Outward Connections

You joined NTU in July 2002 and have a bachelor's and a masters degree in Engineering from Fudan University, one of the top universities in China. Could you describe the differences in educational experiences between Fudan University and your experiences at NTU?

Chao Chen: I deem it an honour to have had the chance to receive education in FDU and NTU, which are both renowned universities in Asia. As predominately a technological university, NTU offers world-class facilities for scientific research, teaching, and student activities. Most importantly, these facilities are easily accessible to all staff and students. In terms of "software", NTU creates a multicultural stage where worldwide excellent researchers, teachers and students with different cultural backgrounds play important parts. They work together, share the ideas, and communicate with each other. Everyone can benefit a great deal from the multicultural experience.

Although less international, FDU provides comprehensive educational programs. For example, technological students in FDU are encouraged to pursue a minor in journalism, history, philosophy or whatever they are interested in. Through these subjects, FDU is able to imbue her students with a broadened scope and an enriched character. Just like the other major universities in China, FDU is gradually overcoming the difficulty of lack of funds, and its infrastructure is now under rapid development.

Why did you choose to further your studies to doctoral level at NTU?

Chao Chen: To conduct my own scientific research has long been my dream. It's thus natural for me to have extended my studies to a higher level. When I was about to decide where to go to pursue a PhD, I was lucky enough to pick up a paper that specified the research projects conducted by Prof. Zhu Weiqiang of Sensors & Actuators Lab of NTU. The project on piezoelectric MEMS drew my attention. I loved the project so immediately that I instantly made the decision to submit an application to EEE, NTU with no hesitation.

What is it like to be an international research student at NTU?

Chao Chen: NTU provides a cross-cultural stage in a fair and even way that people from different backgrounds can feel mutual respect for each other and cooperate smoothly with each other. As this is my first time to be an international research student staying in such a multicultural environment, I very much treasure this wonderful experience from which I can learn a lot.

What is the focus of your doctoral research? Why did you choose this area?

Chao Chen: Currently my research work is concentrated on the piezoelectric thin/thick films for MEMS applications and the development of potential devices, such as ultrasonic arrays, microfluidic pumps, etc. I am certain that I have made the right decision to choose this area, which is both interesting and promising. One can just imagine how fascinating it is to fabricate micromachines with such small size below 1 mm, but that have the ability to drive a turbine or to handle microfluids. Single micropump can be used for precise drug delivery into the human body, whereas a combination of ultrasonic transducers and micropumps forms a powerful tool for biomedical characterization and cell separation. Moreover, an array of micropumps may serve as printing jets, probably for high-speed printers of the next generation. I sincerely believe that the coming breakthrough in this research area will change the future lives.

I believe that you have introduced a new method and already have one patent being processed? Could you tell us about the achievements that you have made to date in your area?

Chao Chen: Yes. One of the challenges in this area is to evaluate the piezoelectric properties of fabricated thin/thick films. The film characterization requires high-resolution instrumentation capable of measuring very small distortions down to several angstroms or even less. For this purpose I proposed a modified laser interferometric system. With the introduction of this new method of modulation, this modified interferometer possesses a simpler structure and is much less susceptible to environmental disturbances or intensity fluctuations from laser source. High resolutions down to Pico-meter have been achieved with simple and low cost instrumentation. Beyond piezoelectric characterizations, I also established an acetic acid routed sol-gel method for deposition of piezoelectric thin films onto silicon substrate. Based on this technique, we fabricated successfully MEMS ultrasonic sensing arrays on a 4" silicon wafer.

You combine your interests in engineering research with your interests and talent in music. You were once the Student Conductor for the NTU Student Guitar group. Is there any connection between your love of science and music?

Chao Chen: I've never lost my aspiration towards science and music. This aspiration has only been strengthened by progresses in both areas. Playing the classical guitar seems to me another research object in my leisure time. I've found that science research and music performance share a lot in common. For example, in order to perfect your performance techniques, you need a scientific way of thinking, to study how to move your fingers accurately and efficiently. Correspondingly, just like a musician, a creative researcher also requires inspiration and imagination, without which innovative ideas would never emerge.

Describe any one event that has contributed to your progress in your study life or your research area?

Chao Chen: I was fortunate that I once won the third prize of National High School Competition of Physics in China, 1994. This honours experience encouraged me to go further on my way of becoming a scientific researcher and engineering developer.

Do you feel that you have changed in any way since studying at NTU?

Chao Chen: The one year studying experience at NTU has brought me not only enhanced skills for cross-cultural communications, but also increased confidence for developing my future career internationally.