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Some Notable Chinese in Dublin in the Mid-Twentieth Century

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Abstract: The careers of three Chinese physicists, Hu Ning, Ma Shijun, and Peng Huanwu at the Dublin Institute for Advance Studies in the 1940s, and later, are described. A brief history of the foundation and operations of the institute, as well as the roles in it of Erwin Schrödinger, Walter Heitler, Max Born, and others are included. Some details are given of the works carried out there. The three men's post-institute careers are described, Ma eventually in Australia, and Hu and Peng in the People's Republic of China where they became distinguished leaders of theoretical physics research.

Keywords: Dublin Institute for Advanced Studies, Éamon de Valera, Erwin Schrödinger, Paul Dirac, Max Born, Walter Heitler

摘　要：20 世纪 40 年代，胡宁、马仕俊和彭桓武三位中国物理学家在都柏林高等研究院从事研究工作，他们在此之后的职业生涯也具有研究价值。埃尔温·薛定谔、瓦尔特·海特勒和马克斯·玻恩等人在都柏林高等研究院的创建和运营过程中发挥了重要作用。研究院的各项研究工作同样值得深入探讨。在离开研究院后，马仕俊前往澳大利亚发展，胡宁和彭桓武则成为中华人民共和国理论物理研究的杰出领军人物。

关键词：都柏林高等研究院，埃蒙·德·瓦莱拉，埃尔温·薛定谔，保罗·狄拉克，马克斯·玻恩，瓦尔特·海特勒

1 Introduction

There are not many accounts by, or concerning, Chinese people in Ireland earlier than the last half of the twentieth century. Among the few reports we have of Chinese in Dublin is the 1953 book, *The Silent Traveller in Dublin* by the calligrapher and

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artist Chiang Yee 蒋彝 (1955), an account of visits to Dublin in 1938 and 1948. Chiang, however, related very much to the Ascendancy class in the country—he was the guest of the Earl and Countess of Longford—and although the book contains some of the author's lovely engravings of sites in the city, it does not tell us much about the interaction of the natives with an oriental visitor. Mention is made of a waitress giggling that she "had never seen a Chinaman before" and, in a bird market, youngsters staring at him "as if I were a bird" (Chiang 1955, 123, 49), observations that would suggest a rarity of people like him in the city in those times.

An entertaining report on an extended stay in the 1950s is *Tall Tales and Misadventures of a Young Westernized Oriental Gentleman* by Goh Po Seng (吴宝星, 1936–2010), a Malayan Chinese, which is an account of his student days there (Goh 2015; O'Sullivan 2015). Mr. Goh arrived in 1953 and stayed for about ten years, devoting much of his time to consorting with artist types and writing poetry, but eventually qualifying as a medic in University College Dublin. He seems to have spent much of his time carousing with poets and actors, and gives the impression of being fully assimilated from the day of his arrival. There were other occasional Chinese students in the city at the time. Goh mentions interacting with some Malayan Chinese students but indicates that they kept very much to themselves. Chinese restaurants, a later focus for Chinese immigrants, especially from Hong Kong, seem not to have been established until about 1957.

All of the above is by way of introducing the fact that there were at least three notable Chinese in Dublin between 1940 and 1950 in the persons of Ma Shijun (Ma Shih-Tsun or S. T. Ma 马仕俊, 1913–1962), Peng Huanwu (Peng Hwan-Wu or H. W. Peng 彭桓武, 1915–2007), and Hu Ning (N. Hu 胡宁, 1916–1997), three physicists working or visiting at the Dublin Institute for Advanced Studies. The latter two were to play an important role in physics in China post-1949. We will look at their lives in Dublin—the academic aspects, via their collaborators, much easier to assess than their personal lives—and, briefly, at their subsequent careers, and comment on them.

2 Dublin Institute for Advanced Studies (DIAS)

The Dublin Institute for Advanced Studies, an institute that is still very active, was established in 1940—for a history of it, see for example Moore's (1989) *Schrödinger*. Featuring Schools of Theoretical Physics, Celtic Studies, and later Cosmic Physics, it was largely the brainchild of Éamon de Valera, the Taoiseach (head of the Irish government) in the late 1930s. De Valera had been a mathematics teacher and had formed a great love for the subject. He had also formed a great admiration for William Rowan Hamilton (1805–1865), Ireland's most distinguished mathematician and mathematical physicist. A leading figure in the anti-British nationalist movement in the

country, de Valera was also an enthusiast for the restoration of the Irish language, hence the inclusion of a School of Celtic Studies—we will not elaborate further on this aspect. After de Valera had secured an essential independence for the Irish state with his 1937 constitution, he could undertake projects that would reflect well on his native land. Becoming aware of the Institute for Advanced Studies founded in 1930 in Princeton in the United States, devoted to mathematics and theoretical physics, he persuaded the government to approve the setting up of a similar institute in Dublin. It was not a project that would immediately contribute to the country's many problems, and he did not have a great cohort of support for it, but by the force of his personality he managed to convince the Dáil (parliament) to approve and fund it. He also had few advisors in the matter, as there were not many in the country with relevant qualifications. The main one was Arthur W. Conway, FRS, professor of mathematical physics in University College Dublin (UCD)—familiar to undergraduates for the Rodriguez-Conway formula for Legendre polynomials. He had written on electromagnetism, relativity, and quantum theory, and had co-edited Hamilton's papers. Another was the professor of mathematical physics at Maynooth College (about twenty-five kilometers from Dublin), Pádraig de Brún, who held a Doctor of Science (DSc) degree in mathematics from the Sorbonne—a polymath. He also had a deep interest in Celtic studies. Finally, there was the important figure of Edmund T. Whittaker, FRS, a sometime director of Dunsink Observatory near Dublin, a former teacher of de Valera's who remained a close friend and was now the professor of mathematics in Edinburgh. His colleague, as professor of physics (natural philosophy), was Max Born, the distinguished cofounder of the Göttingen school of quantum mechanics.[1]

What really triggered the idea into reality was the existence of a potential director for a school of theoretical physics in search of an institute rather than an institute in search of a director. The plight of Professor Erwin Schrödinger, in exile, jobless and at a loose end, came to de Valera's attention via a newspaper report in early 1938 (Wayman 1987, 207). He wrote to Whittaker in the matter, and he established that Schrödinger was in Rome, after fleeing his native Austria when the Nazis took over that year. De Valera, who at the time was Chairman of the League of Nations Assembly in Geneva, interviewed Schrödinger there in November. With Conway's help he arranged some short-term financial support at the UCD, and later via the Royal Irish Academy, until he could have his projected institute established. Professor Schrödinger, a Nobel Prize winner and one of the fathers of quantum mechanics, came to Dublin at the end of the

1 E. T. S. Walton, Ireland's later (1951), and only, Nobel Prize winner in science who was in the physics department at Trinity College Dublin (TCD) at the time, as a pure experimentalist played no active role in the developments. He would later become a member of the Governing Board of the School of Theoretical Physics.

year unaccompanied by any fellow staff or students. He eventually returned to Austria after the Soviets evacuated it in 1955.

3 The early days of DIAS

The DIAS was not formally approved by the Dáil, and thus established, until June 1940. The School of Theoretical Physics took off, with Schrödinger in charge, in November of that year, but really only came to life with the arrival of Walter Heitler in 1941. Heitler, whom one commentator rightly refers to as "the unsung hero of DIAS in the 1940s" (McGarrigle 2015), was Jewish, and had had to leave Göttingen in 1933, spending the intervening years in Bristol. Heitler was recommended as a second professor for the new institute by Whitaker in Edinburgh. After a brief internment in England as an enemy alien, Heitler took up the position in Dublin in June 1941.

The institute was housed in a Georgian building, renamed Hamilton House, overlooking Merrion Square on the south side of the city; for an account of the atmosphere there in the early days we are indebted to, perhaps surprisingly, an account in the Chinese physics journal *Wuli* 物理. Recalling events almost sixty years later, Cécile DeWitt-Morette (2005, 313–314), who arrived there as a student from Paris in early 1946, writes of the almost idyllic environment that was the institute in those early days. "Life at the Institute," she writes, "was enchanting. A small group of 'scholars' shared a beautifully appointed large room. Morning coffee and afternoon tea were the occasions for Heitler, Schrödinger and Peng, who had their own offices, to join us." Tennis was played on the court in Merrion Square, open to residents of the square. Following a visit he had made to the Soviet Union in 1945, Max Born, who visited from Edinburgh, commented on how theoretical physics prospered in both places, in "Russia because they know it to be the foundation of scientific research and material prosperity, in Eire [DIAS] because it is one of the great achievements of the mind in praise of God's creation" (Greenspan 2005, 257).

Members were classified as professors, scholars, or students. As we have mentioned, the preeminent professor of physics in Edinburgh at the time was Max Born, another Jewish expatriate and a man with whom Heitler had collaborated on important works. He happened to have on hand two students who had recently completed their PhD degrees in theoretical physics under his supervision, Dr. Peng Huanwu (1940) and Dr. Shelia Power (1941). Undoubtedly at Heitler's instigation, "Dr. Peng" and "Miss Power" were admitted as scholars on October 1, 1941. For the record, Shelia Power (later Tinney) was a graduate from UCD who had gone on a studentship to study in Edinburgh and was the first Irish woman to gain a doctorate in mathematical sciences. Carelessness in specifying her title was common in the misogynistic atmosphere of the day.

4 Peng Huanwu at DIAS

Peng Huanwu (Peng Hwan-Wu or H. W. Peng 彭桓武, 1915–2007) had graduated in physics at Tsinghua University in Beijing in 1935. Prominent among his teachers was the distinguished ex-Caltech scholar Zhou Peiyuan (Chou Pei-Yuan 周培源, 1902–1993), who cultivated many future Chinese physicists, including Hu Ning (BS 1938), below. After the Japanese invasion of China in July 1937, Peng followed his professor to Kunming, where he would briefly teach before he got an award for overseas study, and ended up with Born in Edinburgh. Unlike Shelia Power, who almost certainly would not have been exposed to quantum mechanics as an undergraduate, it is not clear if Peng had such exposure, but he clearly mastered the subject by the time he wrote his PhD dissertation. Zhou Peiyuan, although his main interest was in general relativity, had been a post-doctoral fellow with both Werner Heisenberg and Wolfgang Pauli in Göttingen.

Peng Huanwu was a scholar at DIAS for two years from October 1941, but then went back to Edinburgh as Carnegie Research Fellow to work with Born on quantum fields. For this work, both of them were awarded the Macdougall Brisbane Prize by the Royal Society of Edinburgh in 1945. In early July 1945 he was appointed as assistant professor at DIAS, and returned to Dublin, accompanied by Born, who had been invited by Schrödinger to give some lectures. How arduous that simple journey was in the early postwar years is described by Greenspan (2005, 257). Not only did Peng's research bring lustre to the institute, as we shall see, but he was much valued as a colleague. Shelia Power in her PhD dissertation had referred to him twice with gratitude for valuable help rendered.[2] Writing of their time at DIAS, Heitler says "One of the most beloved members of the staff was the Chinese H. W. Peng. He joined the institute after having finished his studies in Edinburgh. An unfailing cheerfulness combined with unusual gifts made him a most valuable member of the staff. He was promoted assistant professor and elected a member of the Royal Irish Academy" (Heitler 1976, 651). That Dublin was not a physics backwater will have been impressed on Peng by his participation in a colloquium at DIAS in 1942, where Paul Dirac, Arthur Eddington, Heitler, and Schrödinger were among the speakers. In the summer of 1945, another colloquium was held at the institute where Peng was a lecturer. The other lecturers then were Dirac, Born, and Lajos Janossy (from Manchester)—the company he kept a reflection on how well he was regarded by his peers.

Peng contributed to a variety of physics problems, mostly with a quantum perspective. Work done at Edinburgh with Klaus Fuchs and Shelia Power on the stability of crystal structures were a sideline to his major works on quantum fields (Fuchs and Peng 1942;

2 She had some difficulty with Chinese names, referring to him as Hwang-wu Peng, although an effort was made to erase the "g" in the second entry.

Peng and Power 1942). During his four years in Dublin, Peng was an enthusiastic collaborator with colleagues at the institute. Although he did not publish with Schrödinger—very few did—the great man acknowledged the debt of "interesting discussions and valuable suggestion" he owed to his junior colleague (Schrödinger 1943–1944). Keeping close contact with Born, Peng worked on the formal theory of quantized fields, work for which he would eventually be awarded the DSc degree in Edinburgh.[3] In Dublin, Heitler, who already was an authority on quantum electrodynamics and electromagnetic cascade theory, introduced him to problems of atmospheric cosmic rays, the precursor field to high energy physics. This was a subject so valued by Schrödinger and Heitler that they urged de Valera to add a School of Cosmic Physics to the institute. This was done in 1947, and the opportunity taken of adding Dunsink Observatory, formerly part of Trinity College Dublin (TCD), to the school's concerns (O'Raifeartaigh and Rasche 1998). Peng also published with Heitler and Hamilton (Heitler and Peng 1942; Hamilton and Peng 1944). With James Hamilton, a scholar colleague, and Heitler he published in 1943 a paper in the *Physical Review* on the production of cosmic ray mesons, which attracted much attention (Hamilton, Heitler, and Peng 1943),[4] and followed it up with other papers in the *Proceedings of the Royal Irish Academy*.

In early 1946, a new colleague joined the institute, the twenty-three-year-old Cécile Morette.[5] She had been recommended by Frédéric Joliot-Curie in Paris, for whom she had worked as an assistant, and with whom Heitler had been in contact. Also working in Joliot-Curie's laboratory at the time was an old schoolmate of Peng's from Tsinghua, Qian Sanqiang (Tsien San-Tsiang 钱三强, 1913–1992)—he got a doctorate there in 1940. The careers of the two men would become inextricably bound in later years, and it seems not unlikely that Qian played some role in Morette's decision to go to Dublin. She remained there until September 1947, and made quite an impression on the thirty-one-year-old Peng. Together they published a paper in *Nature* (Morette and Peng 1947a).[6] In an essay she penned on the occasion of his ninetieth birthday she wrote "Peng's guidance awakened in me a lifelong interest for Physics. I dedicate to him whatever has come afterwards" (DeWitte-Morette 2005).

As a professor, Peng could have continued indefinitely at the institute or he could almost certainly have aspired to positions in Europe or the United States—he could

3 This was the first DSc degree awarded to a Chinese in physics in Great Britain, but, as early as 1924, Edinburgh awarded a DSc to a Chinese candidate in physiology.

4 Perhaps it needs to be mentioned that Peng's name occurring last in the author list is no reflection on his contribution to the work. At the time, the admirable practice of placing authors in alphabetical order on a paper was canonical practice—my own supervisor, whose name began with W, invariably followed it.

5 Later quite well known under her married name, Cécile DeWitt-Morette, as the founder of the Les Houches physics summer school in France.

6 For more detail, see Morette and Peng (1947b).

have expected glowing recommendations from Schrödinger, Born, and others. We have seen above Heitler's admiration of the man. We have Max Born, in letters to Albert Einstein in July and October 1944, commending his work, writing of "my Chinese pupil Peng, an excellent man" (Born and Einstein 2005, 142, 153). Schrödinger, also, in a letter to Einstein remarked of Peng that "it is unbelievable how much the youngster has learned, how much he knows, and how quickly he understands everything" (Moore 1989, 416). Despite that, he resigned by the end of 1947 and left the institute.

As DeWitte-Morette has revealed, however, it was not only a lifelong interest in physics that he awakened in her. She claims that they were in love and that he invited her to follow him to China. According to her daughter (DeWitt 2019), he offered her a one-way ticket to Hong Kong and told her that from there he could get her into the Chinese mainland. China in some turmoil at the time, and not knowing the language, harboring fears of being a burden to him, and of not being able to return to France, caused her to "chicken out." They, nevertheless, kept in contact for some years after that.

5 Hu Ning at DIAS

Our second Chinese visitor in Dublin was Hu Ning (N. Hu 胡宁, 1916–1997). He was a scholar at DIAS for two years, 1946 to early 1948, and so overlapped with Peng. They did not collaborate, although in most of his papers at the time he acknowledged Peng for helpful discussions. His shorter stay in the city together with his individual working style means there is much less trace of him in memoirs or archives. Nevertheless, he was a productive scientist, publishing a number of papers while there, many of them in the *Proceedings of the Royal Irish Academy*.

Originally from Suqian, in Jiangsu Province, Hu was briefly in the physics department of Zhejiang University in Hangzhou in 1935. Like Peng, he also studied in the department of physics at Tsinghua University in Beijing, where he graduated in 1938. Hu became the teaching assistant for his professor Zhou Peiyuan in the department of physics. Having won a Boxer Indemnity Scholarship, in 1941 he went to the United States, where he worked on a PhD degree in fluid mechanics at the California Institute of Technology under Theodore von Kármán, obtaining his degree in 1943. At the same time he was also studying quantum mechanics under Paul S. Epstein, and this is the subject with which he is most identified. From his mentor Zhou Peiyuan he also pursued work in general relativity and gravitation. As a post-doc, Hu was at the Institute for Advanced Studies in Princeton from 1944 to 1945 working on basic particle theories with Wolfgang Pauli. Pauli, in general, did not collaborate with lesser individuals, so the fact that he published a paper with Hu in the prestigious *Reviews of Modern Physics* indicates his estimation of the man (Pauli and Hu 1945). For a couple of weeks in March 1945, Pauli visited DIAS, gave a few lectures, and when he returned to Princeton probably spoke to Hu of the institute because

in the autumn of 1945 Hu wrote to Peng, who in turn passed his letter on to Heitler (Guan 2008). This resulted in him taking up a scholarship from January 30, 1946. He was there until the end of January 1948. Clearly a very accomplished theoretical physicist, we do not have much comment on him from the institute, probably because of his stay of only two years. Hu continued the work on nuclear forces that he had started in the United States with Josef-Maria Jauch and Pauli. He teamed up with Heitler to extend the recently developed S-matrix theory of Heisenberg for strong interactions (Heitler and Hu 1945), in which they expressed their indebtedness to Pauli for the introduction to Heisenberg's work "which was unknown in Dublin." He, along with Peng, attended a conference on elementary particles in Cambridge in the summer of 1946, Qian Sanqiang and several other Chinese physicists were also there. He also did pioneering work in general relativity (Kennefick 2007), writing on gravitational waves from binary stars (Hu 1947).



Figure 1: DIAS staff in the summer of 1947. Hu Ning is no. 16, Peng Huanwu is no. 18, Cécile Morette is no. 19. No. 10 is Cheng Kaijia (Cheng Kai Chia 程开甲, a student of Born's, later to play an important role in China's nuclear weapons research). Others present include C. F. Powell (no. 2), Schrödinger (no. 3), Heitler (no. 4), Pádraig de Brún (no. 5), Born (no. 7), Janossy (no. 9), Shelia Power (no. 17), and Achilles Papapetrou (no. 42) (courtesy of the Dublin Institute for Advanced Studies).

6 Ma Shijun at DIAS

Our third distinguished visitor to the city is Ma Shijun (Ma Shih-Tsun or S. T. Ma 马仕俊, 1913–1962). He arrived at DIAS in August 1947, after a stay of almost two years at the Institute for Advanced Studies in Princeton. It may be that, like Hu Ning, he was directed to Dublin by Pauli. Even more likely, however, is that he was invited by Heitler, who was director of DIAS at the time and who knew him well since he had been his supervisor for a PhD degree that he earned at Cambridge in 1941. He stayed in Dublin until September 1949, and thus overlapped with Peng for about four months and with Hu for about five.

Ma was a 1935 graduate of Peking University, and in collaboration with Wu Ta You 吴大猷 (later the leader of the "Academica Sinica" in Taipei) had published papers in *Physical Review* before winning a scholarship which took him to Cambridge (Queens' College) in 1937. This PhD thesis on meson theory in relation to cosmic rays (Ma 1941) seems to have been done under the joint supervision of Dirac, in Cambridge (Butler 1962), and of Heitler, who was at Bristol at that time. So, presumably Ma spent considerable time in that town, since his publication bylines at the time included both Cambridge and Bristol. The types of questions they addressed can be found in a joint publication in the *Proceedings of the Royal Society (London)* in 1940 (Heitler and Ma 1940).



Figure 2: DIAS staff in 1948. Ma Shijun is no. 19. Among others in the photo is A. W. Conway (no. 4) and C. B. A. McCusker (no. 15) who would later be a colleague of Ma's in Sydney (courtesy of the Dublin Institute for Advanced Studies).

In 1941 he returned to China to the Southwestern Associated University,[7] located during wartime in Kunming. He taught subjects as advanced as quantum field theory—Chen Ning Yang 杨振宁 studied the subject under him there in 1943. He stayed there until after the war, remaining very active in research. He published widely, including four papers in *Physical Review*. In Princeton he worked on the new Heisenberg S-matrix formulation of interactions, making important contributions to the theory. In Dublin, he worked, sometimes with Heitler, on quantum electrodynamics, a representative paper being a 1948 paper (Heitler and Ma 1948–1950) in which discussions with Peng and Hu are acknowledged. There is also an obituary for him by T. D. Lee and Yang (2005, 52, 324), for obscure reasons only published in 2005.

7 Post-DIAS careers

We will briefly follow the careers of our three protagonists post DIAS. The briefest, and saddest, is that of Ma. After Dublin he returned to North America in September 1949, where he spent two years as a post-doctoral fellow at the University of Chicago followed by two years at the National Research Council of Canada in Ottawa. According to his obituarist in *Nature*, while at Chicago he married Enrico Fermi's secretary, Mrs. Helen Lin. According to Lee and Yang in their obituary, he was uncomfortable with how he was personally treated in the United States. Also, during and after the Korean War, hostility to China noticeably increased and he felt uncomfortable with the fact that most physics research, being funded by the military, could imply conflict with China. So, he moved to a position of lecturer in the University of Sydney in 1953. This choice may have been due to an acquaintance with Professor Harry Messel, who from October 1951 was Head of Physics in Sydney, and had overlapped with Ma at DIAS for some time in 1949. He continued to publish from there, was promoted to senior lecturer in 1957, and took a year's sabbatical leave at the University of Cambridge in 1960. Regrettably, for reasons unknown, at the age of forty-eight he committed suicide in January 1962, although there are suggestions that frustration with a possible return to China was a contributing factor (Guan 2008, 116). He was survived by his widow and an adopted son. In his obituary, S. T. Butler (1962) who was professor of theoretical physics in Sydney at the time writes of him "as a man devoted to his work and who prepared and delivered his lectures with meticulous care and a thoroughly sympathetic comprehension of student problems. By his unobtrusive manner and quiet sense of humor he endeared himself to all with whom he came in contact." A photo of Dr. Ma in Sydney in 1957 is shown in Figure 3.[8]

7 His affiliations in his publications at the time list the National University of Peking, as does Butler's obituary.

8 He also features in a photo of the staff of DIAS in 1944—see Figure 2. There is also a photo of him in the company of Wu Ta You and C. N. Yang in New York in 1949 (Chen et al. 2022, 4).



Figure 3: Ma Shijun in Sydney, 1957 (courtesy of Robert Hewitt).

The remaining two went on, post 1949, to extended and distinguished, but not uncontroversial, careers in the People's Republic of China (PRC). Peng, as we noted, resigned and left the institute by the end of 1947 to return home to China, from where he had been absent for ten years. Although our main focus is on visitors to Dublin in the 1950s, it is meaningful to follow up a bit more on Peng's interesting career. As it would turn out, he would have another sixty years ahead of him. He died in 2007, but it was a time of great fluidity in political and social life in China and we have little in the way of detail of his life after his return. We have an obituary from the Chinese Academy of Sciences (Academic Divisions 2009), while a pro forma account of his work is available from a CCTV program on his life in 2019 (CCTV 2019).

Peng's future career took some shape when, by sometime in November 1947, he left Europe for China.[9] As we have noted, he could have easily continued at the institute—and, as we have seen, he had romantic reasons for remaining in Europe—but a higher calling appears to have motivated him. Earlier in the summer he had attended a conference of the International Association of University Professors and Lecturers (IAUPL) held in Brussels and visited Paris. There he met again his old schoolmate Qian in Joliot's laboratory, a leading laboratory for nuclear, especially fission, studies at the time. Did Peng and Qian then commit to contributing to the development of nuclear

9 I am indebted to an anonymous reviewer for this information. According to the *DIAS Annual Report* for 1947–1948, submitted to the Department of Education that funded the institute, Morette left sometime in September 1947 and Peng left, to return to China, on December 31, 1947. He may have had some entitlement to holiday leave, which would have enabled him to go before the end of the year.

energy in their homeland? One account[10] of the development of China's nuclear weapons program claims that "two of the most famous [scientists] . . . that manned the upper echelons of China's nuclear program were Peng Hwanwu and Qian Sanqiang" (Lewis and Xue 1988, 44). Joliot, who was a member of the French Communist Party, would later encourage the development of Chinese nuclear weapons and helped Qian to purchase some nuclear instruments. His wife, Irène Joliot-Curie, in 1951 sent ten grams of radium salt standardized for radioactive emissions to China (Lewis and Xue 1988, 36). Qian, it is true, had some familiarity with nuclear physics and had published some fission related material (Tsien, Ho, Chastel, and Vigneron 1946; Tsien, Ho, Vigernon, and Chastel 1947). Peng, however, had little such exposure. During the years 1945–1947 of his stay at DIAS, when nuclear fission and fusion were a hot topic, there is no sign of them in colloquia or publications from the institute, although Heitler did give some lectures on selected topics in nuclear physics in 1944–1946. Peng's forays into cosmic rays and interactions at high energy were far removed from the nuts and bolts of applied nuclear physics. But, as Schrödinger noted, "it is unbelievable . . . how quickly he understands." Later, in the Nuclear Weapons Research Institute, he had a reputation as an "eccentric genius" (Lewis and Xue 1988, 147).

Peng returned to Yunnan University in Kunming and by mid-1949 had moved to his alma mater Tsinghua University. After January 1950 he was working part time at the Institute of Modern Physics of the Chinese Academy of Sciences (CAS), where he was later a full-time professor. He played an important role in the introduction of nuclear and modern physics to graduate students in the capital. It has been remarked how, as a student of Born's and as a teacher, he mirrored J. Robert Oppenheimer in the introduction of high-level theoretical physics to his country. There is not much of a paper trace of him after his return—with students he did publish some work on more mundane problems in the structure of hydrogen and helium nuclei (Peng and Tang 1950; King, Chang, and Peng 1950; Chang and Peng 1950), but forewent the glamor of the exploding fields of quantum electrodynamics and cosmic ray physics. Whether this was for personal reasons or others, we do not know—by the end of the 1950s there were small groups in Peking University and CAS working in quantum field theory.[11] His contacts with physicists outside China, apart from the Soviet Union, seem to have been minimal. For the next twenty-five years from 1950, physics research in China, when not almost totally disrupted by the "Cultural Revolution," was largely devoted to practical matters, especially the military applications of nuclear energy. From the quoted sources we know that he was a very active participant in post-1949 applied physics in the country. In early 1955 it was decided in China to proceed with a nuclear weapons program. Qian as a nuclear physicist was a leader in this work and

10 Also a communication from Peng's daughter-in-law, Li Luo, in 2023.

11 For a detailed discussion of these interesting developments see Yinghong Cheng (2012).

recommended Peng as head of the theoretical design unit. Both of them visited the Soviet Union to learn the principles and operations of nuclear reactors (Liu, Wang, and Zhemchugov 2021). He made important contributions to the theoretical design of China's first-generation fission and fusion bombs. He was at an observation post seventy kilometers from ground-zero at the first detonation of a bomb in October 1964 (Lewis and Xue 1988, 188). He also engaged in basic and applied research, rapid heating technology of steel ingots, reactor theory, and criticality safety in the country. For his role, he received many prestigious awards, including the National Natural Science Prize and National Science and Technology Advancement Prize.

In a relatively privileged position as one of the founding members of CAS, he appears to have been unscathed by political turmoil. As a long-term overseas resident, not to mention his membership of the Royal Irish Academy (it is unlikely that he maintained contact although his membership never lapsed), he represented a special category who would seem to have been a soft target during the Anti-Rightist Campaign in 1957 and for the Red Guards later. Shielded by anonymity in the desert—he spent much of his time at a special academy in Qinghai—and although not considered part of the military, he remained relatively safe. It is believed that Zhou Enlai drew up a list of Academicians to be protected, on which he probably featured because of his intimate connection with the nuclear weapons program (Lewis and Xue 1988).[12] Apart from his visit to Moscow in March 1956 as part of a delegation for the founding of the Joint Institute for Nuclear Research (JINR) at Dubna (Liu, Wang, and Zhemchugov 2021) and another visit in 1959 (although he was not involved in high energy physics), he appears not to have left the country again.

In later years he seems to have led a normal if sheltered life. Reports speak of his devotion to his work, his late marriage—he had one son who made a career in the United States—and an indifference to his appearance (Lewis and Xue 1988, 147). C. N. Yang encountered him on a visit in 1984[13] and he did communicate with Moore in 1985 in the writing of his biography of Schrödinger (Moore 1989, 416). He was already a member of the Academic Division of CAS from its founding in 1955 and in later years would assume several administrative positions, in several universities and in CAS. Here he was founding director of the Institute of Theoretical Physics, from which he resigned in 1983, declining to serve as its honorary director because he wanted to give young scholars more opportunities. He served also as deputy director of the Institute of Modern Physics and the Institute of High Energy Physics, as well as holding other government related positions. According to his daughter-in-law, the Institute of Theoretical Physics of CAS took great care of him in his later life, when he was highly

12 Also communication from his daughter-in-law, Li Luo, in 2023.
13 There is a photo of them both in 1984 (Chen et al. 2022, 29).

revered by the Chinese government and mentioned in numerous TV series.[14] As part of his belated recognition, the International Astronomical Union in 2006 approved the naming in his honor of an asteroid discovered by Chinese scientists (No. 48798). There is a small museum devoted to him at the Institute of Theoretical Physics of CAS in Beijing, and some charming photos from his Dublin days are to be found in the 2005 article in *Wuli* by Cécile DeWitt-Morette, already cited.

After he left Dublin, Hu Ning returned to the United States, via a sojourn at the Niels Bohr Institute in Copenhagen, working successively at Cornell University and at the Canadian National Research Council, where the Theoretical Physics Section at the time was headed by Wu Ta You. In 1951 he returned to China, to Peking University, and had an extensive career at various institutes of CAS. He managed to prolong his interest in pure physics, general relativity, and elementary particles, and his career back there is less obscure than Peng's.[15] For two years, until October 1958, Hu was a researcher and group leader at the JINR, from where he published in both English and Russian, and became a member of its scientific council. After his return he retained his interest in relativity and was a recognized expert in the subject. In the early sixties he wrote articles popularizing the subject in the *People's Daily*, where Einstein was warmly praised. In the later stages of the "Cultural Revolution" there was an aggressive campaign to vilify Einstein, and to deny the theory of relativity—one author noting that "it is impossible to create any new science and technology without denouncing reactionary theories such as relativity" (Hu 2005, 164). This campaign was led by Chen Boda, one of the top figures in the government at the time, and Hu Ning faced pressure when refusing to get involved.

His immunity from harassment may have been related to his other interests, elementary particles. He led a group at Peking University working on this subject, with emphasis on the then fashionable group theory studies. Work like this on fundamental theory, in general, was very much in disfavor during the "Cultural Revolution." The reason for that is of some interest. Unlike Peng, he had no role in the nuclear weapons program and its associated safety net, but an interesting reason, related to Mao Zedong's ideas on physics, seems to have insulated him from attacks on intellectuals (Guan 2008, 169–170). The reason is that at the time he was working on the officially encouraged straton model for the constituents of elementary particles, and from 1965 to 1966 was joint chairman of a collaborative group working on this model. This pre-quark model of hadron structure was essentially the same as the Sakata model, a theory due to the Japanese Marxist physicist Shōichi Sakata 坂田昌一, which received Mao's blessing. Mao took a close interest in these matters (Liu 2018; Friedman 1983)—de Valera was not the

14 Li Luo, communication 2023.

15 The biography of him by Guan Hong (2008) also contains some interesting material on Peng Huanwu and Ma Shijun.

only head of government with an interest in fundamental physics. Mao's philosophy argued ideologically for a universe infinite in extent and infinitely divisible. The unlimited divisibility of matter implied that there were no elementary particles, even the electron could be infinitively divisible. According to Mao, in a talk at the beginning of the "Cultural Revolution," advanced science must get rid of those parts, which practice has proved useless and irrational, and when one lectures on nuclear physics it will suffice to talk about the Sakata model; one needs not start from the theories of Bohr of the Danish school (Lewis and Xue 1988, 38). Essentially this was a dismissal of quantum mechanics—Sakata's work, one should note, would be not so helpful in mastering nuclear physics. In those days when Mao expressed an opinion it was not lightly dismissed, however. The research strove to adhere to Mao's thought as its guiding ideology. Hu was the guiding light in this work, the two principal articles introducing the ideas were joint anonymous papers in *Acta Scientiarum Naturalium Universitatis Pekinensis* (北京大学学报[自然科学版]) in 1966 (Division of Elementary Particles and Laboratory of Theoretical Physics 1966; Laboratory of Theoretical Physics and Division of Elementary Particles 1966), and there is little doubt that Hu was the principal author. The high point of the work was the Peking Summer Physics Colloquium held in July 1966 bringing together physicists from Asia, Africa, Latin America, and Oceania. Here the highlight was a talk "Research on the Theory of Elementary Particles Carried Out under the Brilliant Illumination of Mao Zedong Thought"—with no credit to Sakata—which claimed to have broken away from the superstitious beliefs of Western "authorities" by advancing the theory of the "straton model" (Liu 2018, 102). Although Hu was involved in organizing the symposium he did not give any presentation there. Details of the model were very sketchy, and never published outside restricted publications, but a straton was identified as a "particle of one of the many strata of the structure of matter," so as to emphasize that the straton is not the most fundamental constituent of matter (Liu 2018, 101). This qualitative difference from other sub-hadron models was its only distinguishing feature, and following the debunking of a claim of the observation of a free straton, and release from the intellectual constraints from the "Cultural Revolution," it was eventually overtaken by the much more popular quark model. Not entirely abandoned, however, as at a conference in 1980 Hu again expressed his thoughts on the straton model, stressing that those who study physics should on the one hand have opinions and beliefs, while on the other hand be brave enough to change their opinions when faced with facts. He continued working on the topic long after it had gone out of fashion, and in 1982 he shared a National Natural Science award for the model (Liu 2018, 111). Indeed, the model is still not entirely dead, serving as the starting point for some brave souls probing sub-quark structure.

Hu returned to his earlier interest in general relativity (Hu 1982), taught at Peking University, wrote popular articles, and was the author of widely used textbooks on electrodynamics, quantum field theory, and general relativity. He married, had two children,

and died in December 1997. There is a statue of him in the lobby of Peking University.

8 Conclusions: The influence of DIAS

It is interesting to look at the influence of the three men's experiences in Dublin on their lives and future careers. This, in the case of Peng and Hu, however, was very much circumscribed by the constraints later placed on their required roles in state sponsored science. Peng, on and off, was at the institute for about six years while Ma and Hu each only spent two years there, but all of them had some contact with three of the leading lights of modern quantum mechanics, Schrödinger, Dirac, and Born—only Heisenberg and Pascual Jordan excepted—and, of course, Heitler. He was the world authority on quantum electrodynamics and a great mentor for junior staff—all three of them co-wrote papers with him. As well as the presence of occasional distinguished visitors, from 1941 onwards an annual Summer Colloquium was held for about ten days every July. Among the visitors featured were Eddington and Dirac in 1942, Born, Paul Peter Ewald, and Kathleen Lonsdale in 1943, Dirac, Born, and Janossy in 1945, Christian Møller, Powell, and J. L. Synge in 1947. Ma certainly benefited from this exposure. His obituarist felt that his thirty-five scientific papers, which found global distribution in the world's scientific journals, most of them devoted to quantum electrodynamics or meson field theory, should form a monument to Dr. Ma Shijun. Peng, the most exposed to the quantum views, probably found its later influence greatest in his teaching activities, which received high praise. It is Hu whose future work most reflects some spin-off from his visit to DIAS, in his continuing success, despite discouraging pressures, in elementary particle theory and especially, general relativity. Overall, we can conclude that their Dublin stay was a pivotal episode in their careers.

Our main period of interest, the 1940s–1950s, finds no further notable Chinese visitors to DIAS. For about thirty years after 1949 no opportunities existed for visitors from the Chinese mainland, and the departure of Schrödinger must have generally reduced the attractiveness of the venue for others. Only one Chinese of note can be found at the institute in the later years, Jiang Tao (Kiang Tao 江涛, 1929–2009) who joined in 1966. He was professor of astronomy at Dunsink Observatory, stayed in Ireland for the rest of his life, and became an iconic figure for the Chinese community in the city—a review of his career is available (Drury and Kiang 2019).

Chinese in Dublin are no longer a curiosity; following the opening of many restaurants, mostly by people from Hong Kong, there followed the establishment of a PRC embassy there in 1980, and a flood of students to language schools and tertiary level institutions. A locally born Chinese lady was elected as Lord Mayor of the city in the recent past.

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