

My passion was born over fifteen hundred years ago. As legend has it, an abyssinian goatherd named Kaldi found his mischievous goats dancing wildly around a shrub with waxy green leaves and clusters of dark red berries. Tasting the fruit, Kaldi joined in the berry-induced frenzy. Soon after, a learned imam from a local monastery passed by and took notice of the eccentric behavior triggered by these berries. He brought the berries back to his monastery and subjected them to a series of tests including parching and boiling. The elixir he created was soon distributed to other monasteries in Arabia Felix to be used as a stimulant during late hours of prayer. Over the next several years the beverage spread throughout the world. Coffee was born.

Since then, coffee has become one of the most traded commodities in the world, second only to oil. The development of the espresso machine in 1855 transformed the coffee world. Its creator, Edward Loysel de Santais, aspired to brew coffee faster, but the true potential of espresso was not realized until the development of high-pressure espresso pumps a hundred years later. When properly brewed, espresso should taste similar to the aroma of freshly ground coffee. In the extraction process, water is pushed through the packed espresso, forcing volatile aromatics into a golden, creamy layer called the crema, which rests above the espresso. The volatile aroma remains trapped in the crema for a brief thirty seconds, waiting to be consumed, before it dissipates into the air. Espresso should be dark-red, thick like honey, and have a golden-red crema. Espresso in the United States is black, thin, and has a sour white crema. I propose to study the art of espresso preparation in Italy, where coffee permeates the culture and espresso is a national pride. I am curious to learn how espresso is roasted, brewed, extracted, and finally consumed. Yet, to grasp the blending and roasting process, I must travel to coffee estates to develop a genuine understanding of coffee processing methods and determine how these procedures affect the flavor, body, acidity, and aftertaste of espresso.

Coffee is a universal language with different ethnic accents. I seek to compare the perception of coffee in different societies based on the role each culture plays in the production process. My belief is simple: coffee quality is a direct reflection of the passion of the people who create it. To learn about quality coffee, I must understand the influence each culture has at each stage of production. By understanding and absorbing their passion, my own will be broadened and enhanced.

I will begin my pursuit in Brazil, the world's largest coffee producer. Brazilian coffee composes the base of most espresso blends and is typically prepared using the dry-process. In the dry-process, the whole coffee cherry, which contains two coffee beans, is dried on large patios. In the coffee industry vernacular, the dry-process results in a coffee that can be described as deep, heavy-bodied, and complex. The best Brazilian coffees are nutty and low in acidity, and their mildness is a virtue in Italian espresso. I desire to study coffee harvesting and processing on at least one plantation in each of the Cerrado, Sul De Minas, and Alta Mogiana regions. I have been granted permission to study at the Ipiranga Estate in the Cerrado region, which is a model of social and ecological excellence in coffee production and is responsible for some of Brazil's finest coffee. The Datterra Estate has invited me to study at their seventeen thousand-acre farm where they prepare coffee specifically for espresso blends. I have also received permission from the Veloso Estate in the Cerrado region, where I will be able to study two distinct variations on the dry-process. I have contacted four other estates in different regions of Brazil to arrange a visit.

After learning how a dry-processed Brazilian coffee adds body and complexity to espresso, I will travel to Guatemala to study how the wet-process intensifies the brightness of coffee. In the wet-process, the four layers surrounding the coffee bean are removed sequentially. First, a machine gently removes the skin and pulp. The coffee is then transferred to large fermentation tanks, where a carefully controlled enzymatic reaction, lasting 12-36 hours, loosens and removes the next layer. After fermentation, the coffee is washed and the parchment-covered beans are dried on large patios. Guatemala produces some of the most regionally distinctive coffees in the world, with the regions of Antigua, Cobán, and Huehuetenango considered to be the most important. The finest Guatemalan coffees are spicy, smoky, and bright. The managers of the Victorias Chuva, the Salvador Xolhuitz, and the Agroindustrias estates in the Antigua region have given me permission to study at each of their respective farms.

I will continue my study in Costa Rica, the Latin American model of wet-processing. The best Costa Rican coffees are flawless: mild, sweet, and with strong notes of chocolate and tropical fruit. When roasted properly and added to an espresso blend, Costa Rican coffees add sweetness and complexity. The finest coffee growing farms are located in the Tarrazú, Tres Ríos, and Alajuela regions. I have contacted the La Luna Tarrazú Estate, the San Antonio Tres Ríos Estate, the San Juanillo Estate, and the Doka Estate in Sabonilla de Alajuela, and I have received permission to study at each of these award-winning estates during their harvesting season. Combined, these estates produce twenty million pounds of coffee a year, which will provide an important comparison to the smaller farms I will visit in Guatemala.

Taking my newfound understanding of how coffee processing relates to flavor characteristics, I will journey to Italy to study the art of espresso blending, roasting, and extracting. I hope to begin in the major cities of the Sicilia region where espresso is blended somewhat haphazardly and roasted dark to create a bold and smooth espresso. The goal is to maintain sweetness, while overcoming bitterness and sourness. The dark roast is forgiving when highly acidic coffees from Costa Rica or Kenya are used to add sweetness, but it also destroys the subtle aromatic nuances that make espresso unique. My next stop would be the Lazio region, which is an intermediary between Northern and Southern Italy in terms of geography and roast degree. Rome and its surrounding areas produce espresso that is medium, rich, and aromatic. I will then travel to the Toscana region, which prepares the finest espresso in the world, and I will contrast it to the espresso of Central and Southern Italy. Northern Italians roast espresso light, which forces them to have a better understanding of the balance between acidity and roasting. A careful mixture of dry-processed coffees from Brazil, Ethiopia, and Indonesia is combined with small amounts of sweeter, wet-processed coffees to produce a thick red espresso with a flavor akin to the fragrance of freshly roasted coffee.

In the three regions of Italy, I will study the brewing process by observing how espresso is extracted in relation to how it was blended and roasted. There are over thirty factors that affect the quality of the espresso. If any factor is overlooked, the espresso is reduced to an uninspiring ounce of strong coffee. After speaking with David Schomer and Mauro Cipolla, both of whom studied in Italy before becoming the foremost espresso experts in the U.S., I have realized that small cafés, with their passionate dedication to quality, will be my best sources of information. My professional relationship with Ted Lingle, the executive director of the non-profit Specialty Coffee Association of America,

will allow me to make any necessary contacts in Italy. I have also contacted Dr. Illy, of Illy Espresso, who has been a personal inspiration in my pursuit of a career in coffee science. I plan to meet with Dr. Illy in Trieste to discuss his interest in espresso and his fusion of chemistry research with sensory perception to create the world's most famous espresso blends.

My study of espresso will culminate in Vienna, where Arabian and Middle Eastern coffee influences meet modern Europe, and where coffee has influenced the daily rituals of a thriving metropolis for two centuries. Vienna is a city of historic cafés where cappuccinos are enjoyed slowly and intellectual conversations are attacked fervently. After focusing on the mechanisms of coffee preparation in Brazil, Guatemala, Costa Rica and Italy, I will study a coffee culture in the absence of the producer. I would like to compare the café culture in Vienna to that of the other countries I will be visiting to determine what cultural perceptions of coffee transcend international borders and why certain views are unique to particular regions. In particular, I want to understand how coffeehouses in Vienna have remained intellectual centers since the opening of Vienna's first coffeehouse by Georg Franz Kolschitsky in 1683. My study of the coffeehouse culture will begin in Café Prückel, Café Sperl, Café Hawelka, and Café Westend, all known for their extensive history and jocular clientele.

While in Vienna, I plan to fulfill the purpose of the Viennese coffeehouse by allowing it to be my center for intellectual reflection. I will have the opportunity to collect my thoughts, make comparisons, and draw conclusions as I prepare for my next journey in life, better equipped than when I began. After understanding each stage in the production of coffee, I will be able to sit, relax, and slowly drink a Viennese mokka in a culture that believes it has defined the way coffee should be consumed.

Fifteen hundred years after Kaldi's accidental discovery, I am fortunate to lie on the cusp of a coffee renaissance where art and science are being interwoven. A Watson Fellowship will give me the incredible opportunity to fuse these concepts by providing the artistic complement to my scientific background. I will gain a respect and understanding for coffee, unattainable through reading alone, which will give purpose and meaning to my career in coffee science. It will be an enlightening journey that will strengthen my knowledge of coffee and have a dramatic impact on the decisions I make in my future profession.

PERSONAL STATEMENT

Each morning I take a handful of hard, emerald colored coffee beans from some of the best coffee estates around the world, roast them to perfection, and count the hours until the beans have matured and are ready for cupping. The cupping technique is used to describe the fragrance, aroma, flavor, acidity, body, and aftertaste of coffee. Cupping several different coffees at the same time allows one to discern the flavor elements that are characteristic of a particular origin. I have been roasting and cupping for four years, a daily ritual that has deepened my love and passion for coffee.

My apartment frightens most people. The walls are lined with coffee posters and burlap bags that once contained unroasted coffee. Coffee makers, an espresso machine, an espresso grinder, a coffee grinder, a roaster, and other coffee equipment dominate the kitchen counter and the omnipresent aroma of coffee saturates the room. My over-cared-

for Kona coffee plant rests in my window, trying unsuccessfully to produce coffee cherries. Those with an intense passion understand me. Others smile in amusement.

My thirst for learning about coffee is never quenched. For me, the most intriguing aspect of coffee is how much remains to be discovered. I am fortunate to be in a discipline where I am constantly on the brink of new discoveries. I have kept Davidson's Interlibrary Loan assistant busy by requesting and reading every book about coffee I have discovered. After exhausting these resources, I moved to journal articles, though I have admittedly made only a small dent in the 30,000+ scientific articles written about coffee. My desire to understand coffee is insatiable because it is fueled with each new book I read.

My love of coffee took an important turn four years ago when I sought to understand coffee by researching the art and science behind its preparation. My interest in coffee and my pursuit of chemistry grew simultaneously and then merged. For my honors thesis in chemistry, I have been researching which acids are most influential to the perceived brightness and sweetness of coffee. This past summer, with the assistance of a Kemp scholarship, I investigated the importance of phosphoric acid in coffee. I recently submitted a manuscript detailing this research, which has been accepted for publication in the *Proceedings of the 18th Colloquium of the Association Scientifique Internationale du Café*, a peer-reviewed coffee science journal. To continue this research, I have received a grant from the Specialty Coffee Institute to purchase new equipment to analyze the organic acids in coffee.

Firsthand observation of the relationship between flavor and processing techniques will help me pursue my scientific interest in coffee. Since most of my coffee acid research has implications at the agricultural level, I must understand how coffee is grown and processed. There exists a wide chasm in the coffee industry, with food scientists on one side and coffee professionals dedicated to sensory perception on the other. To make significant progress I must bridge this gap.

After endlessly failing to prepare a respectable cappuccino, I realized there was an artistic side of coffee that was too complex for science to explain. I began to bridge the science/art gap my sophomore year, when I traveled to San Francisco and Seattle to study coffee extraction. I observed the baristas at the best cafés in Seattle, bought my own commercial espresso machine with all the money I had made working at Starbucks for a year, and mastered these techniques myself. I learned “latte art,” and can now pour heart and flower patterns into my cappuccinos, a rare trademark of a passionate coffee professional.

By educating others about coffee, I share my passion with them. I have hosted several coffee tastings, at which I teach students how coffee is prepared, the distinction between origins, and the basics of espresso preparation. I have created an extensive web site to educate visitors about coffee. So far, the web site consists of over 150 pages divided into sections on espresso, coffee, agriculture, and coffee science. Currently, the agriculture section of the web page is depressingly sparse, but I hope that it will one day be filled with videos and pictures of coffee estates detailing each intricate process of coffee growing, harvesting, and processing. The URL of the site is <http://www.coffeeresearch.org>.

Passion has given me the unusual drive to take the steps necessary to pursue my love of coffee. In the past I would spend at least an hour every day studying coffee.

Now my research gives me an excuse to spend countless hours doing what I love. I have acted on my excitement for coffee by making dozens of contacts with the most prominent coffee experts around the world. Their support has reified my pursuit of a career in coffee. After graduating, I plan to attend graduate school in analytical chemistry, which will provide the education I need to delve into the coffee science industry.

As I do not have much experience traveling abroad, this project will be a new and exciting opportunity. I have taken Spanish since high school, and I plan to take the second semester of Italian in the Spring. I hope that traveling to the proposed countries will allow me to polish my formal study of these languages.

My journey is only beginning. Despite my intense passion for understanding coffee preparation and science, I have never held a coffee cherry or smelled the fragrant jasmine aroma of coffee blossoms. I have never spoken with coffee farmers to better understand their culture, nor have I experienced the pride they have for their coffee. Being on the opposite end of the coffee production line, I do not fully comprehend how our demands for organic and shade grown coffee affect the lives of coffee farmers. I have not embraced Italian or Viennese culture to understand how espresso has become a routine in their daily lives. With a Watson Fellowship, the beverage that I have come to love will have an even deeper meaning for me. It will no longer be a cup of espresso, but it will be a farmer, a barista, a culture, and an art.

OTHER EXTRACURRICULAR ACTIVITIES

Resident Advisor - 1997-1999

Orthopaedic Research - Three hundred hours volunteer service at North Carolina Medical Center.

Starbucks Barista - 1997-1998

American Chemical Society Member – Davidson division secretary.

Institute of Food Technologist Member

Coffee Kids Member – A foundation whose purpose is to improve the living conditions of those in coffee producing countries.

HONORS

Kemp scholarship to study the importance of phosphoric acid in coffee.

1999 American Chemical Society undergraduate award in analytical chemistry.