

August 22, 2018

**By FedEx**

USCIS

**Re: I-140 Petition and I-485 Application for National Interest Waiver**

Dear Sir or Madam:

I am writing this letter in support of my request for a National Interest Waiver of Labor Certification and your favorable approval of the attached EB2 immigrant worker petition.

I am a Postdoctoral Research Associate at UCAR (University Corporation for Atmospheric Research) in the Geophysical Fluid Dynamics Laboratory (GFDL) run by NOAA (National Oceanic and Atmospheric Administration) at Princeton University. My work focuses on improving the accuracy of long-term weather prediction. In particular, I study the evolution and life cycle of clouds and how the behavior of clouds and storms impacts the global models currently used for predicting weather -- and how to adjust these models to make them more accurate. The goal of this work is to improve our ability to predict medium and long-term changes in weather patterns with the goal of helping people in a wide variety of regions in the U.S. as well as industries, first responders and policy makers better prepare for severe weather events.

The United States generally considers being "weather-ready" a key national priority. Extreme weather had become increasingly costly in recent years, and these costs include losses in human lives and health as well as extraordinary levels of economic damage to infrastructure, industry and agriculture. The re-insurance industry estimates that the average level of loss due to severe weather between 2010 and 2014 is above \$20 billion, compared to \$5 billion in losses from 1980-1985. According to the *Bulletin of the American Meteorological Society*, weather affects about 3.4% of the U.S. Gross Domestic Product, or more than \$500 billion per year. Furthermore, in a recent report, the National Academies of Sciences have also addressed the importance of research in this field for national wellbeing.

According to NOAA, the U.S. has sustained 233 weather and climate disasters since 1980 where overall damages/costs reached or exceeded \$1 billion, and the total costs of these 233 events exceeded \$1.5 trillion. Almost half of the total damages (\$870 billion) have been caused by tropical cyclones. NOAA is therefore extremely concerned with understanding the variability of the atmosphere, ocean and cyrosphere (frozen water, including frozen parts of the ocean) systems, and with helping society to cope with and adapt to today's variations in weather and to prepare for future changes. For these reasons, the U.S. government strongly supports NOAA research activities that address a process-level understanding of the Earth's weather variability and predictability.

Furthermore, reliable monitoring and accurate prediction of global climate and atmospheric patterns are critical to the United States' abilities to manage a wide range of its own vital interests, including: military investments abroad, water management of drought-prone regions, and opening of commercial routes in the Arctic. Accurate monitoring and prediction abilities are also critical to the U.S. being able to fulfill obligations related to state-level, federal and international pollutant regulations. Each year, the U.S. government spends considerable financial resources to advance its technologies for observing and modeling global climate through both basic and applied operational research, including: an annual budget for Earth Sciences at NASA of approximately \$2 billion, research within NOAA funded at approximately \$0.5 billion annually, and funds of approximately \$1.5 billion annually are federally allocated to the Geoscience directorate at the National Science Foundation. Additionally, following Superstorm Sandy, the U.S. Congress passed legislation to supplement the National Weather Service's budget by \$23.7 million to improve forecasting equipment and supercomputer infrastructure in order to improve U.S. skills and technologies, which lagged behind European forecasts for that extreme storm.

My research seeks to improve weather prediction accuracy by examining the mechanisms of cloud formation and the development of thunderstorms. In particular, my work to date has examined how these storms are organized and clustered by large-scale atmospheric conditions in the tropics, and how rainfall in the tropics affects flooding and drought as well as hurricane formation.

Convection is generated in the tropics and other regions of the earth as clouds form; because warm air has a lower density than cool air, the relatively warmer air carrying moisture rises within the surrounding denser cooler air. Clouds are created as the moist air cools as it rises, causing some of the water vapor in the rising packet of air to condense. The process of condensation releases energy (latent heat) which allows the rising packet of air to cool less than the surrounding air, propelling the cloud higher. If enough instability is present in the atmosphere, this process will continue until cumulonimbus clouds form, supporting lightning and thunder.

Thunderstorms have an impact not only the region of the Earth where they form and release thunder, lightning and rain, but also on weather and climate on other parts of the Earth as the force of convection generated by thunderstorms also impacts atmospheric circulation, which is a global-scale phenomenon that distributes thermal energy (heat) across the surface of the entire Earth and land. In this way, thunderstorm activities in the tropics have a profound influence on weather and climate in North America because these storms generate convective heat that affect the generation of hurricanes which eventually make landfall in the United States. Additionally, tropical convection has a direct impact on the patterns of atmospheric circulation that influence the weather and climates over the extratropics (middle latitudes beyond the tropics); changes in this atmospheric circulation can lead to severe weather conditions such as continental heatwaves and heavy precipitation events along the west coast of the United States. For example, the Madden-Julian oscillation (a giant weather system in the tropics that sweeps around the globe every month or two) has a strong influence on the occurrence of "atmospheric rivers" that draw moisture out of the tropics and can produce devastating floods in California; the Madden-

Julian Oscillation also played a role in ultimately determining the path of Hurricane Sandy, directing it onto the New Jersey coast. Additionally, the tropical phenomenon of El Niño affects seasonal rainfall -- and drought -- in the western United States.

Being able to accurately predict the state of tropical storms and rainfall therefore of critical importance to the United States to help people in different regions across the country better prepare themselves, their homes, and their businesses for severe weather conditions. By extending accurate weather predictions for the U.S. for longer periods, scientists can directly help people better prepare for the potential impacts of severe weather events. However, due to scientists' poor understanding of the dynamics of physics and tropical convection, reproducing tropical convection in the computer models used for forecasting weather and climate remains inaccurate and unsatisfactory. My work in this area -- in particular, the innovative methods I have developed for better modeling for tropical convection and for understanding the physical mechanisms of how connective clouds and thunderstorms evolve through their life cycle over the tropical ocean -- has paved the way for future research to untangle the complex and dynamic physical processes involved in tropical convection and will ultimately improve computer models for forecasting weather over the entire globe.

September 5, 2018

**By FedEx**

USCIS Texas Service Center

**Re: I-140 Petition and Application for National Interest Waiver**

Dear Sir or Madam:

I am writing this letter in support of my request for a National Interest Waiver of Labor Certification and your favorable approval of the attached EB2 immigrant visa petition.

I am a medical research scientist whose work focuses on using gene therapy to fight cancer with results that are more effective and efficient than any currently existing treatments for the disease. I currently serve as an Assistant Scientist in the Department of Cell Biology and Sylvester Comprehensive Cancer Center at University of Miami. My research focuses on harnessing the power of viruses to fight cancer using innovative techniques that are at the forefront of current biomedical research. The implications of this work are far-reaching and include the development of highly targeted therapies that work on advanced metastatic cancers to selectively eliminate only cancerous cells without causing toxic side-effects to normal cells.

In recent years, the American Cancer Society estimates that approximately 1.7 million new cancers are diagnosed annually in the United States, with approximately 610,000 people dying from the disease each year. The vast majority of cancer mortalities – 90% – are people who die of the metastatic disease, when aggressive malignancies have spread throughout the body from the initial point of origin. Unfortunately, the current mainstay of techniques for clinically treating cancer – i.e., surgery, chemotherapy, radiation therapy, hormonal therapy, local therapy and/or a combination of these treatments – are frequently ineffective in cases of late-stage and highly aggressive malignancies that have spread throughout the body. My work focuses in particular on developing novel treatments for metastatic cancer by harnessing the power of viruses to manipulate, change and effectively disable the genetic materials inside the cancer cells without impacting the normal cells throughout the rest of the body.

In particular, I develop novel viral vectors, which are vehicles for delivering genes and genetic information into target cells. Viral vectors are derived from viruses and rely on the basic way that these viruses function in nature – i.e., attacking host cells and introducing their own viral genetic material into the host cell in a way that it becomes a part of the replication cycle of the infected cell for the remaining life span of that cell – to deliver genetically manipulated material into target cells.

Because viruses are so effective at transduction (the insertion of genetic materials into the host cell via infection), medical researchers and molecular biologists have been working for over 30 years on developing methods to use viruses to proactively manipulate and change the genetic materials contained in a particular cell as a way to treat or prevent disease – i.e., to correct mutations that cause disease, or to prevent cancer cells from being able to replicate and spread,

etc. In order to accomplish this, researchers have sought to first remove the genes that cause disease from the virus and then replace them with genes encoded to the desired effect (such as insulin production in diabetics, or cancer cells that do not replicate).

A great challenge in this work is that in the process of this delicate manipulation, the genes within the virus that allow that virus to insert its genome into the host's genome must be left intact. Additionally, since viruses often infect more than one type of cell, viral vectors for specific anti-cancer genes, for example, must also be capable of distinguishing between healthy cells and cancer cells so that they only infect the latter. To date, the viral vectors developed for use in gene therapy have largely been based on viruses that are engineered to be "crippled" so that they can no longer replicate themselves and cannot spread from cell to cell. However, while these types of viral vectors have been proven safe, they are completely ineffective in patients with cancer, a disease that by definition involves the rapid proliferation of cells.

My research has focused on developing a variety of vectors based on different types of viruses, including my most recent work on a novel and groundbreaking retrovirus-derived gene delivery vector that infects and replicates itself selectively in cancer cells and spreads throughout tumors very efficiently and effectively without infecting normal cells. This retroviral-based vector is capable of keeping up with the continual growth of cancer cells. Additionally, I have been working on engineering these retroviral-based vectors to deliver "suicide genes" which are genes that make activator enzymes to convert a non-toxic precursor chemical (a "pro-drug") into an active anti-cancer drug. The pro-drug is not toxic to uninfected normal cells, and the conversion into the active drug occurs only within the infected cancer cells. The use of these novel retroviral-based vectors for suicide gene therapy has broad implications, including much more efficient and effective elimination of cancer cells without causing the toxic side effects to normal cells that usually limit the effectiveness of chemotherapy.

November 19, 2018

**By FedEx**

USCIS

**Re: EB1-2 Outstanding Professors and Researchers Petition for Dr. F**

Dear Sir or Madam:

This letter is to support the attached EB1-2 Outstanding Professors and Researchers Petition for Dr. F, an interdisciplinary mechanical biomedical engineering researcher whose work focuses on using Micro Electro Mechanical Systems (MEMS) and fluid dynamics to develop innovative devices and systems with a wide range of potential biomedical applications. In this work, which has contributed to developing ground-breaking miniature robotic systems and devices that have tremendous potential to directly improve the health and well-being of millions of people, Dr. Feng draws on his multidisciplinary expertise across the following fields: mechanical engineering, material science, MEMS sensors, actuators and microfabrication process.

Dr. F is currently employed as Microfabrication Engineer II at Second Sight Medical Products, Inc. ("Second Sight"), a medical research institute that is researching, developing, manufacturing, and marketing implantable visual prosthetics. Dr. F's work involves microfabrication which is the process of making miniature structures of micrometer scales and smaller. This work uses MEMS, which is the technology of microscopic devices, particularly those with moving parts. MEMS are made up of components between 1 and 100 micrometers in size and full-scale MEMS devices generally range in size from 20 micrometers to 1 millimeter (although components arranged in arrays can be larger). Microfabrication processes were originally developed for semiconductor manufacturing but in recent years these processes have been applied to other fields, such as biomedical applications. The major concepts and principles of microfabrication include: microlithography, doping, thin films, etching, bonding and polishing. The global market for biomedical MEMS devices is expected to grow at a compound annual growth rate of approximately 26.1% and to reach approximately \$26.6 billion in 2025.

MEMS and the subfields of microfluidics/lab-on-a-chip optical MEMS have extended and adapted the original semiconductor microfabrication methods and processes for a wide range of biomedical applications. However, because of the large surface area to volume ratio of biomedical MEMS devices, the forces produced by ambient electromagnetism and fluid dynamics are more important design considerations in these tiny biomedical devices than with larger scale mechanical devices. For certain complex applications, biomedical MEMS components can also be arranged into larger arrays that consist of a central unit that processes data and several components that interact with the surroundings such as microsensors.

Second Sight's Argus II Retinal Prosthesis System ("Argus II") is the world's first approved device intended to restore some functional vision for people suffering from blindness. Argus II is an implantable device that uses a biomedical MEMS array to provide electrical stimulation to a patient's retina in order to induce visual perception in blind people with severe to profound

retinitis pigmentosa and bare light or no light perception in both eyes. Argus II is approved for use in the United States and the European Economic Area.

A visual prosthesis system is substantially more complex than any other existing biomechanical medical prosthesis. Pacemakers in the heart work well with only 2 electrodes, and even the most advanced cochlear implant devices accomplish all the functions with only 16 electrodes. In contrast, even the most basic visual prosthesis requires tens to hundreds of electrodes to generate a functional visual field. For this reason, MEMS technology, which substantially reduces the size of the device and improves the accuracy of fabrication, is a prerequisite for a successful implantable visual prosthesis.

In his research for Second Sight since 2016, Dr. F has focused on developing microfabricated components and MEMS arrays for our innovative human visual prosthetic products. Dr. Feng is responsible for researching, planning and designing process steps and associated tooling to produce these critical flexible MEMS components, including the novel Implantable Thin Film Microelectrode Array (MEA), for Argus II; this array will ultimately be implanted in human bodies in order to function as a seeing eye for functionally blind patients. For this work, Dr. F designs, develops and tests fabrication processes and related equipment operations -- all of which are vital to the ultimate success, usability and durability of Second Sight's visual prosthetic devices. He develops and uses specialized techniques such as machining, pattern transfer, deposition and etching and molding to create functional structures.

February 16, 2016

**By FedEx**

USCIS

**Re: I-140 Petition and Application for National Interest Waiver**

Dear Sir or Madam:

I am writing this letter in support of my request for a National Interest Waiver of Labor Certification and your favorable approval of the attached EB2 immigrant visa petition.

I am a Bioinformatics Scientist currently working at the Van Andel Research Institute in Grand Rapids, Michigan. I use complex computer programming languages and a variety of sophisticated statistical methods to perform genomic and epigenetic analysis of cancer. This research is part of the Cancer Genome Atlas (TCGA) project, a large multi-year project that brings together top cancer researchers from around the country that financed through both the National Cancer Institute (NCI) and the National Human Genome Research Institute at approximately \$100 million per year. The ultimate goal of this project is to develop a molecular level understanding of many different types of cancers that will enable us to develop better, more effective methods for detecting, diagnosing and treating these cancers.

Cancer currently accounts for nearly 1 in every 4 deaths in the United States, and the incidence of cancer is rising. The number of new cancer cases is expected to increase nearly 45% by 2030, at which point the American Society of Clinical Oncology estimate that cancer will surpass heart disease to become the leading cause of death in the United States. The American Cancer Society also estimates that 13.7 million Americans alive today have had cancer; some of these people are now cancer free, while others are undergoing treatment for the disease. The American Cancer Society also estimates that approximately 1.66 million new cases of cancer will be diagnosed in the United States this year, and that an estimated 585,720 people will die of the disease in the United States this year (amounting to nearly 1,600 cancer deaths per day).

Cells change from being normal cells to becoming cancerous when the DNA inside the cell nucleus mutates, either due to internal genetic factors (i.e., factors inherent in the DNA itself) or external epigenetic factors (i.e., changes in gene activity, expression and ultimate cell function due to chemical reactions in the cell that are *not* caused by changes in the DNA sequence itself but rather by environmental factors). Genetic DNA mutations and epigenetic dysfunctions within cells are the primary cause of cancer.

My research studies the epigenetic changes that cause cells to become cancer cells, and in particular the molecular mechanisms in these cells that transform normal cells into cancer cells. Much of my work to date has focused on the role of DNA methylation (a cellular process that is important for controlling the expression of genes) in cancer. This work has far-reaching implications, and in addition to continuing to advance our understanding of cancer, may hold the key to more effective cancer prevention, detection, treatment and monitoring.

Epigenetics, one of the most rapidly advancing and expanding fields in biology, studies the environmental and external factors that switch genes on and off and affect and can change the ways that cells read genes -- even when the underlying DNA itself hasn't changed. My work has significantly advanced our understanding of particular epigenetic mechanisms as these relate to cancer. Cancer epigenetics involves studying the effects of external, epigenetic modifications to the genome of cancer cells; even though these epigenetic changes do not involve any modification to DNA, the alterations may last for a cell's life and may even be heritable across generations. The types of epigenetic changes that cause cancer to start can involve the disturbance of a variety of critical cellular mechanisms, such as the silencing of tumor suppressor genes and/or the activation of oncogenes (e.g., cancer genes). Research has shown that these epigenetic alterations to cells are as important as genetic mutations in a cell's transformation to cancer, and that, therefore, the manipulation of these epigenetic mechanisms holds great promise for cancer prevention, detection and therapy.

The Cancer Genome Atlas project began in 2005 as a national effort to bring together clinicians, pathologies and molecular and computational biologists to profile the molecular changes that occur in major types of cancer. TCGA's mission was and continues to be to elucidate the key changes in molecular and biological processes that cause various different types of cancer to grow and to thereby improve our ability to diagnose, treat and prevent these diseases. TCGA, a high profile project with substantial international recognition, uses large-scale genome sequencing and bioinformatics to analyze and catalogue the genetic mutations responsible for particular cancer types.

The first phase of TCGA focused on characterizing 3 types of human cancers: glioblastoma multiforme, lung and ovarian cancer. In 2009, TCGA expanded to phase two during which researchers initially planned to complete the genomic characterization and sequence analysis of 20-25 different tumor types by 2014. However, during phase two, TCGA scientists surpassed that initial goal and researchers have so far succeeded in characterizing 33 cancer types, including 10 rare cancers using techniques that include: gene expression profiling, copy number variation profiling, SNP genotyping, genome wide DNA methylation profiling, microRNA profiling and exon sequencing of at least 1,200 genes.

I have been a core member of TCGA since 2010 and during the past 5 years, I have led TCGA epigenomic data analysis for several cancer types and have played a pivotal role in groundbreaking discoveries. My work has already had significant impact on the field by identifying new categories of epigenetic alterations that distinguish tumors previously thought to be of the same type (and therefore treated clinically as the same, often with poor results). My research and analyses have also pointed to genes whose suppression contributes to the development of cancer, shedding light on the biological basis of these cancers. The results of some of my work for TCGA was reported in the top journal *Nature* and has been cited more than 1,350 by other scientists in less than 2 years; the results of my most recent TCGA findings will be published in upcoming months in many top international journals and will have a tremendous impact on deepening our understanding of many cancers, the first step toward improving treatment strategies and survival rates.

My work for TCGA initially focused on gastric cancer (stomach and colorectal cancers); gastric cancers are the third most common cause of cancer-related deaths in the world and are responsible for more than 50,000 deaths per year in the United States. Gastric cancers remain difficult to cure in Western countries primarily because it is extremely hard to detect in early stages and most patients present with advanced disease. My epigenetic analyses have contributed to the development of a novel molecular classification that divides gastric cancers -- which to date had all been treated as the same type of cancer -- into 4 major subtypes, each with a distinct epigenetic alteration that defines it. For example, I found that gastric tumors that were positive for the Epstein-Barr virus had an extremely high prevalence of particular epigenetic changes that silenced their tumor suppressor genes. In another class of tumors, I identified abnormally frequent epigenetic silencing of a gene that normally performs DNA mismatch repairs. Being able to classify these tumors by their particular epigenetic alteration will help to facilitate the development of more effective treatments that are better targeted to the particular epigenetic alteration that has led to the development of that cancer. This classification system, which has been made available for use by researchers around the world, may offer predictive information for response to various chemotherapy and drug treatments and will ultimately improve overall patient survival. This groundbreaking research made the front page of the *New York Times* and other national news media.

August 28, 2015

**By FedEx**

USCIS

**Re: I-140 Petition and Application for National Interest Waiver**

Dear Sir or Madam:

I am writing this letter in support of my request for a National Interest Waiver of Labor Certification and your favorable approval of the attached EB2 immigrant visa petition.

I am an astrophysicist currently serving as a Researcher at Seward Observatory at the University of Arizona. My computational research focuses on developing numerical simulations and complex visualizations to understand the nature of our physical universe, including black holes. For this work, I use special purpose hardware, including some of the fastest next generation supercomputers in the world. I develop innovative software and algorithms that harness the tremendous computing power of these supercomputers to simulate and study highly complex astrophysical systems such as black holes. The results of this work have broad implications – among them the potential to offer the first direct proof that black holes exist, including Sagittarius A\* (Sgr A\*), the black hole that is thought to be located at the center of our own galaxy, the Milky Way.

A black hole is a place in space and time that exhibits a gravitational field so strong and large that it swallows everything in its reach. Nothing – including light – can escape a black hole's grip. Scientists think black holes are created in two ways: some originated when the galaxy they are in was formed, and some are formed through the collapse of a very big star in on itself (a supernova). The gravity inside a black hole becomes extremely strong because the matter inside the hole has been squeezed and compressed into a tiny space in a self-perpetuating cycle. Scientists speculate that every large galaxy contains a supermassive (masses that are equal to more than 1 million suns together) black hole at its center. Sgr A\*, the supermassive black hole that is thought to be at the center of the Milky Way, has a mass of 4.3 million suns and is located 26,000 light years from Earth at the center of the Milky Way.

As the extreme gravity of a black hole draws in the matter around it, it creates a giant swirl of colliding gasses and matter that are spun around the black hole like water circling a drain. The compression of this matter that occurs inside the black hole results in a great deal of friction. This friction turns into plasma that is heated to a billion degrees or more causing it to “glow” and radiate electromagnetic energy that astronomers are able to detect on earth. By making images of the glow of matter swirling around the black hole before it goes over the edge (the black hole's boundary) and plunges into the black hole's abyss of space and time, scientists are able to see the outline of the black hole itself, which is also called its shadow.

Black holes are a type of accretion disk, e.g., a structure that is formed by diffused materials orbiting around a massive central body. Magnetohydrodynamics (MHD) is the simultaneous study of both the hydrodynamics of conducting fluid and the behavior of magnetic fields (for example, magnetic fields that exist in the plasma near black holes). Magnetorotational instabilities (MRI) are fluid instabilities that occur in these magnetic fields when objects are orbiting a massive central object. MRIs are important to the overall dynamics inside black hole accretion disks and are a major cause of turbulence inside black holes (and other accretion disks). In 1970s, the U.S. Nobel Laureate Richard Feynman identified hydrodynamic turbulence as “the most important unsolved problem of classical physics.” The original research on MRI was published 24 years ago, and has been studied by countless astrophysicists around the world. The prestigious 2013 Shaw Prize in Astronomy (which is often called the “Nobel Prize of the East”) was awarded for research in MRI.

In my work as a computational astrophysicist, I use highly sophisticated numerical simulations to create virtual models of the fluid dynamics and MRIs that operate within black hole accretion disks and other systems in our physical universe. These models involve complex numerical schemes that are programmed into supercomputers, e.g., high-performance computers that are many thousands of times faster than personal computers and are capable of processing parallel sets of sophisticated numerical schemes.

Supercomputers have become integral to a great number of fields that rely on highly complex data modeling, from weather prediction to social analysis to studying black holes. The U.S. government has long recognized the importance of supercomputing and the U.S. government is required by law to develop and deploy high-end computing systems for advanced scientific and engineering applications and also to support programs to develop software and hardware for high-end computing systems. To this end, the U.S. government launched the CORAL initiative and invested \$525 million to build three state-of-the-art supercomputers in U.S. national labs and is also currently building a \$174 next generation Trinity supercomputer. These next-generation supercomputers are expected to enable and lead transformative research in basic sciences, energy management, monitoring the environment and climate change as well as many other areas of critical and practically applicable research.

Developing software for supercomputers requires the technical expertise to be able to leverage their hardware capabilities. Very few computational scientists in the world are capable of developing algorithms and software programming for such powerful supercomputers. I have been developing algorithms and programming for supercomputers for more than 10 years, during which time I have published 11 papers using algorithms developed on supercomputers. These algorithms I have developed have pushed computational physics to its limit and solve some of the most challenging problems in astrophysics.