

Creativity, originality and initiative, demonstrated in any area of your life (500 chars)

I never danced before college, but quickly picked it up and became a leader in MIT DanceTroupe (DT). As a choreographer, my specialties were in hip-hop and “tutting,” sharp, angular hand and arm movements named for their resemblance to Egyptian paintings. Besides inventing creative choreography, I enjoyed teaching and was especially proud when I watched formerly shy dancers perform their hearts out onstage. As publicity chair, I rebranded DT by designing a new, consistent logo still used today.

Capacity for accomplishment, demonstrated through activity that requires drive & sustained effort (500 chars)

I worked with Prof Jill Mesirov at the Broad Institute of MIT and Harvard, where I developed an algorithm called REVEALER, which discovers new candidate activators of cancer, aiding in the understanding of the bigger picture of cancer genesis as well as identifying drug targets. I led the collaborative effort of REVEALER, working with computational biologists to analyze the algorithm’ wet-lab researchers and physicians to determine clinical relevance, and software developers to ensure usability.

Commitment to the values expressed in the US Constitution and the Bill of Rights (500 chars)

By advocating for women in science, engineering, and the media, I fight for equality of people as outlined in the US Constitution and Bill of Rights. I am part of a national movement, “Nerd Girls” to eradicate stereotypes of smart women, volunteer with Science Club for Girls, and host screenings of female awareness films such as “Miss Representation.” Despite the US’s strides in equality between genders, a tangible gap in science, engineering, technology, and leadership positions remains.

Please write in essay form about your experience as a New American. Indicate, if appropriate, the role of family and other institutions in bringing you to the position you now hold. Also indicate what activities you have undertaken that might give evidence of **creativity, accomplishment, and commitment to the values expressed in the US Constitution and the Bill of Rights.** (1000 words max)

“We hold these truths to be self-evident: that all men are created equal, that they are endowed by their creator with certain inalienable Rights, that among these are Life, Liberty, and the Pursuit of Happiness” While not a constitutional value, this line from colonial America’s Declaration of Independence has profound impact on the culture of the United States (US), withstood the test of time and has been quoted in fights for equality. As a naturalized citizen of the US, I uphold this statement through interpreting Russian immigrants’ medical encounters and advocating for women. Importantly, I recognize that these opportunities, including attending the Massachusetts Institute of Technology (MIT) would not have been accessible to me had my family stayed in the Soviet Union (USSR).

As a child, I heard my parents' friends complain about immigrant children losing their native language, and I was determined to not be one of them. I attended Russian parties with my family and sat at the "adults" table to practice Russian. In undergrad at MIT, I went to Russian-speaking events and took Russian language classes at Harvard. After college, I sought to ensure that new immigrants had equal opportunity to their right of Life through equal access to healthcare and obtained a certificate in Russian-English medical interpretation. Through interpreter training, I was exposed to a variety of ambiguous ethical situations, such as maintaining confidentiality in interpreting for the same patient but for different practitioners and having knowledge of the patient's medical condition that could affect a procedure, ameliorating reaction to hearing a cancer diagnosis, and experiencing disrespect to female interpreters as interpreters in Russia are primarily male. I am well aware of the Russian discrimination against women, which my mother was exposed to when she was attending the Moscow Institute of Physics and Technology, known as the "Russian MIT." There, one of her male peers asked her, "What are you doing here? Why aren't you at home having babies?" I have experience similar prejudice from Russian men in the US. They are so surprised to hear that a young woman such as myself is attended MIT and is not just looking for a rich husband to latch on to.

Women's inequality in the US is subtler than in Russia. Instead of overt sexism, there are subtle barriers to women achieving success in both technical and nontechnical fields, and I seek to eradicate them. As a volunteer for Science Club for Girls (SCFG), a Boston-based afterschool program for girls K-6 to get excited about science and math, I taught an anatomy curriculum to 2nd graders and loved seeing their excitement about science. These were easily the most rewarding hours of my week. But when I judged a science fair at an inner-city middle school, I was disappointed. This school didn't have SCFG and I saw that regardless of race, the greatest divide between the fantastic and the mediocre science projects was gender. The girls weren't going for the hard, high-risk projects. Instead they did the tried and true: making crystals out of Borax at different temperatures but not recognizing the difference between crystalizing in liquid or in air, investigating invisible ink, and growing plants. The boys made a bike that could charge a cell phone, a drum set out of terra cotta plant pots and a piezoelectric, and a static electricity generator. I was dumbfounded that at 7th grade, the difference in scientific ability between the genders was so great. I realized that while I could teach 2nd graders about science and get them excited about my own subjects, there was a psychological shift that we as a nation need to make happen.

Women in the media are not portrayed as strong, capable, and smart. Instead they are sexy, manipulative, and vapid. I am a role model through *Nerd Girls*, a national movement to dispel myths about women in science and engineering. Girls today are pressured into looks and not brains as a result of a lack of media coverage of smart women. I know that I was pressured by this media. Through Nerd Girls, I am creating stories for young women to look up to and be inspired by, so they know it's okay to be smart. Additionally, I am organizing a screening on UCSC campus of *Miss Representation*, a new documentary exploring the dearth of strong and capable women in media, and will lead a discussion of the film afterwards. There is an accompanying K-12 curriculum to the film and after this

initial screening, I will teach this curriculum to local Santa Cruz schools. I want to use this film as a forum for students of color, as well. While I am Caucasian, I recognize that Black, Latino/Latina, East Asian, South Asian, and Middle Eastern people are highly underrepresented in the media's depictions of high-ranking officials in both the public and private sector, and this needs to change. This discussion should occur in groups of all genders and races, for only when all parties realize that discrimination occurs, can it stop.

My involvement in women's and immigrant issues could not have been possible in the USSR, and I am forever thankful for my family's move to the US. However, appreciating my parent's choice to move to the United States took the better part of my life. As a child, I just knew that we were a little different: we celebrated New Year's instead of Christmas, we always went to a friend's house for Friday Shabbat dinner, and we spoke Russian at home. A famous story in my family is when I was asked in kindergarten, "How do you speak Russian?" and the five-year-old me answered, "It's easy! You just open your mouth and say it in Russian!" I didn't appreciate the value in speaking a non-English language at home brought me.

Had my family stayed in the Soviet Union, my parents would not have divorced and my mother would not be pursuing the love of her life, a mathematics PhD, and I would not have had the same opportunity to attend the fantastic institution of MIT. Soon after our visit to Russia, my stepmother Ira gave birth to my younger brother Gersh. Despite the pain of divorce, I found happiness in my untraditional Russian family. Ira's family has been incredibly welcoming, and as my biological relatives are all in Russia, it has been fantastic to have grandparents and aunts and uncles through Ira. I have been able to practice Russian and connect with a Russian community I never could have previously imagined.

Through my experiences as an interpreter and advocate for women, I have come to appreciate my family's move to the US and opportunity to uphold the statement, "All men are created equal."

Please indicate in essay form your major goals for your career and how your education will further them (1000 words). **Needs direction/organization!!**

Coming of age as the Human Genome Project reached its fruition, I was obsessed with genetics and learned early on that the genome is a powerful tool with profound application to understanding disease. I was frustrated by undesirable effects of drugs, and began mentally constructing an ideal future where a simple blood test could inform the physician of nearly every aspect of a patient's health status, dictating treatment and future steps. The advent of high-throughput genomics, proteomics, and other -omics technologies brings this vision of personalized medicine closer to reality.

Innovation is best paired with a solid foundation, and I began my journey at MIT where I was one of two people to obtain dual degrees in mathematics and biological engineering. After graduating, I trained as a bioinformatician at the Broad Institute of Harvard and MIT. The interdisciplinary environment was inspiring because the algorithm design process was not only an iterative process, but also a convergent symbiotic evolution of

biologists and mathematicians. The Paul and Daisy Soros Fellowship for New Americans can deepen my doctoral studies by allowing me the freedom to forge novel collaborations between computation and biomedicine, as I have witnessed groundbreaking research occur at the intersection of disciplines. I considered pursuing an MD/PhD dual degree, but realized I would contribute more broadly to society if I focused my efforts on research. Thus, instead of pursuing a dual degree, I want to do my PhD in a medical environment.

Currently I am in a Master's of Bioinformatics program at University of California – Santa Cruz (UCSC), where I intend to finish the two-year program in one year. This is a feasible goal as I have experience in accelerated programs - I received two bachelor's degrees from MIT in four years. Since UCSC does not have a medical school, I am currently applying to PhD programs. It is important for me to pursue my doctoral studies where there is a large effort towards clinical integrated genomics because I know these labs will have the first opportunity to access new data collected by novel methods, and therefore the first opportunity to develop algorithms that can save lives.

For example, attending Harvard Medical School's program in Bioinformatics and Integrative Genomics (BIG) would offer me the opportunity to capitalize on existing collaborations, and forge novel ones with clinicians from the fertile hospital community. Specifically, I am interested in working with the Children's Hospital Informatics Program for their innovations in health care informatics, such as the Informatics for Integrating Biology and the Bedside (i2b2) program. The i2b2 network allows researchers and clinicians from around the world to collaborate on patient data, creating a platform for distributing innovations in clinical bioinformatics. The true mark of applicability is in widespread usage, and I want to be in an environment that has the capability to implement my tumor-analysis algorithms in a clinical setting, and where I can surround myself with people with this collaborative mindset.

In my future career, I aim to merge the disciplines of mathematics, computer science, and biology to cure human disease. Production of biological data is no longer a bottleneck; rather, computational interpretation of these data is one of the great challenges in biology. I will apply informatics to life sciences by pioneering a future of personalized medicine harnessing advancements in –omics technologies. This vision is currently most pertinent to cancer, where national efforts such as The Cancer Genome Atlas (TCGA) are developing vast data repositories for genome analysis.

The clinical manifestation of cancer is so complex and multimodal, caused by interaction of a variety of inherited and environmental factors and potentially leading to widespread metastasis, that traditional treatment methods of surgery, chemotherapy, and drug therapy are insufficient. However, the combination of cancer biology and informatics provides fresh insight into important problems such as development of drug resistance.

My goal is to revolutionize cancer treatment by developing a dynamic model of within-tumor interactions to understand drug sensitivity and cancer evolution through integrated genomics and epigenomics. I am especially interested in sequencing single-cell

tumor cells, a promising approach as most cancers are incapable of growing in a monoclonal population on a petri dish. My model will capture the temporal response to therapeutics by encoding the interactions between individual cells and predict the magnitude of the population's response, how quickly the surviving resistant population may relapse, and what combination therapies to pursue to avoid relapse. Currently, the highest demand for tissue-specific modeling is in cancer, but I am interested in modeling other disease tissues through collaborations with leading research hospitals such as Massachusetts General Hospital.

To maximize my impact on revolutionizing medicine through personalized genomics, I want to be a professor at a major research institution, where I will foster an open-source atmosphere by publishing groundbreaking papers, mentoring students, and organizing conferences. I cannot wait to co-chair the Student Council Symposium at the International Society for Computational Biology's annual conference and to continue the circulation of innovation in bioinformatics. Moreover, I will strive to apply my discoveries to create something new, whether a new device or a new paradigm; as true power lies in application. I will be a "collaboration junkie," (source: Prof. Aviv Regev) and seize opportunities to work with people of diverse experiences and expertise because our strengths together can solve problems in completely unexpected ways. As a professor, I will embody the bimodality of bioinformatics by obtaining appointments in both medicine and applied mathematics, and pursuing collaborations with physicians and biologists. My quantitative skills will filter noisy biological data into actionable information to promote health and combat disease.