Application to faculty position in Physics

The purpose of this letter is to express my interest in an opening tenure-track assistant professor position at your school.

My qualifications and experiences for the faculty position in Physics are as followings:

- A PH.D Degree in Applied Physics from University of Texas at Arlington.
- A Master's Degree in mathematics from Louisiana Tech University.
- A Master's Degree in Physics (Astronomy) from Florida International University.
- Four graduate level courses from Engineering.
- Postdoc experience in computational electromagnetic field on biotech research.
- Currently teaching at Elizabeth City State University as an assistant professor of Physics.
- "Evidence for droplet reorientation and interfacial charges in a polymer-dispersed liquid crystal cell", S. C. Sharma, L. Zhang, A.J. Tapiawala, and P. C. Jain, Physical Review Letters **87**, 105501 (2001).
- Five and half a year full-time engineer and teaching experience in China.
- Six years half-time teaching experience in Physics (including labs), Math (including the computer lab) and Astronomy.
- Two years usa industrial Engineer and Scientist experience in Optical communications /Photonics/Microelectrons and EO materials.
- One pending US patent "3-D Optical Switches".
- Elected President of Graduate Student Council of University of Texas at Arlington and a Committee member of The University of Texas System Student Advisory Council from 1999 – 2000.
- Up-to-date knowledge of computers – Windows environment, use and programming of standard office programs such as Microsoft Word, Excel and PowerPoint. I experience in programming in Mathematica 4.0, Matlab, Fortran, Visual Basic 6.0 and C.

I have enclosed a resume (vita), teaching statement, a statement of research plan and three copies of reference.

Sincerely yours,

Lei Zhang

Statement of research plan

My main field of research interest is non-linear experimental Optics, during the past seven years my research experience includes three-years characterizing electro-optics properties of polymer and liquid crystalline materials (including ceramics) and their applications, two-years industrials' research and engineer experience on testing and designing laser-based optical devices and several months research experience on beam propagating in biological materials. The future research plans are based on the former experience and are aimed to continue and develop experimental biophysics research program by combination my optics experience with my knowledge of biological cells.

One of the main interests is developing a laboratory experimental optical tool for the quantitative deformation of cells and this method is called the "optical stretcher". Individual biological cells can be trapped and deformed therefore stretched when the radiation pressure of two counter-propagating laser beams are applied. Using non-focused laser beams to protect the cells from damageable light intensities which is different from optical tweezers since most cells trapped with optical tweezers do not survive beam power greater than 20-250 mW depending on the specific cell type and the used wavelength. 780 nm Ti-sapphire laser will be used to minimize thermal heating of the sample from absorption. With fluorescence microscopy demonstrating the essential features of the cytoskeleton in a cell which is connected to the plasma membrane acting as a spring and building up a restoring tension, the optical stretcher can provide accurate measurements of whole deformed cell elasticity and thus can distinguish between different cells by their cytoskeletal characteristics and for the same reason it can be used for quantitive research on the cytoskeleton. Also the deforming force profile might be calculated to help in understanding the structure of cytoskeleton.

A better understanding of the basic cytoskeletal cell biology from the "optical stretcher" will contrbute to the understanding of the pathology of these disorders and can impact their diagnosis and therapy. Since measuring changes in the cytoskeleton are often used to diagnose certain diseases such as cancer the "optical stretcher" could be a novel approach and by using a micro-fluidic flow chamber it could advance to a diagnostic tool in clinical laboratories. The elasticities of PC12 cells at different temperature will be the first experiment for the "optical stretcher".

Experimental biophysics research projector can involve students in both undergraduate level and graduate level. Student participation in research is an important part of the educational and research plan. In additional to learning background information of project especially for biophysics-interdisciplinary project, they learn about developing, running experiments and solving the problem. Also this is a way I prepare students for future careers.