

纪念吴健雄先生诞辰 95 周年

回忆母亲的点点滴滴*

袁纬承

衷心感谢主办单位和太仓市政府的盛情邀请,参加我母亲吴健雄(Chien-Shiung Wu)95周年纪念暨健雄职业技术学院新校区落成典礼。大家都知道,我母亲因首次用实验毫无疑问地验证了“弱相互作用下宇称不守恒”定律而闻名。那时我才10岁,所以当时对此的第一手认识比较稚嫩。但是,我愿借此机会与大家共同感悟我母亲身上所具有的人格魅力,尽管她自己从没公开表述过,但我作为一位亲近的旁观者就感受很清晰了。

首先介绍一点母亲的简历。1912年,也即是清王朝结束统治的第二年,她出生于离这里不远的浏河。当时,女孩子如果能接受教育那只能是在家里。她的入学启蒙及后来科学的事业得益于她父亲吴仲裔的鼓励,是他鼓励我母亲考入了苏州第二女子师范学校。1930年,母亲从她父亲处得知当时著名的胡适博士正在上海的中国公学讲学,她欣然报了名。胡适是中国伟大的文学家之一,他在新文化运动中扮演了重要的角色。诺贝尔奖获得者李政道教授提起过这样一件事:“胡适博士曾告诉我说,在学期期末他跟其他的教授说起,他班级有一个聪敏至极的学生,总是满分并且期末考试得了100分。然后,有两位教授,一个是教历史的(杨教授),一个是教社会学的(马教授),说他们也有一个很特殊的学生,考了100分。当他们对了一下笔记,发现他们所指的竟是同一人,都是吴健雄。”

从南京国立中央大学毕业后,母亲面临着难题,当时,中国还没有物理学科方面的研究生教育。所以,1936年,她渡洋赴美留学,兜里揣着密歇根大学的研究生入学通知,做好准备致力于原子光谱的研究。她路经旧金山时拜访了一位朋友,并认识了物理学家欧内斯特·劳伦斯(Ernest Lawrence)和罗伯特·奥本海默(Robert Oppenheimer),看到了他们正在建设的回旋加速器以及令人兴奋的伯克利物理世界。劳伦斯极力主张她留在伯克利,加入他的科学前沿项目的研究。自此,母亲就没去成密歇根州。那次在伯克利,由一位新近抵达的中国研究生带领她参观物理系和实验室。那位留学生后来就是我的

父亲,他叫袁家骧。我猜想,母亲之所以决定留下来,这可能也起到了一定的作用。但是,后来她坚持说,因为了解到女生仍不允许使用密歇根大学学生会的会所,而她不愿意忍受二等学生待遇,才决定留在伯克利。1937年,日本发动侵华战争,触动了一系列的历史性国际事件,阻碍了母亲回国,直到37年后她回去时,父母早已去世,也没能见上他们一面。

上世纪40年代末、50年代初,母亲完成了一系列实验,解决了当时测量 β 衰变谱一个重要的问题。她通过不断地更仔细地重复当时的测量,证明了原先的结果是错误的。Lee Lidofsky教授是母亲以前的一个学生,后来成为哥伦比亚大学的名誉教授,他这样写道:“吴博士的理念是这样的,仅仅指出某人的工作有错是远远不够的。你必须识别人家实验中的技术或方案中的毛病,然后指出这些毛病会导致出现什么样的错误。最后,也是最重要的是:由你来想出办法做好这件事,然后,付之行动!她确实就是这么做的!”

当母亲决定要做著名的“宇称不守恒”实验时,她就从没犹豫过。她迎接挑战之后的激动和迫切的心情,可从她的自述中略见一斑:“那一年的春天,我和我丈夫已计划在日内瓦参加一个国际高能物理会议,然后开始远东的演讲行程。我们俩都是20年前于1936年离开中国的。已经定好了英国客轮“伊丽莎白女王”的舱位,我突然意识到我必须立即做实验,在其他物理界人士认识到此实验的重要性并先做出来之前而首先实施。尽管我感觉宇称守恒定律是错误的概率微乎其微,但我迫切想要作出明确的验证。所以我请求袁家骧让我留下来。所幸的是,他完全理解时间的紧迫性,终于同意单独前往。”

关于母亲致力于物理研究的风度,李政道先生在他们首次见面时这样写道(那时,李政道是费米的学生)“健雄和费米(Fermi)对实验不同的态度令我印象深刻。当时,费米试图测量中子和电子的相互作用力。虽然我是他从事理论研究的学生,但我

* 根据袁纬承在吴健雄诞辰95周年纪念座谈会上的发言翻译成文

经常到他的实验室。费米通常是站在那儿,要他的助手大声朗读从测量仪上读出的数据。接着,他会用他的小计算尺进行验算,然后说“好”。接下来,他的助手将朗读下一个数据。费米将会重复这个过程,并说“好”或“仔细点读”。那时,我以为一个伟大的物理学家就是这样做实验的:你知道了答案,测量只是为了确认一下你已经知道的内容。”

“当我有一天参观健雄的实验室时,她正在抛光一些表面,她向我解释说,测量 β 谱要做的第一件事就是要有洁净的表面,其次重要的事就是要管好你的电子,叫它们不乱跑。她的这种做法对我来说太新颖了,给我留下了深刻的印象。”

接下来,我想对我母亲的优点作一概括,回想起来,是这些优点造就了她的品格。我总是记得她对细节倍加关注,不愿意有丝毫疏忽,并从来不回避问题。母亲同时提倡勤奋工作,不仅自己身体力行,而且还影响周边的人。我记得她在很多时候引用那句名言:天才是 90% 的汗水加上 10% 的灵感。但是不要误解,对于她来说执着的工作并不是目的。在早期,诺贝尔奖获得者塞格雷(Emilio Segrè)因为她在实验室工作太努力没能抽出时间跟踪同领域的其他研究工作而对她进行批评。这件事对她以后的生活有着重大影响。在晚年,为了平衡工作中的付出她总是问自己:你所完成的工作究竟体现了什么样的价值?

她让自己的学生工作得很刻苦,但始终考虑着他们的最大利益。对他们将来人生之路她思想开放,不过过早地评判。名人往往期待自己的孩子成为他们所期望的人,恰恰相反,我母亲从未要求我走她相同的道路,更不用说成为一名物理学家。她总让我做最适合我做的事情。对她的学生,她持有相同的观点。她所提供的训练是否成功?我想她的记录可以说明这一点:一些学生成为实验物理的著名教授,而有一位成了哥伦比亚工程学院的荣誉教授,另有一位是加利福尼亚纳米系统研究所(California NanoSystems Institute)的所长,第三位的兴趣则转向了神经生物学,现在是加州大学圣地亚哥分校生物科学系的系主任。

我钦佩母亲的另一个品格是她做事有全局观点。我也发现她所具备的是非感:她做事或承担义务不是简单地考虑事情是否受欢迎或是否时髦,她更想知道那些事情是否正确而值得一做。当母亲深信某个论点的时候,她从不回避向那些她认为有可能影响事物结果的人表达自己的观点。无论他们是

诺贝尔奖获得者还是世界闻名的领导人,比如周恩来或者邓小平。

母亲总能敏锐地把握新技术所蕴涵的巨大潜力。举个例子,她对计算机了解不多,但经常向我表达对计算机威力之大的赞叹之情。遗憾的是,当父亲给家中买了一台最新技术水平的个人计算机时,母亲已经患过一次中风,不能使用计算机了。尽管如此,她总能以乐观的心态对待变革,而不是以逃避的心态发牢骚“今不如昔”。

作为一名女性,母亲的成就表明一个女性的成就可以不亚于一名男性。即使这对她很重要,但她很少向我公开地表露这种想法。我想这是她的个性,她认为这是显然的,那当然她的最好行动准则就是假定别人也认为这是显而易见的。

当母亲专心致志做某个实验的时候,我记得可能连续许多天都很难转移她的注意力。但她终究会转身来管我,她根本不理睬我那些小抱怨而是指出一些重要的而恰恰被我忽视的问题。母亲在内心深处始终挂念着我,总让我感到意外。

在母亲去世的时候,李政道先生引用了爱因斯坦在居里夫人去世时说的一段话来称赞她:“当一位伟人走到她生命的尽头,我们不要仅仅回忆她在工作为人类做出了什么贡献。对一代人和整个历史来说,杰出人物的道德品质要比他们单纯的学术成就可能意义更重大。她的力量、她的毅力之纯洁、她的客观性、她的不可蜕变的判断力,这些品质都集中于一个人一身是很少的。一旦她认准了某一方向是正确的,她就会毫不妥协、坚韧不拔地去追求”。我的观点或许略有偏颇,但我相信上述这段话对于母亲来说是很相称的。

虽然母亲喜爱发现自然界的深沉奥秘,但她同样可在小事中找到快乐:一朵美丽的鲜花,一个可爱的小孩,众多小摆设中的一件,南京六朝古都的柏树。点点滴滴,我将永远铭记!

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附 袁纬承发言英文原文

I wish to thank the organizers and Government of Taicang for having invited me to honor my mother Chien-Shiung Wu at this inaugural opening of the Chien-Shiung Institute of Technology. As many of you know, she is renowned for having performed the first experiment to unequivocally demonstrate parity's non-conservation in the weak interactions. I was only 10 years old at the time of the parity experiment, and my first hand view of the events was limited. But I hope to share with you some of my mother's qualities that, although never openly verbalized by her, became obvious to me as a close observer.

First, some background about my mother: In 1912, not far from here in Liuhe, she was born in the year following the overthrow of the Qing Dynasty. At that time, girls were educated at home, if at all. The beginning of her schooling and career in science owes itself to the encouragement of her father Zhong-Yi Wu who encouraged her to attend the Suzhou Girl's High School. Later in 1930, she learned from her father that the famous Dr. Hu Shih was lecturing at the National China College in Shanghai, and she enrolled there. Dr. Hu Shih was one of the great literary figures in China and he played an important role in transforming the classical Chinese form of writing into the present modern form. The Nobel prize-winning physicist Professor Tsung-Dao Lee once wrote: "Dr. Hu Shih told me that, at the end of the semester, he mentioned to other professors that there was one fantastically brilliant student in his class who was always perfect and got 100 in the final exam. Then two professors, one in history (Prof. Yang) and one in sociology (pro. Ma), said that they also had an exceptional student who got 100. When they compared notes, they found they were referring to the same person, Chien-Shiung Wu." (p29)

When she graduated from the National Central University in Nanjing, my mother was faced with the dilemma that China, at that time, offered no graduate instruction in Physics. In 1936 she sailed to the US with an acceptance to Michigan's graduate program in hand and with full expectations to study Atomic Spectroscopy. On her way to Ann Arbor she stopped in San Francisco to visit a friend and became introduced to the exciting world of Berkeley physics with Ernest Lawrence, Robert Oppenheimer, and the cyclotron they were building. Lawrence urged her to stay at Berkeley and to join his forefront-of-science activities. My mother never made it to Michigan. During this first encounter with Berkeley, she was given a tour of its physics department and laboratories by a recently-arrived Chinese graduate student. That student eventually turned out to be my father Chia-Liu Yuan, and I suspect that may have played a role in her decision to stay. Later, however, she was to insist that she was aware that women were not yet permitted to use the University of Michi-

gan student union building and that she stayed because she did not want to settle for second-class treatment. In 1937, armed conflict between Japan and China commenced, thereby starting a series of historical world events that would keep my mother from returning to China until 37 years later and after her parents had passed away without her ever seeing them again.

In the late 1940s and early 1950s, my mother performed a series of experiments that solved an important problem with the existing measurements of beta-decay spectra. She did so by more – carefully repeating the existing measurements and demonstrating that they were wrong. Prof. Lee Lidofsky, a former student and subsequently a professor emeritus at Columbia, would later write: "In Dr. Wu's philosophy, it wasn't enough that you simply say that someone else's work was wrong. Rather, it was necessary for you to identify any faults in its techniques or design, then show how those would have led to errors. Finally, and most important, it was up to you to develop ways to do it right, and then, to do it! And she did!"

When the idea to perform her famous parity experiment came, she didn't hesitate to follow it. In her own words, my mother describes the excitement and the urgency with which she embraced the challenge: "That spring, my husband and I had planned to attend an International Conference on High-Energy Physics in Geneva and then proceed to the Far East on a lecture tour. Both of us had left China in 1936, exactly twenty years earlier. Our passages were booked on the HMS Queen Elizabeth before I suddenly realized that I had to do the experiment immediately, before the rest of the physics community recognized the importance of the experiment and did it first. Although I felt that the chances of the parity conservation law being wrong were remote. I urgently wanted to make a clear-cut test. So I asked Chia-Liu to let me stay and to go without me. Fortunately, he fully appreciated the importance of the time element and finally agreed to go alone."

Of Professor Wu's style of doing physics, T. D. Lee was to later write about the first time they met (when Lee was a student of Fermi): "I was impressed by the difference between Chien-Shiung's attitude and Fermi's towards experiment. At that time, Fermi was trying to measure the interaction between neutrons and electrons. Although I was his theory student, I often visited his laboratory. Fermi would typically be standing up and asking his assistant to read aloud the numbers from their measuring instrument. He would then calculate on his small slide rule, and then say "good". Then his assistant would call out the next reading. Fermi would repeat the process, and say "good" or "read more carefully." I thought that was the way a great physicist does an experiment: "you know the answer and the measurement is simply to confirm what you know already."

"On the day I visited Chien-Shiung's laboratory; she was polishing some surface. She explained to me that the

first important thing in measuring beta spectra is to have a clean surface , and the second most important thing is to train your electrons so that they do not straggle. Her approach was such a novel one to me that it made a great impression on me. ”

I'd like to conclude by giving my thoughts on the qualities of my mother that , in retrospect , made her who she was. I always remember that she paid great attention to detail and was reluctant to ever sweep any problem under the rug. My mother was also a proponent of hard work ,not only in her own activities but in the activities of those around her. On many occasions I remember her quoting the famous dictum that genius is 90% perspiration and 10% inspiration. But don't be misled ;hard work to her was not an end in itself. In her earlier years ,one of the incidents that most influenced her later life was when Nobel-prize winner Emilio Segrè chastised her for working too hard in the lab without taking time out to keep abreast of other work in the field. In later life ,she always tried to keep how hard one worked in perspective by asking :what of value had the work accomplished ?

She worked her students hard ,but she always had their best interests in mind. She accepted with an open mind and without prejudice the paths that their lives would take them. Contrary to what might be expected from a famous parent , she never asked that I follow in her footsteps ,or that I even become a physicist. She always wanted me to do what my talents were best suited for. She viewed her students in the same way. And was she successful in the training she provided ?I think that her record speaks for itself :Some of her students became famous professors in experimental physics ,but one became a Professor Emeritus in Columbia's Engineering school ,another is the director of the California NanoSystems Institute ,and a the third's interests took him to neurobiology where he is now the Dean of the Division of Biological Sciences at UCSD.

Another quality I admired in my mother was her ability to always see the proverbial “ forest for the trees ”. I also found in her a moral sense that kept her from doing things or taking positions simply because they were popular or in fashion ,rather she would want to know whether they were the “ right ” things to do. When my mother felt strongly about an issue , she would never shy away from expressing that opinion to others whom she thought might be able to influence outcomes. She did this irrespective of whether they were nobel-prize winners or world leader such as Chou-En-Lai or Deng-Xiao-Ping.

My mother was always quick to embrace the po-

tential of new technologies. For instance ,she often expressed to me her marvel at the power of computers even though she herself had limited experience with a computer. Unfortunately , later on when my father bought a state-of-the-art personal computer for home , my mother had already experienced her first stroke and was unable to use it. Nonetheless ,one thing that sticks in my memory is that she always took an optimistic view towards change rather than taking that easy refuge often embraced by saying that “ things were much better in the old days ”.

Being a woman and one that would help show that a woman's accomplishments could be equal to that of a man ,if that were important to her ,then it was a thought that she rarely expressed openly to me. I think it was in her nature that she just took this as being obvious and ,of course ,she felt her best course of action was to act as if it were obvious to everyone else as well.

Sometimes when she was working hard on an experiment. I remember that it might be hard to divert her attention for many days in a row. But then she would finally turn to me and ,bypassing all my minor complaints , would voice her concern about a much more important problem that I had been neglecting. It always would surprise me that all the time she had been thinking about me in the back of her mind.

At the time of my mother's death ,T. D. Lee honored her by quoting the following remarks ,which Albert Einstein wrote at the time of Madame Curie's passing :
“ *At a time when a towering personality has come to the end of her life let us not merely rest content recalling what she has given to mankind in the fruits of her work. It is the moral qualities of its leading personalities that are perhaps of even greater significance for a generation and for the course of history than purely intellectual accomplishments. Her strength ,her purity of will ,her objectivity ,her incorruptible judgement ,all these were of a kind seldom found joined in a single individual. Once she had recognized a certain way as the right one she pursued it without compromise and with extreme tenacity* ”. My vantage point is not unbiased ,but I believe those words were appropriate.

But even though my mother delighted in discovering the grander secrets of nature ,I will always remember her as one who could also find delight in its smaller wonders-a beautiful flower , a young child , one of her many small knick-knacks ,the cypress of the six dynasties in Nanjing.