

## PERSONAL STATEMENT-PAUL CONSTANTINE

### SCIENTIFIC COMPUTING AND COMPUTATIONAL MATHEMATICS

A fleeting moment of self-awareness: The hard-wood edge of the seat bears firmly into my backside; my arm, pressed against the small worn platform desk attached to the chair, bears the burden of my torso, which is frozen upright to support my head, whose eyes stare fixed on the blackboard while Dr. Gao hastily composes a succession of words and symbols – his hand barely keeping pace with his voice which, already at an unnaturally slow rate, is precisely and passionately spewing patois – meaningless to the masses – that constitute a carefully constructed course culminating in a sublime truth. I scribble panic-stricken notes, recording only the initial conditions and the trickiest points of the argument; I want to exercise my full mental force to absorb every turn along our path. This intensity continues for a length of time that I cannot estimate, but at the end – signaled by a small, prudently drawn square – Dr. Gao stands before us in front of a waterfall of logic; the spray, which manifests itself as chalk dust, litters the air around the board and clings to his hands. “This, as you know, is the Fundamental Theorem of Calculus.” His casual tone betrays the immense relief evoked by the small square, for he knew the conclusion of the argument before he began his exposition. This was no mere technique. This was not a formula to be applied to some pre-fabricated exercise. Before me a monumental truth had been revealed; a relationship between two conceptual worlds, which up to this point in the semester had been completely distinct – the area under the graph of a well-behaved function on a bounded interval is related to the antiderivative of the function evaluated at the interval’s endpoints.

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A completed proof transcends time and therefore us. As we follow an argument, we connect ourselves with an objective reality that exists outside of our perceptions and prejudices – a realm of knowledge beyond our temporal limitations. Dr. Gao's proof, while a formative experience, was not the single turning point in my decision to pursue a career in mathematics, but one of many such moments I have experienced in lectures, dialogue, and personal reflection. They have been a part of my composition since my earliest memories – my father explaining division to me as a child, my 5<sup>th</sup> grade math teacher revealing number systems with bases other than ten. These glimpses of infinity have intoxicated me. I live for the brief moments of clarity when a conceptual connection is established, a relationship is forged or uncovered between distinct elements: consolidation, harmony, enlightenment.

My school records may appear spotty at first glance, but let me offer an analysis, from an inside perspective that the reader may not find in the characters, numbers, and course names on the transcripts and score reports. My first three years of college do not deserve significant verbiage, other than to say that I was neither directed nor focused towards finishing school, not to mention any particular career. I completed the majority of my coursework with mediocre marks, lackluster enthusiasm, and little motivation. Upon realizing that I was incurring significant debt for my sub-par performance and unsatisfying academic experience, I left school to re-group and find direction. A spontaneous three-month trip to Europe, financed by the proceeds from the sale of my car, served as the spark towards maturity that I needed. I returned from my travels armed with fresh motivation, renewed self-confidence, and recognition that I am capable of excelling in academia. So I went back to

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school to finish my bachelor's degree. I matriculated at University of North Texas because of its proximity and price tag. Recalling my brief, scattered encounters with the infinite, I chose math as my major; I had already completed my basic, three-semester calculus sequence and I knew how to succeed in a math class environment. I did not want to incur any more debt than necessary, so I took as many courses as my schedule would permit, worked twenty-five hours a week at a local music store, and played in a band on the weekends. The first semester I enrolled in nineteen semester hours – all crammed into Tuesday and Thursday to leave room for my work schedule. By the end of the semester I realized that I thrive in this environment of severe over-stimulation; my grades were stellar and I felt extraordinarily fulfilled by my enterprises. So I continued this pattern for the rest of my time at UNT and achieved similar success. By the time I received my degree *cum laude*, I had completed more semester hours during my eighteen months at UNT than I had completed in my first *three years* of college combined, all while maintaining a social life and a part-time job. My GPA during that rich eighteen-month period was a 3.85, a significant improvement over the meager 3.0 I earned during my first university experience.

What did I gain from my experience at UNT that makes me a good candidate for graduate study in mathematics? My math courses were the most rewarding and stimulating of all my courses. In them I tapped my reservoir of quantitative and logical reasoning capabilities, and my analytical talents blossomed. In Real Analysis and Abstract Algebra I was trained to utilize rigorous methodologies for creating refined arguments and proofs. In Probability, Numerical Analysis, and Differential Equations I explored some

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applications of mathematics, learned to construct algorithms, and developed my computer programming and technical writing skills. My electives, upper-level interdisciplinary courses in Finance, Mathematical Economics, Econometrics, and Accounting, taught me to be resourceful and integrate material from many sources to complete my assignments. I developed personal relationships with my professors and fellow students that created an academic community where I could both receive and provide support. These relationships were some of my primary motivators towards pursuing a career in mathematics. The challenging coursework and motivating relationships often drove me to deep personal reflection, where I discovered both innate talent and a seemingly limitless passion for the material. Through these experiences I have realized that I must find a career where I can be on the forefront of knowledge. This will only occur if I obtain a Ph.D., a research degree, evidence that I am capable of doing solid research. These careers exist in both academia and industry, but access to them requires that I prove myself a researcher of the highest caliber.

My goal from entrance into UNT to the conference of my degree was to find employment in industry. I intended to gain approximately two years of work experience and then to reevaluate my educational plans. Therefore I spent my last semester job-hunting, an overwhelming and exciting endeavor. I learned to market myself through the principle channels of the résumé and the interview, and by graduation, I had secured a job as an actuarial analyst for Watson Wyatt, a global human resources and actuarial consulting firm. This put me on the path toward gaining actuarial credentials. At Wyatt, I surpassed expectations by rapidly learning the systems and methods of the pension

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valuation process. I excelled in both my daily work and corporate trainings. I passed the Society of Actuaries Course 1(Calculus and Probability) on my first sitting and was awarded a raise, a bonus, and company sponsorship for the remaining exams. But despite my success, I was miserable. The work was mundane and routine, and the stimulation that I thrived on in academia was completely absent. Certainly the steady paycheck was desirable, but though I was gaining the world, I was losing my soul. E.T. Bell best summarizes my feelings in his popular *Men of Mathematics*. In his brazenly editorial style, he declares of actuarial work, "Such work for a creative mathematician is poisonous drudgery." So when, after ten months at Wyatt, I had the opportunity to change jobs for more interesting work and better pay, I jumped at the chance. A friend worked in the Information Technology department for a local financial services firm, ORIX Capital Markets, as an application architect. He had observed how I had rapidly acquired programming languages for my math classes, so he recommended to his department that they hire me as an application developer based on my aptitude. I was experientially unqualified for the position, but we were confident that I could come up to speed in a short time and quickly become a productive member of the team. I've been at ORIX for nearly two months, and, as expected, I have rapidly acquired knowledge of the fundamentals of Java J2EE application development and object-oriented design. While I find the work much more satisfying than actuarial work, I still know that I belong in a research environment. The skills and experiences that I have gained in industry will enhance my academic work in ways that will consecrate me from other students. And when the time comes to find full-time employment, whether in industry or academia, I will certainly have an edge on

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the competition.

Going forward, I intend to begin graduate study in Fall 2004, work towards a Ph.D., and, in the process, make decisions about which field to adopt as my specialization and how to pursue a career in that field. My course selection, work experience, and personality point me towards work in applied math, but beyond that initial classification, I currently have no narrower direction. Therefore, I intend to use my first year of graduate study to explore available fields and open problems that remain to be tackled and solved. At this point in my development, this is not a handicap to my direction and focus.

Commenting on a man's direction in life, Thoreau states, "It is by a mathematical point only that we are wise, as the sailor or the fugitive slave keeps the polestar in his eye; but that is sufficient guidance for all our life." His unintentional double entendre is significant in this passage: in my case, it is a *mathematical* point that guides me. My passion for this discipline has grown through my university and work experience, and a career in mathematics offers the best possibility to assuage my daemon – the daemon that demands significance and purpose in my life's work, that craves knowledge and the pursuit of understanding above all else. Nietzsche claims, "Mathematics is merely the means for general and ultimate knowledge of man." And here we find a profound paradox that permeates our pursuits: Mathematicians spend their lives devoted to glimpsing, grasping, and understanding that which transcends humanity – the infinite – perhaps in a courageous attempt to better understand themselves and their fellow humans. This notion drives me toward pursuit of a life-long career in mathematics.

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### ADDITIONAL INFORMATION

This formal application – an apparent necessary evil for all graduate programs – failed to capture many aspects of my life and personality that I value greatly; here lies my opportunity to name some of those. My second passion, behind my quest for the transcendent in mathematics, is music. This affair began my sophomore year of college. African hand drums were the first instruments to summon me, and I absorbed their technique and traditional song styles quickly. Soon followed my relationship with similar percussion from Cuba, Puerto Rico, and Dominican Republic. This music consumed me, and I spent many hours meditatively practicing rhythms and songs from ancient religious cultures that were transported to the Caribbean by the slave trade. Within a year, I bought a drum set and transferred my knowledge of Latin rhythms to this more contemporary instrument. I also spent time learning more popular music styles like rock, funk, and jazz. But percussion alone could not keep my full attention; melody and harmony soon peaked my interests. My minor at University of North Texas was music, and I ravaged through my music courses, devouring every bit of history, theory, and aural training that came to my ear. As a math major with no formal musical training, I was the anomaly in my music courses, but I was quickly accepted into an exclusive community of aspiring professional musicians. Now out of school, I coordinate and arrange the music for my small church. My principle instruments are drum set, miscellaneous percussion, piano, keyboard, and my laptop computer. I spend significant time arranging old Christian hymns with dark jazz chord progressions in modern styles as a part of my complex spiritual expression.

Religion was the shore of departure for my intellectual voyages, and

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the sands from that deserted, sacred beach have stuck to my feet and dirtied my clothing since I set sail. From there, I studied theology and religious philosophy, and these in turn led me to epistemology, ethics, and literary criticism. When time came to separate the career from the hobbies, these subjective disciplines did not have substantial science sufficient to satisfy me, and the rigor and refinement of mathematics won. I could not have endured a life filled with the frustration and angst that these endeavors engender in me due to their lack of objectivity.

Many of these activities may suggest an introverted personality, but my patterns of social interaction have been extroverted since I was an infant. I value community, and I strive to involve those around me in my pursuits while intentionally involving myself in theirs. (I was voted "Friendliest" in my high school class.) I expect to continue these patterns in graduate school by cultivating relationships with students and professors.

The theme that spans my wide variety of interests is the process of learning, reflection, and expression. Nearly all of my enterprises have had exciting beginnings, periods of maturation, and eventual fruitful results. I am prepared to continue my maturation in mathematics through graduate study, and I look forward to enjoying the fruits of my labor.

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