist Tian Yuemin 田跃民 on the basis of photographs. We have a miniature of the statue, also in bronze, at the Archive – undoubtedly the heaviest package we have ever received by air mail! In connection with the inauguration of the statue at the East China Petroleum Institute, a memorial room for Niels Bohr was also established there.

In 2001 Ge Ge received the prestigious Danish Order of the Dannebrog “for his contribution to increasing the Chinese understanding of Danish science and promoting the Denmark-China scientific cooperation.” He was in fact able to translate all the volumes of the *Collected Works*, the last volume of which was published in English in 2006. It testifies to Ge Ge's dedication that he enthusiastically went on with the work in spite of having lost his eyesight; he died the following year. Thus, Ge Ge could never see the publication of the completed *Bohr Collected Works* in the Chinese language. Through undoubtedly great efforts – of which I do not know the details – not least by Ge Ge's daughter, a new Chinese edition of the entire *Collected Works* of Niels Bohr has now come out. It is printed on much higher-quality paper than the original edition.

² Professor Ge's visits were sponsored by physicist and Vice Chancellor of the University of Copenhagen, Ove Nathan, and funded by the Daloon Foundation (now the S.C. Van Foundation) and the Sonning Foundation.

Marking this special occasion, not only do we celebrate the publication of that new, improved Chinese edition of the *Niels Bohr Collected Works*, but also – and just as much – the dedicated personality and scholar, Professor Ge Ge, who made its publication possible in the first place.



Page from Volume 2 of the Niels Bohr Collected Works, on which starts the first part of Bohr's famous trilogy from 1913, introducing what later became known as the "Bohr Atom"

References

Bohr, Nils (2012) *Ni'ersi Bo'er ji* 尼耳斯 玻尔 集 [Niels Bohr Collected Works], ed. and transl. by Ge Ge 戈革, Shanghai: Huadong shifan daxue chubanshe.

- Vol. 1/第一卷: *Zaoqi zhuzuo (1905–1911)*
早期著作 (1905–1911)
[Early Works (1905–1911)]
- Vol. 2/第二卷: *Guanyu yuanzi wulixue de zhuzuo (1912–1917)*
关于原子物理学的著作 (1912–1917)
[Work on Atomic Physics (1912–1917)]
- Vol. 3/第三卷: *Duiying yuanli (1918–1923)*
对应原理 (1918–1923)
[The Correspondence Principle (1918–1923)]
- Vol. 4/第四卷: *Zhouqi xi (1920–1923)*
周期系 (1920–1923)
[The Periodic System (1920–1923)]
- Vol. 5/第五卷: *Liangzi lixue de chuxian (yi 1924–1926 nian wei zhu)*
量子力学的出现 (以1924–1926年为主)
[Emergence of Quantum Mechanics (mainly 1924–1926)]
- Vol. 6/第六卷: *Liangzi wulixue de jichu (1926–1932)*
量子物理学的基础 I (1926–1932)
[Foundations of Quantum Physics I (1926–1932)]
- Vol. 7/第七卷: *Liangzi wulixue de jichu (1933–1958)*
量子物理学的基础 II (1933–1958)
[Foundations of Quantum Physics II (1933–1958)]
- Vol 8/第八卷: *Daidian lizi zai wuzhi zhong de chuantou (1912–1954)*
带电粒子在物质中的穿透 (1912–1954)
[The Penetration of Charged Particles through Matter (1912–1954)]
- Vol. 9/第九卷: *Yuanzihe wulixue (1929–1952)*
原子核物理学 (1929–1952)
[Nuclear Physics (1929–1952)]
- Vol. 10/第十卷: *Wulixue yiwai de hubuxing (1928–1962)*
物理学以外的互补性 (1928–1962)
[Complementarity Beyond Physics (1928–1962)]
- Vol. 11/第十一卷: *Zhengzhi luntan (1934–1961)*
政治论坛 (1934–1961)
[The Political Arena (1934–1961)]
- Vol. 12/第十二卷: *Tongsuhua yu ren (1911–1962)*
通俗化与人 (1911–1962)
[Popularization and People (1911–1962)]

- Bohr, Hans (2008) *Nogle erindringer om familien* [Some memories of the family], Copenhagen: Bohr Family.
- Ge, Ge 戈革 (1999) “Niels Bohr and Oriental Culture”, in: *Shi qingshi wenzhou* 史情室文帚, Beijing: Zhongguo gongren chubanshe, pp. 582–596.
- Yin, Xiaodong 尹晓冬 (2012) “Danmai wulixuejia Ao’ge Bo’er 1962 laihua shimo ji yingxiang” 丹麦物理学家奥格玻尔1962年来华始末及影响 [Danish Physicist Aage Bohr’s 1962 visit to China and its Impact], in: *Ziran kexue shi yanjiu* 31:3 (2012), pp. 329–342.
- Yin, Xiaodong 尹晓冬 and Wang Zuoye 王作跃 (2013) “1963 nian Zhongguo wulixuejia fu Danmai Bo’er yanjiusuo fangwen yanjiu de lishi kaocha” 1963年中国物理学家赴丹麦玻尔研究所访问研究的历史考察 [A Historical Study of Chinese Physicists’ Visits at the Niels Bohr Institute of Denmark in 1963], in: *Ziran kexue shi yanjiu* 32:4 (2013), pp. 470–490.