Short Answer and Optional Questions

Your answer to the following questions will be evaluated along with the essay you wrote as part of the Common Application. We encourage you to take advantage of this additional opportunity to let us know about your intellectual and personal interests. Please limit each answer as indicated.

28. **The following questions are required for engineering and transfer applicants. Please limit your response to one to three paragraphs. You may use the additional page provided at the end of this form.**

    a. (For Engineering Applicants Only) If you are applying to the Pratt School of Engineering, please discuss why you want to study engineering and why you would like to study at Duke.

    b. (For Transfer Applicants Only) Consider the books, essays, poems, or journal articles you have read over the last year or two, either for school or leisure. Please discuss the way in which one of them has changed your understanding of the world, other people, or yourself.

    c. (For Transfer Applicants Only) If you want to transfer to Trinity College of Arts & Sciences, please discuss why you consider Duke a good match for you. Is there something in particular at Duke that attracts you? If you want to transfer to the Pratt School of Engineering, please be sure to answer question 28a above.

29. **The following questions are optional—and, yes, they truly are optional! If you choose to answer them, please use the additional page provided at the end of this form unless noted otherwise. If you choose not to answer them, your chance of admission will not be affected.**

    a. (For Arts & Sciences Applicants Only) If you are applying to Trinity College of Arts & Sciences, please discuss why you consider Duke a good match for you. Is there something in particular at Duke that attracts you? Please limit your response to one or two paragraphs.

    b. If you have participated in any significant research activity outside of school, please provide a brief description and limit your response to one or two paragraphs.

    c. We seek to understand and appreciate you as an individual. If there is a parent, sibling, other relative, or friend who you think could help us do that, we would be happy to receive a one-page letter from one of them. (It must be mailed to our office by January 2, 2010.) This optional information will be considered in our understanding of you as a person, but will not be formally evaluated as part of your application.

If you have a disability and would like to receive consideration for reasonable accommodations, we encourage you to contact the Disability Management System-Student Access Office at (919) 684-5917, voice; (919) 684-5324, TTY; or e-mail, disabilities@aas.duke.edu. Duke University is committed to equality of educational opportunities for qualified students with disabilities, but the level of services provided at post-secondary institutions can differ considerably from what many students receive in high school. For example, all students in Trinity College of Arts & Sciences must fulfill a foreign language requirement.

Duke Community Standard

Duke University is a community dedicated to scholarship, leadership, and service and to the principles of honesty, fairness, respect, and accountability. Citizens of this community commit to reflect upon and uphold these principles in all academic and non-academic endeavors, and to protect and promote a culture of integrity.

To uphold the Duke Community Standard:

- *I will not lie, cheat, or steal in my academic endeavors;*
- *I will conduct myself honorably in all my endeavors; and*
- *I will act if the Standard is compromised.*

Conditions of Application

In applying for admission to Duke University, you are consenting to the following conditions:

- That the information supplied by you on this application is true and correct to the best of your knowledge;
- That providing false information, including your citizenship or U.S. visa status, is grounds for termination of your application or revocation of an admissions offer or your enrollment status at any time;
- That you authorize the Admissions Office and appropriate faculty and staff of all educational institutions you have attended to discuss your candidacy;
- That the only valid notification of an admissions decision is the formal (printed) decision letter from the Dean of Undergraduate Admissions;
- That Duke University may discontinue your application for admission if you are accepted under a binding Early Decision program to another college or university;
- That Duke University may discontinue your application or withdraw your offer of admission at any time if you apply Early Decision to Duke and the terms of the Early Decision Agreement are not met; and
- That if any of the information in your application changes between now and your enrollment at Duke, you will notify the Admissions Office **within 48 hours**. Failing to notify the Admissions Office **within 48 hours** of any changes may result in the withdrawal of your application and/or the offer of admission at any time.

EARLY DECISION

Early Decision applicants, we need your first quarter grades. When you give the **School Report Supplement** to your college advisor or school registrar, also ask him or her to send your first quarter grades to Duke when they become available.

(For Engineering Applicants Only) If you are applying to the Pratt School of Engineering, please discuss why you want to study engineering and why you would like to study at Duke.Ê
ÊÊÊÊÊÊLast Sunday I realized, again and more fully than ever, why I want to immerse myself in engineering.ÊÊ I awoke in the midmorning, still drifting yet well-rested.Ê In those dreamlike moments before opening my eyes, fragments of thought, old and new, began to coalesce into ideas that I immediately felt an urge to implement.Ê First, I mused, it would be interesting to write an RSA encryptor (the same sort of computer program that makes credit card data secure online) in the scientific programming language Mathematica, and then see how Mathematica's algorithms and our school's parallel computer would fare at cracking the keys.Ê As I lay still, the practical details of its implementation unfolded in my quietly fascinated mind. My thoughts continued to branch. Presently, my awareness turned to the micro-architecture of the computer chip I had developed for the Intel Science Talent Search. I considered for a moment, and began to work out new, more efficient logic. The Verilog code for a more powerful design was at the tips of my fingers, when suddenly I realized, somewhat dejectedly, that I should instead get up and finish my art history homework and revise my college essays. It was then, I saw, that although I deeply enjoy these non-engineering activities Ð art history is one of my favorite classes and college essays are both fun and revelatory Ð they are distinctly secondary to what I love most: that is, conceiving and carrying out scientific projects. Lying in bed and suddenly finding myself infused with a desire to go and build something last Sunday reminded me of the effortless, exulted inspiration that had, since elementary school frequently blazed up in my rested mind. It was this intense passion for discovery and creation that had over the years driven me to build robots, conceive biology experiments, and craft algorithms for naught but the sheer excitement and wonder of the experience.Ê Now, as the day grows late, I want to again coax flames from these potent embers I have discovered to yet glow hot within.Ê Studying science and engineering will encourage and empower me to do this more deeply than ever before.
ÊÊÊÊÊÊAt Duke specifically, I would be surrounded by many of the world's top thinkers and innovators, both expert and student, and this amazing camaraderie would inspire me to greater invention. Even beyond this, Duke is special among research institutions for its lengthy track record of developing paradigm-bending innovations. What I've been most impressed with is the school's willingness to push the limits of what humans believe possible: metamaterial "invisibility cloaks," ultrasound imaging, microfluidic systems, and smart materials are but some of the "straight-out-of-science-fiction" developments to have come from Pratt. Duke researchers not only proved these once-unimaginable concepts possible, but in the process of doing so have developed entirely new fields of technology that are now influencing everything from the way we build microchips to how we assay biosamples. This mentality Ð that limiting preconceptions can and should be broken Ð is something that I cannot resist wanting to be a part of.
ÊÊÊÊÊÊTo me, there is no feeling more electrifying than that which comes from gazing through my closed eyelids into an untouched glen of new knowledge, and then from its fruits, creating something previously believed impossible. That is the root of my fascination with science, that is why I wish to study engineering, that is why I want to go to

Duke.

If you have participated in any significant research activity outside of school, please provide a brief description and limit your response to one or two paragraphs.

The most important research project I have worked on is the massively parallel propagation-delay algorithm and FPGA (field-programmable gate array) microchip I independently designed for the Intel Science Talent Search. The chip was demonstrated to solve certain computationally difficult problems – graph theoretic shortest path problems – an order of magnitude more quickly than traditional computers, and the novel theoretical approach was shown to be generalizable to other, even more difficult problems such as the subset sum problem. These innovations have applications in fields from network routing to cryptography to missile interception to computational biology. My research abstract is below.

"This paper describes the development, optimization, simulation, and practical FPGA (Xilinx Spartan-3E X3S500E) implementation of a new parallel algorithm for the NSSP (single source shortest path problem with nonnegative edge weights). Its run time has an upper bound of O(min(n, ?)), and it uses hardware resources on the order of O(m), the theoretical optimum. It was applied to standard benchmark problem instances and its performance was compared to that of the fastest general case implementation of Dijkstra's algorithm – O(m + n log n). For practical instances of the problem, the propagation delay algorithm required on the order of 200–300 times fewer clock cycles. The hardware implementation achieved is fully scalable, and the paper proposes a second-generation chip architecture which, when implemented, will make the device efficiently problem-reconfigurable in real-time. The relatively low cost of the chip combined with its power and flexibility make it broadly applicable in a wide variety of laboratory and field situations. Moreover, the underlying algorithm is the product of a new parallel computing paradigm, which will be termed "accelerated propagation delay" because it is based on controlling and recording the relative speed of signals propagating in parallel through a network. This paradigm is generalizable to solve other problems that are even more computationally intensive than pathfinding, including the NP-complete subset sum and Hamiltonian path problems. An accelerated design to solve the first of these problems was developed as part of this project and is proposed briefly in the discussion."