

# DISTINCTIONS

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# **DISTINCTIONS**

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***DISTINCTIONS***, the journal of the Honors Program of Kingsborough Community College of the City University of New York, welcomes scholarly articles and creative works that explore important issues in all aspects of humanistic endeavor, not confined to a specific academic discipline. Our editorial staff is sympathetic to a broad range of theoretical and critical approaches; however, the views expressed in articles are solely those of the authors.

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# Bridging Dissent

In the Summer of 2012, I was fortunate to be part of a group of Kingsborough faculty that traveled to the University of Vermont in Burlington for a four-day set of seminars entitled “Bridging Cultures to Form a Nation: Difference, Community, and Democratic Thinking,” kicking off a three-year faculty development and curriculum project. This was sponsored by a joint-grant that was awarded to the American Association of Colleges & Universities and The Democracy Commitment: An American Community College Initiative from the National Endowment for the Humanities. Our group of professors—from disciplines as diverse as Art History, Criminal Justice, and Speech Communication—interacted with community-college faculty from as far away as Kapiʻolani Community College in Hawaiʻi (also called KCC). We discussed the infusion of democratic ideals into our curricula and compared notes on many issues, from faculty workload to support for scholarship, reminding us of the many ways that we have it really good at the City University of New York.

The original text of the grant reads as follows: “Diversity has always characterized our nation’s democracy and marked differential access to opportunities. In the face of ever increasing diversity, intensified globalization, and hardening political polarization, it is more urgent than ever that higher education—and the humanities in particular—offer vehicles through which students expand their knowledge of each other’s cultures and develop skills to work across differences toward shared goals. As a microcosm of our nation’s diversity, community colleges are the ideal public space to infuse such learning, and the humanities—steeped in the practice of entering imaginatively into other people’s lives and worldviews through literature, history, and philosophy—are particularly well-suited to cultivate these capacities” (<https://www.aacu.org/bridgingcultures/>).

In the years since, the Bridging Cultures group on campus has worked to infuse civic engagement texts, assignments, and experiences into our courses in order to explore these issues and themes. One of the ways in which I have done this in my own classroom has been to immerse ourselves in texts that present dissenting voices, such as Sofya Kovalevskaya’s 1892 novella *Nigilistka* [Nihilist Girl] or Jean Genet’s 1943 novel *Notre-Dames-des-Fleurs* [Our Lady of the Flowers], texts that explicitly subvert “dominant paradigms” (if I may use such an ‘80s term) of gender, class, and race. These explorations have been coupled with various out-of-class experiences that BC faculty have facilitated, from Prof. Pierre’s art history course that comprised almost entirely of museum visits to Prof. Leggett’s environmental politics course that involves advocacy with historical understanding.

Some of this work is presented in this issue of *Distinctions*, and indeed has been for the last few issues. The quotation that “dissent is the highest form of patriotism” has been attributed to various Americans from Thomas Jefferson to Howard Zinn. Regardless of coinage, I do believe that this is true and the articles in this issue illustrate the importance of this idea in practice.

**Robert Cowan, Ph.D.**  
Associate Professor, Department of English

# Observing Greenmarkets, “Eating Animals,” and Beyond

A Little Change is Better Than No Change<sup>1</sup>

Nancy Bello

## Abstract

After reading *Eating Animals* (2009) by Jonathan Safran Foer, I decided to seek out greenmarkets for fresher, organic fruits and vegetables. Realizing that on Staten Island there are only two greenmarkets opened only on Saturdays, I wanted to see if this lack of greenmarkets has an effect on my community. I personally feel that it does, considering Staten Island has one of the highest rates of obesity and diabetes.

Reading *Eating Animals* caused a trip in self-discovery for me and made me take personal inventory of my own health issues. In addition, because I am a student studying community health, it made me think of how much we do not think about what we put in our bodies. It also led me to think about the availability of healthy foods in my community. As a result, I decided to seek out greenmarkets for fresher foods, specifically organic fruits and vegetables. My research directed me to become conscious of the fact that there are only two greenmarkets on Staten Island, according to GrowNYC, the lowest number among the five boroughs.

There are greenmarkets throughout each of the five boroughs of New York City (GrowNYC, 2013). They are located in 26 different locations throughout Manhattan, 18 locations throughout Brooklyn, 10 locations throughout the Bronx, 8 locations throughout Queens, and two locations on Staten Island. Since the other boroughs have numerous greenmarkets, consumers have more of a choice of day and location. It was also reported that many greenmarkets open in May and close in November; however, there are 16 locations in Manhattan that stay open year-round. Therefore, besides Staten Island having

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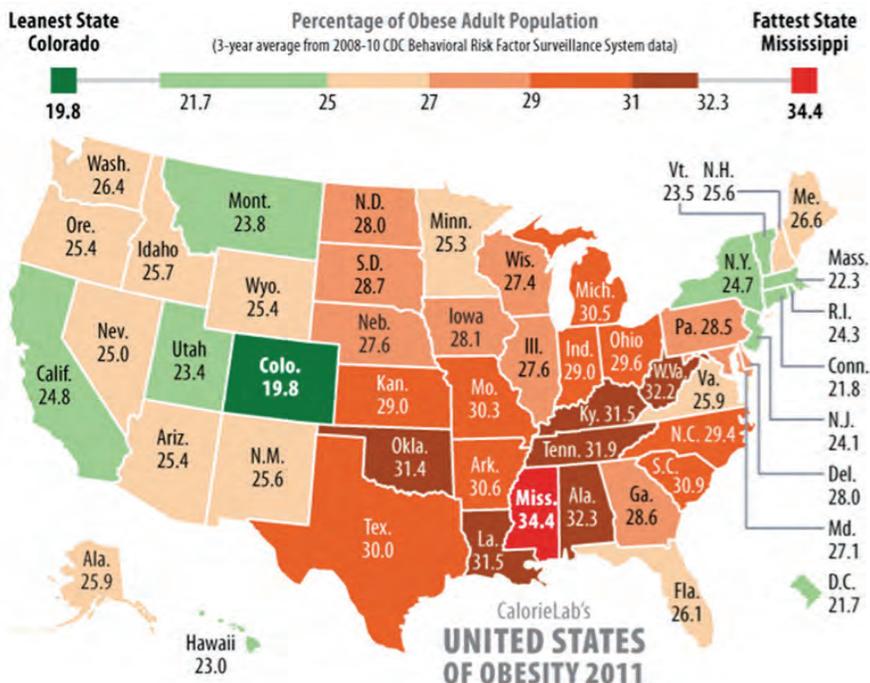
<sup>1</sup> Completed under the mentorship of Prof. Jose Nanin for COH 12: *Critical Issues in Community Health*.

only two greenmarkets, they are only open on Saturdays and, once November ends, the markets close until spring. What is the consumer to do about fresh fruits and vegetables then? In order to keep healthy, the consumers need to have access to fresh fruits and vegetables all year long. This should be the goal in each borough.

Mayor Michael Bloomberg and City Council Speaker Christine Quinn have proposed that the city issue 1,500 licenses to street vendors to start up a program called “Green Carts.” These carts would sell fresh fruits and vegetables. Mayor Bloomberg is planning to target specific areas of the city where the consumption of fresh fruit and vegetables is lowest. The number of carts in each borough would be proportionate to its population. Five hundred permits are being issued in the Bronx and Brooklyn, 250 in Queens, 200 in Manhattan, and 50 in Staten Island. Many cons and pros have been reported on this issue, especially from business owners who believe the street carts would take business away from them (Loeser and Walker, 2007).

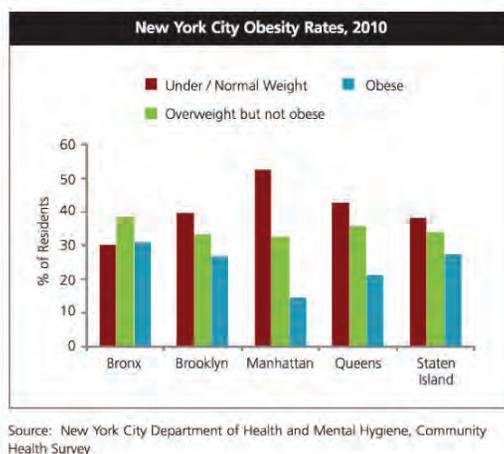
The Centers for Disease Control and Prevention (CDC) states that in “a 2004 Community Health Survey, researchers have found that 90% of New Yorkers eat fewer than the recommended five servings of fruits and vegetables a day and 14% eat none at all” (CDC, 2004). This led me to research the obesity rates for the United States. Mississippi is the most overweight state for six consecutive years—34.4% of people are reported as obese. Maine reported the highest increase over the last year, with Oregon dropping the most. Colorado continues to be the leanest state in the United States, with 19.8% of adults being obese. New York and 11 other states reported 24.7% of obese adults [See Figure 1 from New York City Department of Health and Mental Hygiene (NYCDOHMH), 2011.]

Figure 1



Breaking this information down for New York City, the highest percentage of obese adults was in the Bronx, with 32%, followed very closely by Staten Island with about 30%, then Brooklyn with 28%, Queens with about 22%, and Manhattan with the lowest rate at 15%. Manhattan also had the highest under/normal weight percentage reported, at 52%. Staten Island came in fourth with 38% of residents being under/normal weight, and the lowest percentage of under/normal weight was reported for the Bronx (See Figure 2 for obesity rates from NYCDOHMH, 2010). I can assume the lowest percentage of obesity and the highest percentage of under/normal weight go together because Manhattan is a walking borough with a lot of available fresh fruit and vegetables at almost every corner, not even including the 26 greenmarkets. However, speaking from my own perspective, Staten Island is not a walking borough. If you consider problems that Staten Island faces—no to easy access to healthy food, the locations of food-markets, the extreme number of fast-food restaurants, quick in-and-out delis and only two greenmarket locations once a week for fresh fruits and vegetables—it is not hard to see why Staten Island reported in as the second highest borough for obesity and fourth for the under/normal weight category.

Figure 2



Furthermore, the South Shore residents of Staten Island are extremely passionate about their soda intake. The Staten Island Advance (2013) stated that 31% of residents just in the South Shore area consume one or more sugary beverages per day. Health Commissioner Dr. Thomas Farley stated in the same article that, “Reducing sugary drink consumption is critical to reducing obesity and obesity related illnesses, which kill more people in New York City than anything except smoking.” Statistics show that “nine of the top ten neighborhoods with the highest obesity rates city-wide were also the highest in sugary drink consumption. At the other end, the three least obese neighborhoods were also the lowest in sugary drink consumption.” The Advance also reported that Staten Islanders “turned the biggest thumbs-down of any borough to the ban on sale of large sized drinks, according to a Quinnipiac University poll.” It was reported through this poll that 65% of Staten Island voters think the plan has “no fizz,” with just 32% in favor. Overall,

the poll said, “city voters oppose the proposal by 51% to 46%” (Young, 2013). Personally, it is very rare that I have soda in my house. This is not really an issue of concern for me. However, I feel these extra-large beverages are ridiculous. If you are thirsty after finishing your regular sized drink, then buy another. My guess would be that people would think twice about purchasing another drink. Our portion sizes need to be downsized so we can better control what and how we eat. As a result, the obesity levels in our community can decrease. Reducing soda size is just one piece of a very long equation. Another piece is the increased availability of healthy foods in our communities, especially fruits and vegetables.

Greenmarkets “were founded in 1976 with a two-fold mission: to promote regional agriculture by providing small family farms the opportunity to sell their locally grown products directly to consumers, and to ensure that all New Yorkers have access to the freshest, most nutritious locally grown food the region has to offer” (GrowNYC,2013). As reported by GrowNYC, there are greenmarkets throughout each of the five boroughs of New York City. They are located in 26 different locations throughout Manhattan, 18 locations throughout Brooklyn, 10 locations throughout the Bronx, 8 locations throughout Queens, and 2 locations on Staten Island (GrowNYC, 2012, Figure 3). Since the other boroughs have numerous greenmarkets, consumers have more of choice of day and location. It was also reported that many greenmarkets open in May and close in November. However, 16 locations in Manhattan stay open year round. Staten Island has only two greenmarkets; they are only open on Saturdays, and once November ends, the markets close until spring. What is the Staten Island consumer to do about fresh fruits and vegetables then? In order to encourage healthy behaviors, the consumers need to have access to fresh fruits and vegetables all year long. This should be the goal in each borough.

Figure 3



To satisfy my curiosity about what was available in my community, I headed out to the Staten Island Mall, the location of my first greenmarket, which is located in the front parking lot of the Mall on Richmond Avenue. You can arrive at this location by driving or by city bus. My second visit was to St. George Greenmarket located on Hyatt Street, which can be accessed by bus, car, or train to St. Marks Place. This location however, involves walking from the train, will take some time and it is uphill. Greenmarkets accept cash, all credit cards and debit cards. They also accept Women, Infants, and Children supplemental nutrition program (WIC ) and Farmers Market Nutrition Program (FMNP) checks with a wonderful incentive to continue shopping at the greenmarket; if you spend \$5.00 with food stamps; you will receive credit of \$2.00 worth of food stamps to use at this or another greenmarket. All you need to do is to sign up at the information tent and ask for a Frequent Shopper Club form. Each greenmarket works jointly and follows all the same regulations. I located the information tent, which has much needed information for a first timer; there is an information tent located at each greenmarket.

I spoke to the director, and she informed me that all produce are freshly grown, and that 25% of all ingredients must be local to be considered part of the greenmarket. Most of the vendors were from New Jersey, one Vender was from Decker Farms, which is located on Staten Island. This was a nice surprise since I know that the grammar schools on Staten Island use this farm for school trips, especially around pumpkin picking time. They also have fresh dairy vendors with eggs, cheeses and other varieties of dairy products, including fresh made pies. All pies are made with the fruits from the vendors. In addition, they also have a special program for immigration merchants. They send them to a six-week program to learn how to manage a business and set them up with a plot of land to start their gardens. Prices seem to range around average for vegetables and fruits. However, I found the ground beef to be very expensive at \$8.00lb and the flounder was priced at \$14.00lb. All the meat, fish, and turkey tents are labeled organic. One added bonus down at St. George greenmarket was a tent set up for the children to learn about the fruits and vegetables. They also learn songs and have a nice time while parents and guardians shop. I thought this was a wonderful idea to keep the children safe while educating them on good eating habits.

Through my observations, I discovered that at the Staten Island Mall greenmarket there were mostly white and a few Hispanic consumers. The ages of consumers ranged from middle-aged adults to elderly. It was reported to me that they do see many people using food stamps at this location; however, the population at this market is found not to be that serious about going green. When I asked what she meant, the director stated, "You would notice nobody brings recyclable bags. Everyone uses plastic bags." They also have a compost section that hardly gets used. Sometimes they will see the same people but mostly people just come and go randomly. I felt very embarrassed standing there holding my plastic bags filled with fruit and vegetables, not even thinking to use my own recyclable bags. She stated that throughout the other boroughs, especially in Manhattan, everyone uses recyclable bags and uses the compost section. I thought to myself that, Manhattan has many greenmarkets that operate more than once a week, which would make using the compost section easier, and to suggest using recyclable bags by handing them out

occasionally. I know they are a non-profit organization; however, maybe they should try to have a company donate recyclable bags so that people might think to use recycle bags instead of plastic or hang signs suggesting to use recyclable bags. I personally did not even think about it. I will now use recyclable bags.

Observing at the St. George Greenmarket, I noticed it was mostly African American, Latinos/Hispanics, and Russians. This market was definitely full with entire families from grandparents, parents, and children. I found this group of people to be much friendlier. In fact, my husband engaged in a conversation with some women regarding stuffed peppers, which is my favorite childhood food. By the sound of their conversations, many people consider it theirs as well. It was a much more relaxed atmosphere with a group of children singing in the middle. I did notice the meat tent and was wondering how people afford such prices. I notice myself that people were using food stamps and their purchases were not as large as at the other greenmarkets. However, I did notice the compost section being used as consumers walked in. Everyone seemed happy, the vendors were talking, customers were socializing, and the kids were in their own tent.

So one may wonder: why does Staten Island have only two greenmarkets, when in fact we have many locations for these markets? I assume they picked the mall because many city buses use the route of Richmond Avenue, making it reachable by everyone throughout Staten Island. The location in St. George is also nearby a bus stop and if in good shape, you are able to walk the hill up from the train. I can assume not many elder people can make that walk.

On a personal level, I honestly do not think I could have made it before losing the weight I have. Therefore, from my observations, I discovered two problems: lack of transportation and lack of greenmarkets. The transportation by train on Staten Island is set up on one line, with some stops being in the middle of a town, while other stops located in the middle of a residential area such as Bay Terrace for example. The city bus route is noticeably set up according to different routes. Since Staten Island is set up this way, I feel guidelines for greenmarket locations need to be utilized better.

As I continued observing, I can understand better the medical concerns in our country, which is on the increase concerning obesity, diabetes, and heart problems (Checchi, 2013). If we take the time and plan locations of greenmarkets, this would enhance community members' abilities to obtain more fruits and vegetables. Within our society, we really need to select things that are easily obtainable so that the consumer wants to change their habits. Nobody wants to be bothered with taking a bus on a Saturday morning across town to reach the only market before things run out. And, often a person might work on the only day the market is opened. I personally would find it easier if the market opened at least once during the week. That way people have a choice.

I decided to go back down to the greenmarkets and see if I can speak to some customers regarding their thoughts and opinions that they have on the greenmarkets located on Staten Island. To my amazement, everyone was more than happy to give his/her opinion and to share thoughts with me. A few women mentioned that it was part of their Saturday routine to purchase their vegetables and fruits for the week. One man stated he came to buy his fish and meats while his wife picked out the vegetables. The kids were

involved in a project and they even said they loved coming on Saturday mornings. One of the questions I asked was regarding the hours of operations; everyone stated almost the same thing: it would be nice to have a few extra days. I did mention to them that the other boroughs had not only more greenmarket locations; they also had different days to choose from and a variety of different hours. They looked surprised and asked why; I explained that I was trying to find out why myself.

I also decided to use my own social media connections to get a sense of what my friends and family thought about the greenmarkets on Staten Island. Therefore, I placed my question on Facebook. It, asked whether anyone used the greenmarkets and if so, would you please write me a few lines regarding your experiences. I was very happy that almost everyone responded. Some of the negative responses that I received were due to the fact that people did not know we had greenmarkets on Staten Island, and who did not know what a greenmarket was, and one response was scary; she stated her children did not eat vegetables or fruits so it is a waste of time to go. Another negative point was that they were out of the way, in inconvenient locations. On the positive side, some friends mentioned the outdoor environment and friendliness of the merchants were pleasurable experience. They found the fruits and vegetables to be very fresh, appealing, and enjoyed listening to the merchants suggesting different ways of using their produce. One reported that the organic meats, turkeys, and chickens were delicious. My husband and a few women at the market exchanged recipes and spoke of childhood comfort foods; it seems that stuffed peppers ranked high on the list of favorites.

One of my dearest friends found herself on food stamps after Superstorm Sandy, which many of us who lived through it consider a hurricane. My friends lost their entire business and half their house, but thank God, their family was safe. She does not speak about her personal problems but having read the first part of my report she questioned the incentive of using food stamps. I gave her the paper work and explained to her what the greenmarket was all about. She is now a user of the greenmarkets.

As well as the greenmarkets are run, they are lacking in the advertising area. I feel that when a person, for example, applies for food stamps or any other government assistance they should be told about the greenmarkets. Other ways of advertising if not on the local cable channel, could be flyers, newspaper advertisement, and flyers in doctor's offices. Somehow, the word of greenmarkets needs to get out into the community.

I would like to continue my research in order to further examine greenmarkets on how they could decrease obesity rates throughout Staten Island. I would like to understand better why Staten Island only has two greenmarkets. I also want to investigate who decides on the number of greenmarkets for each borough. I feel these questions need answering to understand the entire situation. With more knowledge, better programs can be created.



As I look back to the beginning of my journey learning about the greenmarkets and studying the overall rates of health issues on Staten Island, I thought back on how I became intrigued. It began with a book called *Eating Animals*, by Jonathan Safran Foer, a reading assignment brought together by KCC Reads. The author began

speaking about his experience of being poor and his families' traditional ways of eating and the way his family looked at food. As the book proceeds, Mr. Foer continues to give his opinion and reports on the way animals are being abused. However, I never felt it was all about changing our habits as opposed to teaching us a new way of looking at what goes on before we make our food choices. What I did realize he was trying to say was that a little change is better than no change. In my own experience, I had to cut out high cholesterol foods, begin exercising, and lose weight to decrease my cholesterol numbers without the need for medication. My choice was to change my eating habits in the end; every change is a change for the better.

As a society, we have traditions that, during the holidays and socializing, bring us to a round table of food products. Foods are the main stream of our lives. If you bring up vegetarianism or the way animals are tortured and killed, most responses would be "that is what they are put on earth for." People get very funny about a subject that seems to interfere with their comfort zone; you find that people can be very closed minded about his subject. I stated a few times when discussing this book that "everyone has blinders on when it comes to the way animals are treated. We all know to some degree that these animals are being mistreated; to what degree is the question we do not realize. Until we read a book like *Eating Animals*; after reading such a book you have no choice but to drop the blinders."

There are organizations that try to do the right thing. Unfortunately, they are outnumbered by the big money making farms. Factory farmers allow ranchers "to make sickly animals highly profitable through the use of antibiotics, other pharmaceuticals, and highly controlled confinement, has created new, sometimes monstrous creatures" (Foer, 2013). Due to the amount of antibiotics given, we see the effects now through our younger generations of girls who experience earlier physical development and it seems to occur earlier with each generation.

Foer (2009) also states: "Since the world has changed so much, the same values don't lead to the same choice anymore." As a society when we take in information, we have a way of processing it to how we perceive its importance in our lives. Our lives have become a little more hectic and a little more materialistic but for the benefit of our health, we need to slow down and think of the choices we are making. Listen to the health reports; ask questions regarding health issues even if they do not pertain to you; become knowledgeable of things out of your reach such as meat producers and food handlers. When I read this quote I had to stop and think of the craziness of it; "isn't it strange how upset people get about a few dozen baseball players taking growth hormones, when we're doing what we're doing to our food animals and feeding them to our children?" (Foer, 2013)

We, as a society, put a lot of effort in finding the right house, the car that produces less toxic fumes, and energy saving appliances, yet we ignore one of the most important aspects of our health, the food we consume. I am not lobbying for everyone to become a vegetarian even though the health benefits have been proven. Those people who do think about it and feel that they cannot make a difference by changing their ways are adding to the millions who choose not to think about it. One person makes a difference because in

the end it really is not one person it is millions of people thinking the same way.

We will never be able to close down the many big money making farms but we should, boycott restaurants, such as Kentucky Fried Chicken, who brag about the mass production of chickens that they kill each year. Also, included within these famous names are Tyson and Smithfield. It has been reported that these companies, especially Tyson "slaughter 2.2 billion chickens annually and ... some employees were also found to be mutilating live birds during multiple investigations" (Foer, 2009). To make matters worse, Tyson and Kentucky Fried Chicken owners work together. The idea to break down these companies sounds overwhelming to the majority of regular day people. However, one small change from each person will send a message.

As a community on Staten Island how can, we make a difference in our eating habits and access to healthy foods? There is an old saying that asks, "How do you get to Carnegie Hall? Practice, practice, practice." So how does this apply to making a difference? Very easily: advertise, advertise, and advertise. Your voice is the key to making a difference. Every clinic and doctor's offices should be advertising about the benefits of the greenmarkets. As I was doing my project, many areas of Staten Island came to mind that would be perfect for a greenmarket. However, given the red tape of getting started we will need a strong connection with someone whose voice is respected and heard. This is where our voices are the key to advertising. The more we speak of the problem the more it is heard.

As a Staten Islander my entire life, I saw the first McDonalds open. I remember it was a big deal and a treat to go. It was considered a family outing and I do not recall going there again unless it was for a special treat. However, through the years, many fast food restaurants have opened up and you see families sitting down as if it was a feast. Unfortunately, you also witnessed the obesity problem among people. We also have to take into consideration that these restaurants are offering specials such as dollar menus, value meals, and coupons. For many people, fresh fruits and vegetables are expensive. However, I personally also feel people are just too busy to cook healthier foods so stopping by a window is easier. People would argue that these restaurants have healthier choices-yes they added salads, did something different to their fries and use different oil. However, the majority of the people are supersizing their meals. My goal for my community is to spread the news about the need for more greenmarkets, healthier food choices and to lower the obesity rates. If we lower the obesity rates, I feel other medical issues can be reduced.

In conclusion, slaughtering and medicating the animals that we consume just to satisfy the pockets of big money corporations, plus the lack of greenmarkets, sheds light on how unhealthy our food options are and how limited our access to healthy foods can be. What I hope my paper does is start a conversation about the subject of healthier eating and cutting down on the unhealthy medical issues such as obesity, diabetes, and heart conditions. We have conversations everyday with people; this is the point of connection. The connection point is the key to spreading the news regarding the lack of greenmarkets availability, the slaughtering of animals, and medicating them with medicine that we are feeding our children.

The author Malcom Gladwell wrote a book called *The Tipping Point*. In his book

he summarizes that the connection point that people have is what makes a product fly off the shelves or die at the production line. The connection point that people make with other people can and will make a difference. It is like playing telephone except we want the message to stay strong. My goal for this paper is to inspire just one conversation on this subject, which can lead to many.

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# Parametric Resonance<sup>1</sup>

Chaim Bernstein

## Abstract

The goal of this paper is to determine the frequency of parameter change at which parametric resonance will occur. We will use knowledge of the physical phenomenon as learned during the course of this semester, and we will solve the equations using the methods of Landau and Lifshitz.

## Introduction

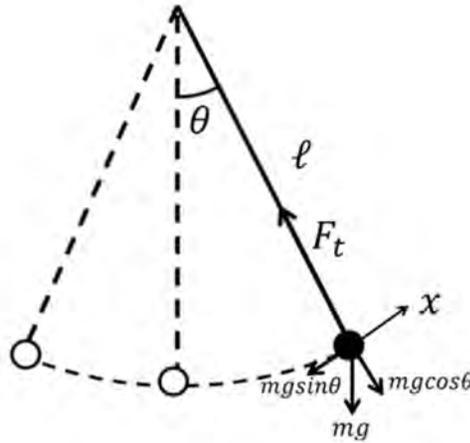
It is known that for any given pendulum that its period depends only on the acceleration due to gravity for the particular location, and on the length of the pendulum. It is also known that for a pendulum consisting of a string of negligible mass and a bob attached to it, the length of that pendulum is from the point where the string originates to the center of mass of the bob. We have all seen children in the playground on a swing. When the child stands on the swing, he or she is like the bob at the end of a pendulum. Once the child sets the swing is in motion, he or she will then bend and flex his or her knees at given points of the oscillation so as to continuously increase the height of each swing. Each time a child crouches, their center of mass is lowered, effectively lengthening the pendulum. Every child doing this knows that the optimal positions for greatest increase in height are to flex his or her knees when reaching the highest point in the swing's path, and to bend when approaching the bottom of the arc. Our question, however, is can we define a periodic function of time at which this phenomenon, called parametric resonance, will occur, as opposed to the child-on-a-swing's method of basing it on positions.

## I. Undamped Simple Harmonic Oscillator

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<sup>1</sup> Completed under the mentorship of Prof. Gregory Aizin for PHY 13: Advanced General Physics. For help understanding new concepts in mathematics, Professor Stephen Majewicz was consulted.

We begin by examining the undamped simple pendulum. For the following image, we call the length of the string to the bottom of the center of mass of the bob  $\ell$ , the angle of displacement from vertical  $\theta$ , the force of tension in the string  $F_t$ , and the magnitude of the bob's displacement  $x$ .



Choosing the instantaneous Cartesian co-ordinate system as shown in the figure, and separating the force  $mg$  into its components along those axes, we can write the following according to Newton's second law of motion:

tangential acceleration:  $m\ddot{x} = -mg * \sin\theta$ , which is the restoring force;

radial acceleration:  $m\ddot{y} = F_t - mg * \cos\theta$ .

Note: Acceleration in the y-direction is  $\frac{mv^2}{\ell}$ , the centripetal acceleration, where  $v = \dot{x}$ .

We solve for small angles where  $\theta \ll 1 \text{ radian}$ , so that  $\dot{y} \approx 0$ , and  $\sin\theta \approx \theta$  therefore  $\sin\theta = \frac{x}{\ell}$ , allowing us to write the equation of motion in the x-direction as

$$m\ddot{x} = -mg \frac{x}{\ell} \quad \text{or} \quad \ddot{x} + \frac{g}{\ell}x = 0.$$

The solution is periodic and sinusoidal, as we know that any period for a given pendulum is identical to all others, so we take the general solution to be

$$x = A\cos(\omega_0 t + \zeta)$$

where  $\omega_0$  is the natural frequency and  $\zeta$  is the phase angle.

Taking the first and second derivatives,

$$\dot{x} = -\omega_o A \sin(\omega_o t + \zeta)$$

$$\ddot{x} = -\omega_o^2 A \cos(\omega_o t + \zeta) = -\omega_o^2 x$$

and substituting this into the equation for motion, we obtain:

$$-\omega_o^2 x + \frac{g}{\ell} x = 0$$

Solving for  $\omega_o$ ,

$$\omega_o^2 = \frac{g}{\ell} \quad \text{and} \quad \omega_o = \sqrt{\frac{g}{\ell}}.$$

Thus, for a simple pendulum, we find that the only factors which affect the frequency are gravity and the length of the pendulum, such that the period for a given pendulum will be

$$T = 2\pi \sqrt{\frac{\ell}{g}}.$$

## II. Undamped Parametric Oscillator

### II.1 Setting up the equation

As we saw for the simple harmonic pendulum, the natural angular frequency of the system,  $\omega_o$ , depends only on gravity and the length of the pendulum. Suppose now that we were to change one of these parameters, length, periodically as a function of time, such that

$$\ell(t) = \ell_o + \ell_1 \cos(\omega t),$$

where  $\ell_o$  is the original length of the pendulum,  $\ell_1$  is the length of the change, and  $\omega$  is the frequency of the parameter change.

We then substitute this into the equation of motion

$$\ddot{x} + \frac{g}{\ell_o + \ell_1 \cos(\omega t)} x = 0 \quad \text{or} \quad \ddot{x} + \frac{g}{\ell_o (1 + \frac{\ell_1}{\ell_o} \cos(\omega t))} x = 0,$$

where  $\frac{g}{\ell_o} = \omega_o^2$ , and we define  $\frac{\ell_1}{\ell_o} = h \ll 1$ , solving for small perturbations. Then,

$$\ddot{x} + \omega_0^2 \frac{1}{1+h\cos(\omega t)} x = 0,$$

and because  $h \ll 1$ , we can use the expansion

$$\frac{1}{1-\varepsilon} = 1 + \varepsilon + \varepsilon^2 + \varepsilon^3 + \dots$$

and approximate the value to be  $1 + \varepsilon$  for  $-1 < \varepsilon < 1$ .

We can now write our differential equation of motion for the undamped parametric pendulum as

$$\ddot{x} + \omega_0^2 [1 + h\cos(\omega t)] x = 0.$$

## II.2 Understanding the effects of a parameter change

The coefficients of  $x$ ,  $\omega_0^2 [1 + h\cos(\omega t)]$ , are periodic with period  $T$ , so for any solution  $x(t)$ ,  $x(t + T)$  is also a solution. Furthermore, any solution  $x(t)$  can be written as a linear combination of two linearly independent solutions  $x_1(t)$  and  $x_2(t)$  such that

$$x(t) = Ax_1(t) + Bx_2(t).$$

where  $A$  and  $B$  represent initial conditions of the system. Therefore, we also get solutions  $x_1(t + T)$  and  $x_2(t + T)$  which can each be represented as linear combinations  $x_1(t)$  and  $x_2(t)$  as well, such that

$$x_1(t + T) = \alpha x_1(t) + \beta x_2(t) \quad \text{and} \quad x_2(t + T) = \gamma x_1(t) + \delta x_2(t),$$

then

$$x(t + T) = Ax_1(t + T) + Bx_2(t + T)$$

becomes

$$x(t + T) = A[\alpha x_1(t) + \beta x_2(t)] + B[\gamma x_1(t) + \delta x_2(t)]$$

$$x(t + T) = (A\alpha + B\gamma)x_1(t) + (A\beta + B\delta)x_2(t).$$

We define  $A' = (A\alpha + B\gamma)$  and  $B' = (A\beta + B\delta)$ , so that

$$A'x_1(t) + B'x_2(t) = (A\alpha + B\gamma)x_1(t) + (A\beta + B\delta)x_2(t),$$

allowing us to write

$$\begin{pmatrix} \alpha & \gamma \\ \beta & \delta \end{pmatrix} \begin{pmatrix} A \\ B \end{pmatrix} = \begin{pmatrix} A' \\ B' \end{pmatrix}.$$

If we allow  $\begin{pmatrix} A \\ B \end{pmatrix}$  to be an eigenvector of  $\begin{pmatrix} \alpha & \gamma \\ \beta & \delta \end{pmatrix}$  with the associated eigenvalue  $\sigma$ , then

$$A' = \sigma A \quad \text{and} \quad B' = \sigma B.$$

Substituting back, we obtain

$$x(t + T) = \sigma x(t).$$

Translating the above mathematical manipulation in terms of the physical phenomenon, each period will find the pendulum in a different location. That is,  $x(t)$ , the position of the pendulum at time  $t$ , will be rescaled each period such that at time  $t + T$  the position of the pendulum  $x(t + T)$ , will be equal to  $\sigma x(t)$ .

Our interest is in the case where periodically changing the length of the pendulum results in exponential growth of each successive oscillation, therefore we define

$$\mu = \frac{\ln|\sigma|}{T} \quad \text{or} \quad \sigma = e^{\mu T},$$

then we can write

$$x(t + T) = e^{\mu T} x(t).$$

Finally, if we define a function of time  $P(t)$  to be periodic such that  $P(t + T) = P(t)$ , (where  $P(t)$  is the function of time according to which the parameter changes),

$$x(t + T) = e^{\mu(t+T)} P(t + T) = e^{\mu T} e^{\mu t} P(t) = e^{\mu T} x(t)$$

then we can now express the rescaling of each oscillation as one continuous function of time as follows:

$$x(t) = e^{\mu t} P(t).$$

Thus, as expected, we find that the solution to our equation is of the form

(exponential growth/decay)\*(periodic function of time),

and stability depends on the sign of  $\mu$ .

### II.3 Solving the equation

We expect that the system is most unstable, leading to exponentially growing oscillations, when the frequency of  $P(t)$ , the periodic function of the parameter change, is twice the natural frequency  $\omega_0$  for the pendulum (as we mentioned in the introduction, the child bends at both ends of the arc, that is twice as frequent as the completion of one period of the swing). Therefore, for our equation

$$\ddot{x} + \omega_0^2[1 + h\cos(\omega t)] = 0,$$

we allow the frequency to be

$$\omega = 2\omega_0 + \varepsilon$$

where  $\varepsilon \ll \omega_0$  is the allowed variation.

We can now write the equation

$$\ddot{x} + \omega_0^2[1 + h\cos(2\omega_0 + \varepsilon)t] = 0$$

and the solutions will be of the form

$$x(t) = a(t)\cos\left(\omega_0 + \frac{1}{2}\varepsilon\right)t + b(t)\sin\left(\omega_0 + \frac{1}{2}\varepsilon\right)t$$

and stability depends on the growth or decay of the coefficients  $a(t)$  and  $b(t)$ .

Note:  $a(t)$  and  $b(t)$  will be represented as  $a$  and  $b$ , respectively, for the remainder of the paper.

Substituting this solution into the equation, we get

$$\left[\ddot{a} + 2\dot{b}\omega_0 + \dot{b}\varepsilon - a\omega_0\varepsilon - \frac{1}{4}a\varepsilon^2 + \frac{1}{2}ha\omega_0^2\right]\cos\left(\omega_0 + \frac{1}{2}\varepsilon\right)t$$

$$\begin{aligned}
 & - \left[ -\ddot{b} + 2\dot{a}\omega_o + \dot{a}\varepsilon + b\omega_o\varepsilon + \frac{1}{4}b\varepsilon^2 + \frac{1}{2}hb\omega_o^2 \right] \sin \left( \omega_o + \frac{1}{2}\varepsilon \right) t \\
 & + \frac{1}{2}ha\omega_o^2 \cos \left[ 3 \left( \omega_o + \frac{1}{2}\varepsilon \right) t \right] + \frac{1}{2}hb\omega_o^2 \sin \left[ 3 \left( \omega_o + \frac{1}{2}\varepsilon \right) t \right] = 0
 \end{aligned}$$

Notes:

1.  $\varepsilon \ll \omega_o$ , therefore we may ignore all higher order terms of  $\varepsilon$  as they are of higher order smallness and do not affect the first approximation.
2.  $h \ll 1$ , and for the same reason we may ignore all terms that are higher order in  $h$ . The terms of higher frequency can be shown to be higher order in  $h$ .
3. We assume  $\dot{a} \sim \varepsilon a$  and  $\dot{b} \sim \varepsilon a$ , so we may ignore  $\dot{a}\varepsilon$ ,  $\dot{b}\varepsilon$ ,  $\ddot{a}$  and  $\ddot{b}$  as well.

This leaves us with

$$\begin{aligned}
 & \left[ 2\dot{b} - a\varepsilon + \frac{1}{2}ha\omega_o \right] \omega_o \cos \left( \omega_o + \frac{1}{2}\varepsilon \right) t \\
 & - \left[ 2\dot{a} + b\varepsilon + \frac{1}{2}hb\omega_o \right] \omega_o \sin \left( \omega_o + \frac{1}{2}\varepsilon \right) t = 0.
 \end{aligned}$$

For this equation to be true for all  $t$ , the coefficients of both  $\sin$  and  $\cos$  must equal zero. Therefore

$$\begin{aligned}
 2\dot{b} - a\varepsilon + \frac{1}{2}ha\omega_o &= 0 \\
 2\dot{a} + b\varepsilon + \frac{1}{2}hb\omega_o &= 0
 \end{aligned}$$

As indicated above, stability depends on the growth or decay of the coefficients  $a$  and  $b$ , so we are seeking solutions where

$$a \propto e^{\mu t} \quad \text{and} \quad b \propto e^{\mu t}$$

Therefore, substituting  $\dot{a} = \mu a$  and  $\dot{b} = \mu b$ , and representing the system of linear equations in matrix form, we have

$$\begin{pmatrix} \mu & \frac{1}{2}(\varepsilon + \frac{1}{2}h\omega_o) \\ \frac{1}{2}(\varepsilon - \frac{1}{2}h\omega_o) & -\mu \end{pmatrix} \begin{pmatrix} a \\ b \end{pmatrix} = 0.$$

This homogeneous system will have a solution when the determinant of the coefficient matrix is equal to zero, i.e.

$$-\mu^2 - \frac{1}{4} \left[ \varepsilon^2 - \left( \frac{1}{2} h \omega_o \right)^2 \right] = 0$$

$$\mu^2 = \frac{1}{4} \left[ \left( \frac{1}{2} h \omega_o \right)^2 - \varepsilon^2 \right]$$

Again, instability, or parametric resonance, occurs when  $\mu$  is real and positive, or  $\mu^2 > 0$ . This occurs when

$$-\frac{1}{2} h \omega_o < \varepsilon < \frac{1}{2} h \omega_o$$

We can now describe the mathematical solution in terms of physics. We see that parametric resonance will occur, that is, each successive oscillation will grow so long as each change in length occurs within  $\varepsilon$  of half the natural frequency multiplied by the magnitude of the change.

Additionally, we can see that the larger the magnitude of the change in length, there is a larger allowed range of deviation from the precise frequency  $2\omega_o$  where parametric resonance will occur. On the other hand, for very small perturbations (as in the case we are solving for),  $\varepsilon$  must be very near zero, and resonance will require a smaller interval such that  $\omega = 2\omega_o$  more precisely.

### III. Damped Parametric Oscillator

#### III.1 Introducing Damping

When damping such as air resistance is present in a system, the equation of motion is modified to account for it. Specifically, by Newton's second law of motion

$$m\ddot{x} = -kx - \eta\dot{x}$$

where  $k$  is the restoring force, and  $\eta$  is the coefficient of friction which affects the motion of the pendulum proportional to the velocity, or first derivative, of the system. We can therefore write the modified equation of motion as

$$\ddot{x} + 2\lambda\dot{x} + \alpha x = 0$$

where

$$\frac{\eta}{m} = 2\lambda \quad \text{and} \quad \frac{k}{m} = \alpha$$

We seek solutions for this equation of the form

$$x(t) = e^{-\lambda t} x_1(t)$$

where  $x_1(t)$  is the same solution we would choose for the undamped system. This is intuitive, as the added term of friction is cause for decay of oscillations, and is addressed by the negative exponential multiplying the general solution.

Substituting this solution into the equation, we obtain

$$e^{-\lambda t} \ddot{x}_1(t) - \lambda^2 e^{-\lambda t} x_1(t) + \alpha e^{-\lambda t} x_1(t) = 0$$

and since  $e^{-\lambda t} \neq 0$  we can write

$$\ddot{x}_1(t) + (\alpha - \lambda^2)x_1(t) = 0.$$

### III.2 Damping and the parametric oscillator

For our problem, where

$$x_1(t) = a(t)\cos\left(\omega_o + \frac{1}{2}\varepsilon\right)t + b(t)\sin\left(\omega_o + \frac{1}{2}\varepsilon\right)t$$

and

$$\alpha = \omega_o^2[1 + h\cos(2\omega_o + \varepsilon)t]$$

we solve in the same manner as before, and note that where we previously had the amplification of each oscillation to be by a factor of  $e^{\mu t}$ , it now becomes  $e^{(\mu-\lambda)t}$ . Thus instability depends on the sign of  $\mu - \lambda$ , and the boundaries of the region about the frequency  $2\omega_o$  where parametric resonance will occur are found by solving

$$\mu^2 = \frac{1}{4} \left[ \left( \frac{1}{2} h \omega_o \right)^2 - \varepsilon^2 \right] > \lambda^2$$

for when  $\mu^2 > \lambda^2$ , which gives us

$$-\sqrt{\left(\frac{1}{2}h\omega_o\right)^2 - 4\lambda^2} < \varepsilon < \sqrt{\left(\frac{1}{2}h\omega_o\right)^2 - 4\lambda^2}$$

It is important to note that parametric resonance will only occur when the value under the square-root is positive, i.e. when

$$h > \frac{4\lambda}{\omega_o}$$

This means that if friction is present, the change in the pendulum's length must exceed a threshold magnitude so as to lead to exponentially growing oscillations. If the required length is not met, friction will cancel the effects of the parameter change, and the amplitude of the oscillations will decay. Additionally, the relationship between the magnitude of the lengthening and the allowed variation from the frequency  $2\omega_o$  remains as before, albeit requiring more accuracy for larger coefficients of friction.

In conclusion, we find that parametric resonance will occur for the undamped and the damped pendulum when the frequency of the parameter change is near to twice the natural frequency of the system. For the undamped pendulum, the range about this frequency for which resonance will occur is proportional to the magnitude of the lengthening. For the damped pendulum, this range is shortened as the coefficient of friction increases, and parametric resonance will only occur for magnitudes of lengthening which overcome the damping effects of friction. It remains a mystery how a child does this parametric excitation of the swing without knowing all the theory presented above.

## Works Cited

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# Zentangled Animal Alphabet<sup>1</sup>

Ksenia Bodnarchuk

I would like to introduce my ABC children's book. This book provides a way for young children to understand how pictures are connected with letters with the help of the unique Zentangle Method. I choose animals, which help me to explore and at the same time support my concept. In my approach, the first letter from the word, representing that particular animal, was used for visualization. For example: B for Bee, Z for Zebra, and so on. Illustrations of animals illustrate the meaning of the words so that children can understand this book without even reading it. The creation of this alphabet book took me several steps and I used mixed printing techniques for finalization of my illustrations, such as drawing, scanning, retouching, and designing in Photoshop. In order to catch children's attention, I have used only two colors. "Zentangled Animals" is a journey in which children can participate in a fun and enjoyable way.

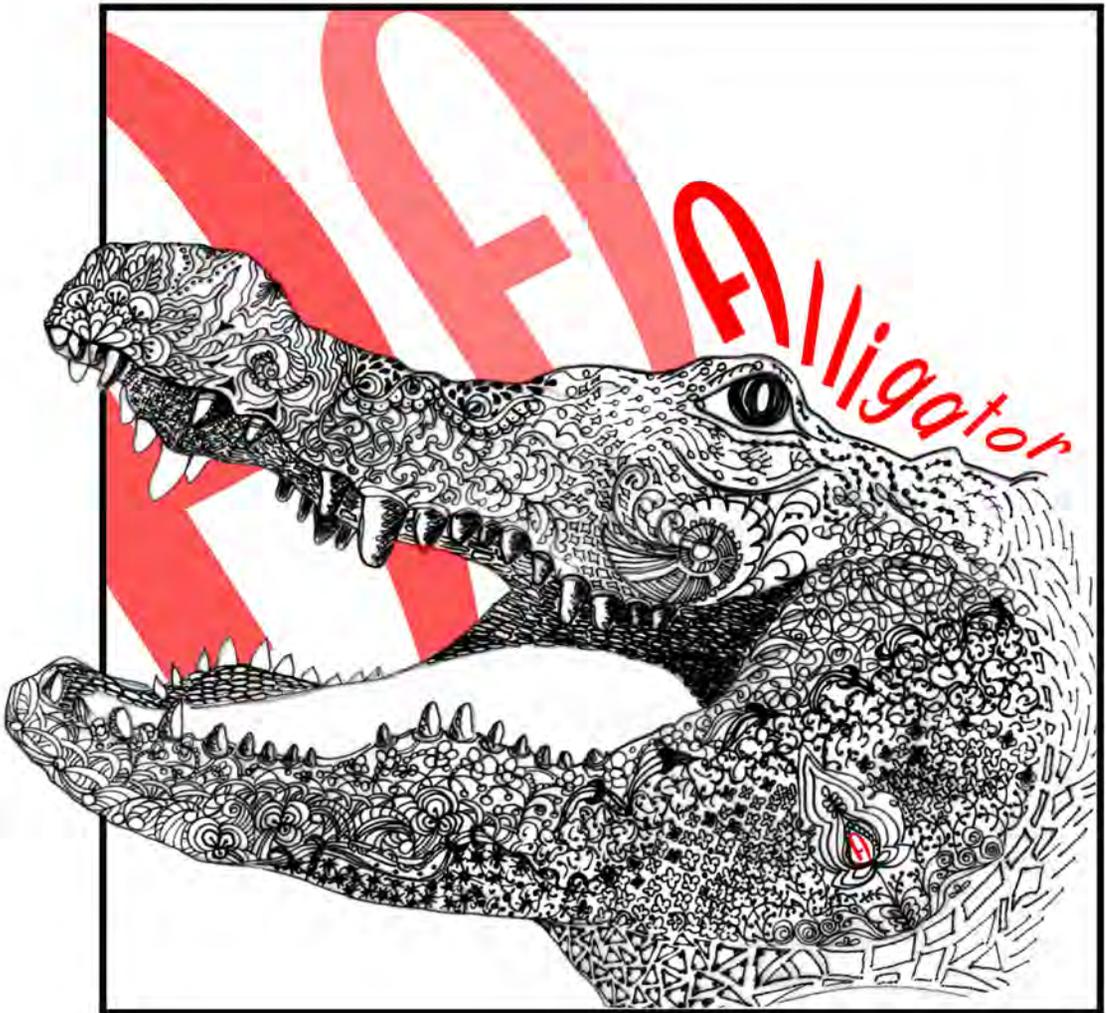
I was inspired by my professor who showed us during class hours many new techniques and methods to be used in illustrations. The Zentangle Art is a new trend in decorative doodling, used by calligraphers or illustrators. I found out about this method and was so influenced that I decided to apply it to one of my projects. It can be done by anyone, but artistic talent is needed. The main concept with such an approach is simple: you draw one structured pattern after the next and put them together. Using only a micron pen, which is a very delicate tool, and paper, you create beautiful images with stunning details. Each mark is called a "tangle," and you can combine various tangles into patterns to create "tiles or small square drawings." Through the specified steps you can learn how to draw and create unique images. Nowadays, there are hundreds of certified teachers who will train beginners. When I found out about Zentangle, it seemed to me hard and complicated. But, when I learned how to use it, I realized Zentangle's unique and inspiring process. Later on when I learned how to create one piece, I decided to use this approach or manner for my alphabet book. Zentangle art is a great way to catch kids' interest and keep their attention.

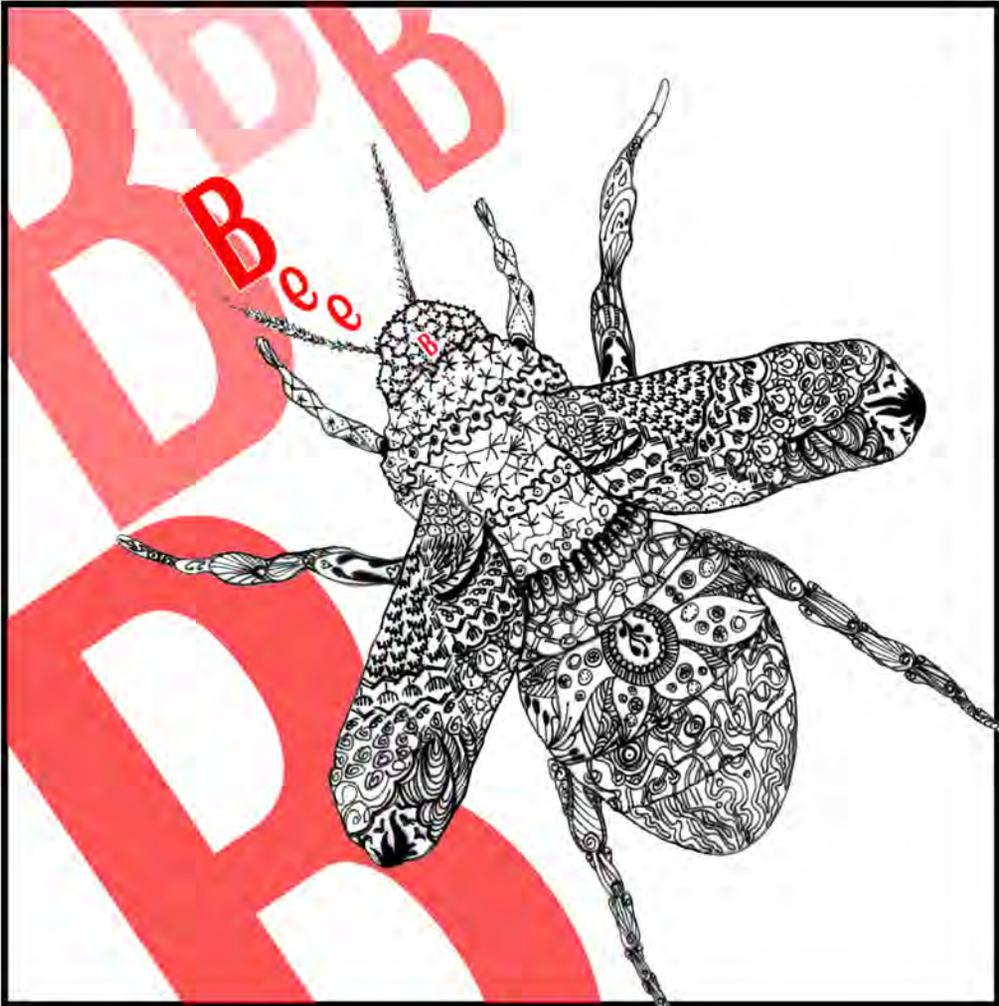
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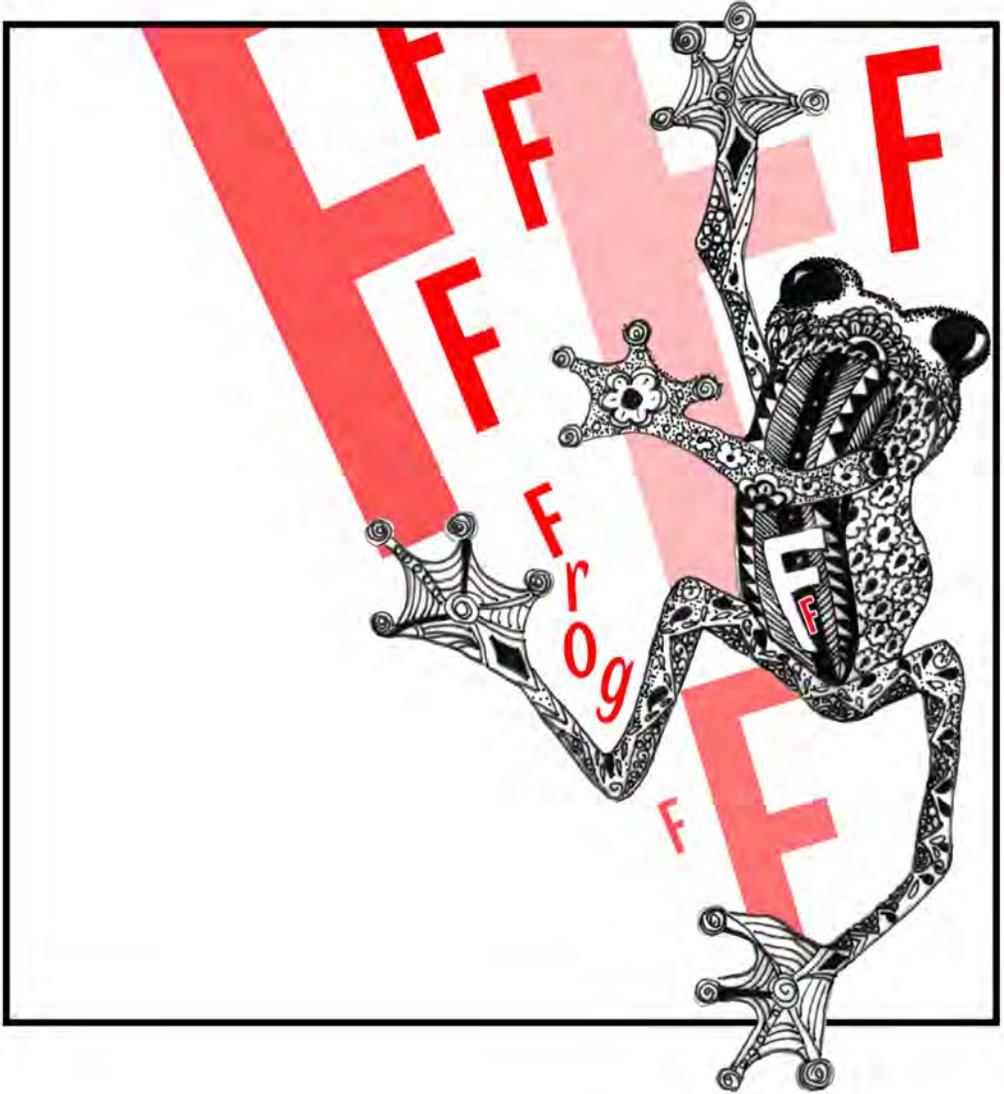
<sup>1</sup> Completed under the mentorship of Prof. Valerie Sokolova for ART 74: Designing with Type.

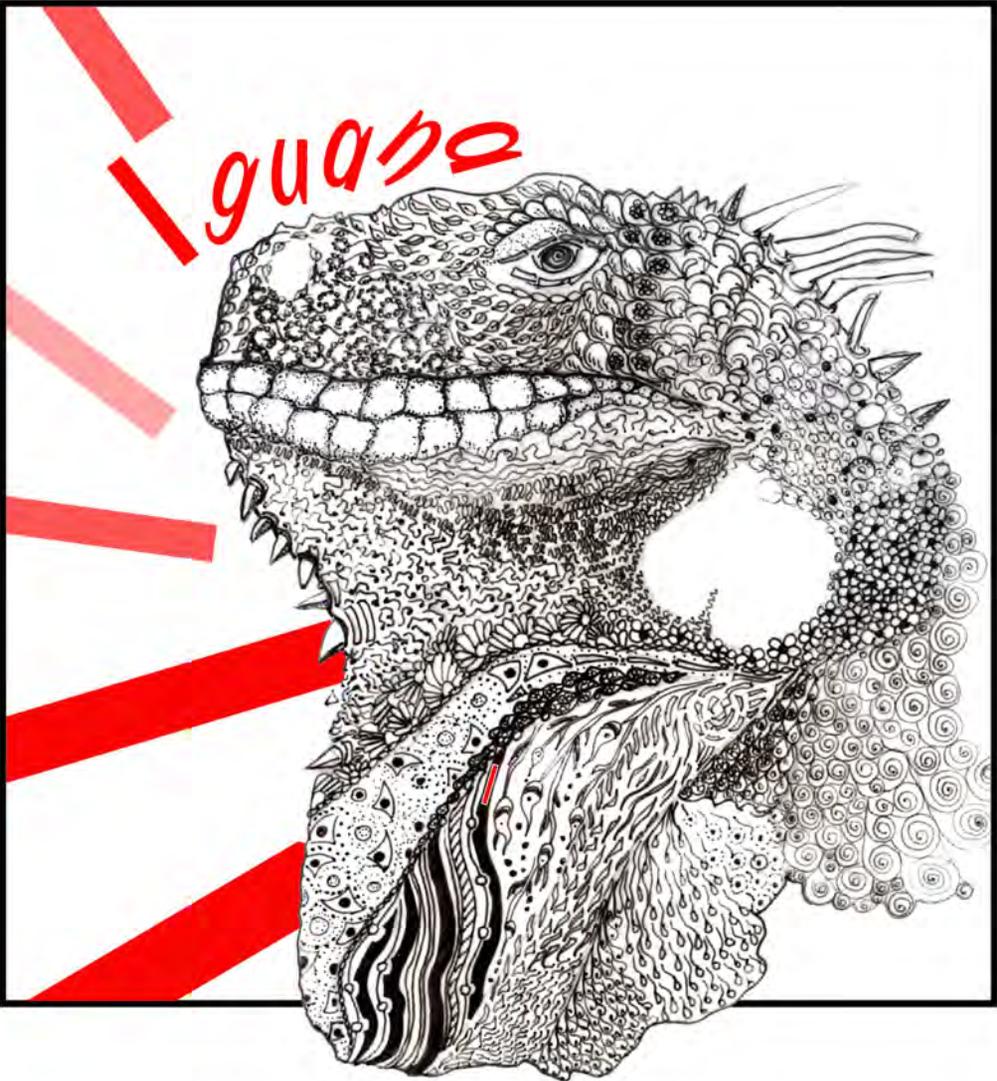
Using new creative approaches and techniques learned in illustration class was my first step in the book design process. To begin my ABC book, my first step was to pick animals that would match the general concept. After the selection of animals was approved by my professor, I filled each animal's contour with unique patterns. Each page was separately scanned and brought to its final look by intensive retouching with Photoshop program tools. The proper typeface was chosen to emphasize the design concept. Each page was put together separately, creating unique selections of images for the ABC alphabet book.

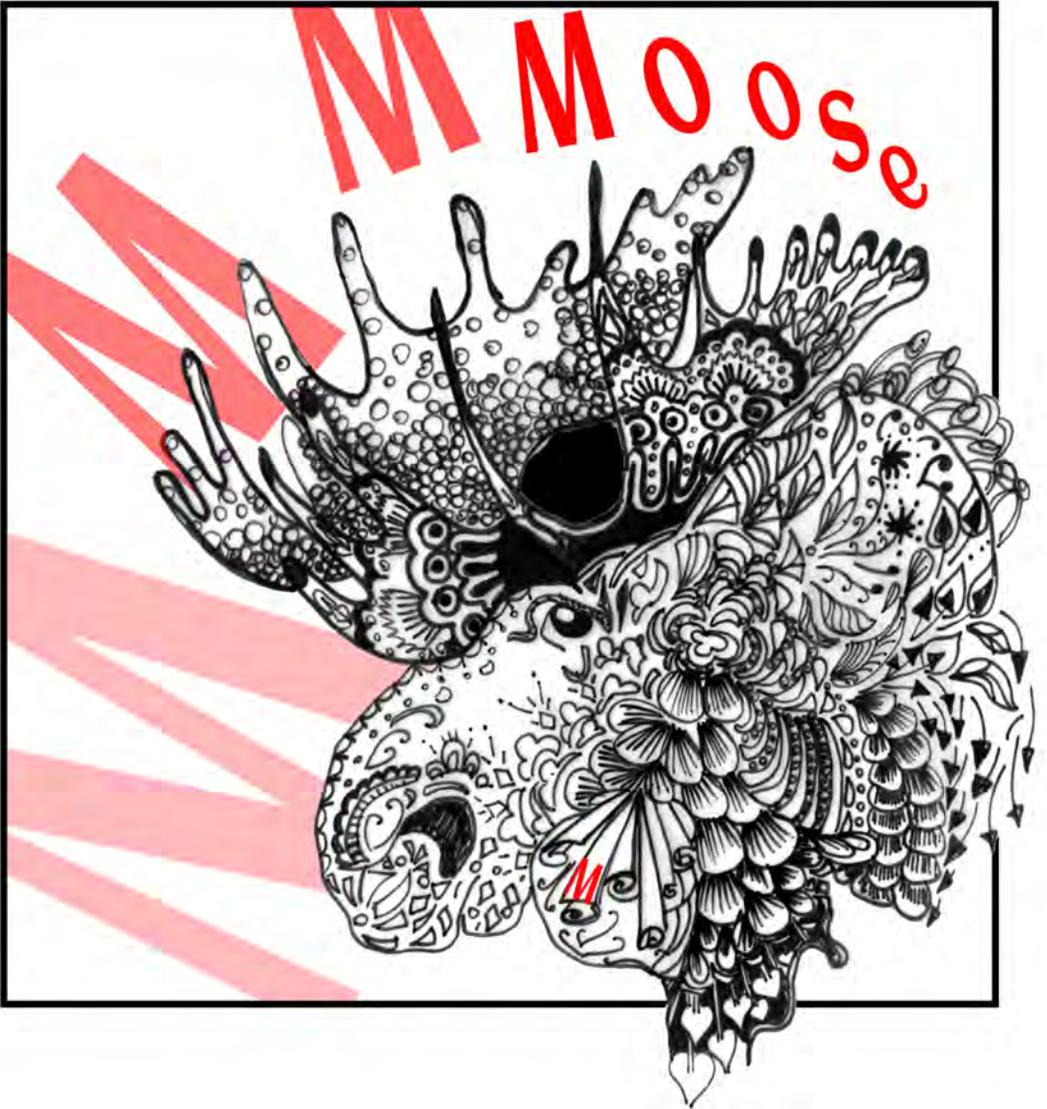
This project empowered me and gave me courage and the opportunity to better understand the interrelation of form and function in typography. This assignment helped me feel more confident in using design elements and language in the future and to experiment more with image and type in my creative work.



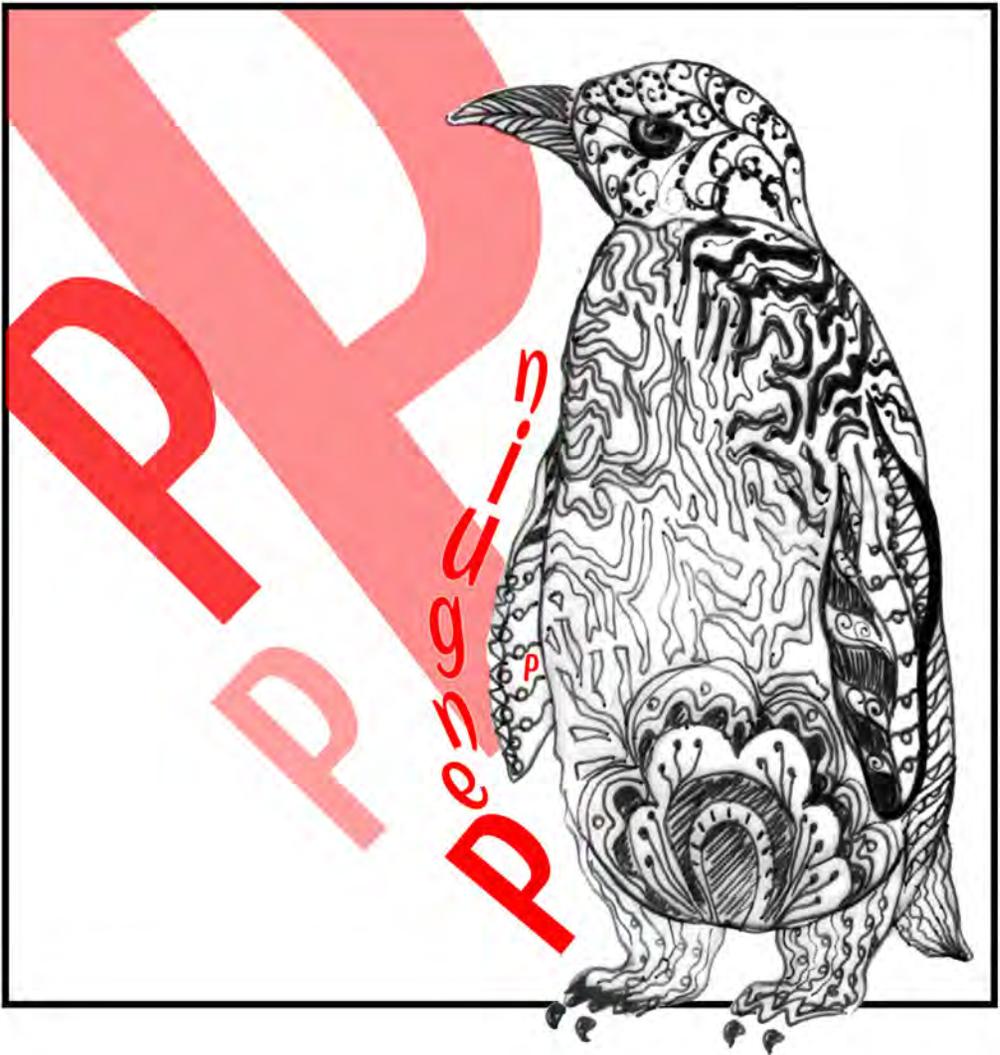


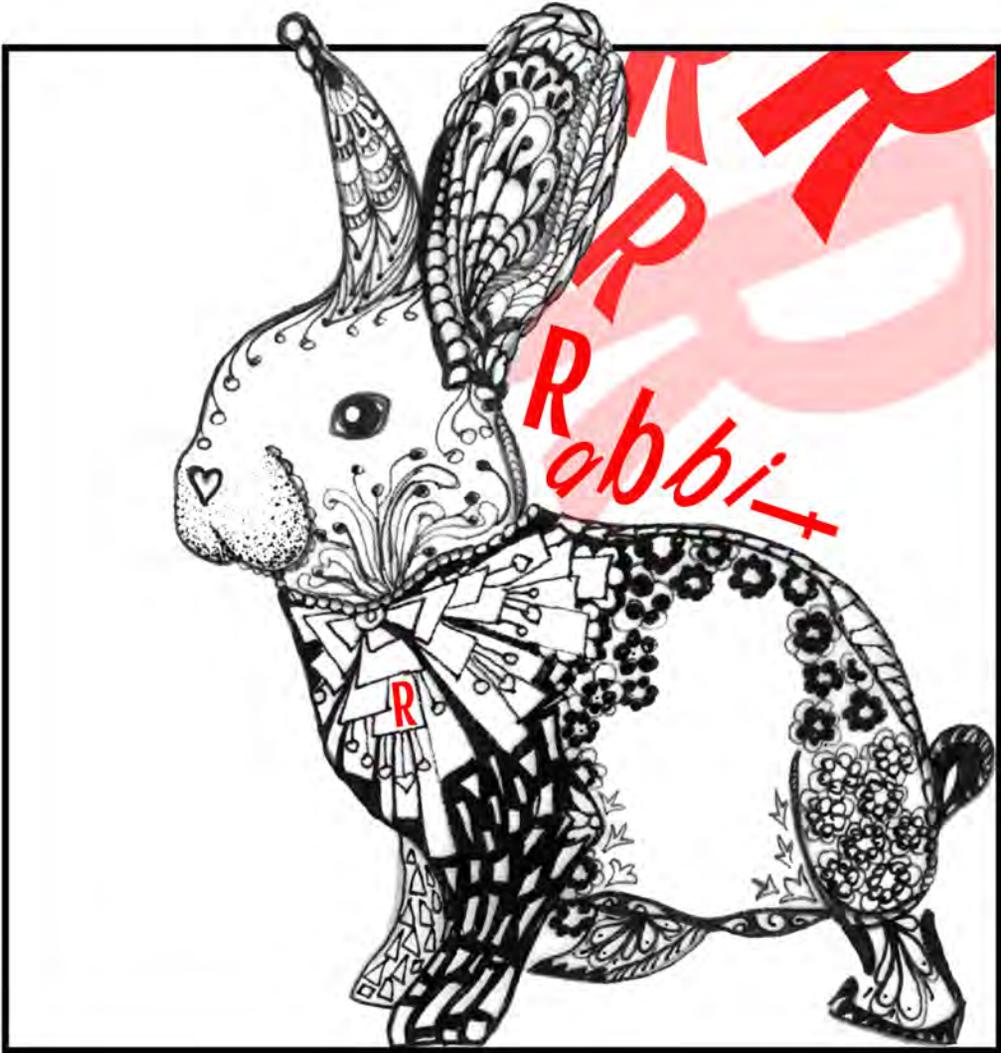














# Silver Nanoparticles & Their Effect on Diabetic Patients' Wounds<sup>1</sup>

Heerawattie Chowrie

**W**ound treatment is still a very active area of research. A significant portion of the population has impaired wound healing, which can lead to severe complications and death. Diabetic patients, for example, suffer poor blood supplies, which inhibit the wound healing process and can lead to amputations in order to avoid the spread of the infection. Silver has antiseptic, antimicrobial and anti-inflammatory properties, which allow it to help heal wounds. Silver is currently widely used in wound dressings and is attracting even more interest when prepared in its nanoparticulate form. Nanoparticles can be defined as very small grains with sizes between 1 and 100 nm (a nanometer is a billionth of a millimeter). The decrease in grain size offers a great increase in surface area, which makes silver nanoparticles ideal candidates for antimicrobial application. Some products that were experimented on are Acticoat™, Acticoat 7, and Acticoat Absorbent™, which have been shown to be very effective in recent and old wounds. These products and others that are available can be very helpful for diabetic patients' wounds.

## What are Nanoparticles?

Nanoparticles exhibit different properties compared to their bulk counterparts. For example, silver's shiny grey color changes to brown as the grain sizes are reduced from micro- to nanometers. This difference in color is even more striking for gold; 10nm grains of gold will absorb green light and appear red. Being that it is exhibiting this change in color it shows that the interaction between gold and light depends on the size of the grain. Silver metal as we see it in jewelry and silver nanoparticles only vary in size; both are made of identical three-dimensional networks of silver atoms. However, the behavior of surface electrons is drastically affected by the grain size decrease. The surface electrons are confined in space, changing the way they interact with the incident light—a phenomenon

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<sup>1</sup> Completed under the mentorship of Prof. Deborah Berhanu for CHM 110: General Chemistry.

known as surface Plasmon resonance.

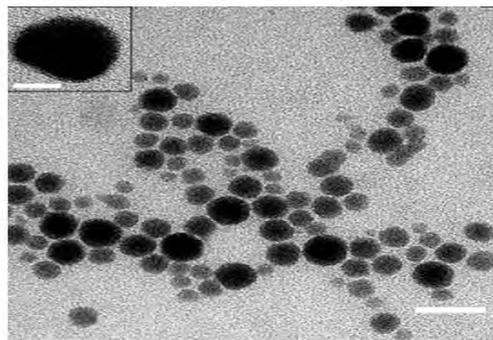
Similarly, other physicochemical properties can change when the size of the grains is reduced to 100 nm and below. Specific surface area is the total amount of surface area per mass unit and, in the case of silver; the increase in specific surface area when the grain sizes decrease is of great interest for medical applications. More surface atoms are exposed to the environment in comparison to atoms in bulks, which have a much higher rate of inner atoms (Rai et al. 2008).

The surface area in nanoparticles is one of the main reasons why they are effective. Atoms at the surface have fewer neighbors than inner atoms. Due to the lower coordination and unsatisfied number of bonds, surface atoms are less stabilized, hence more reactive.

### What is Silver?

Silver is a transitional metal element with an atomic number of 47; it contains 47 protons and electrons. Transitional metals have the ability to conduct electricity and heat. In transitional metals the valence electrons are present in more than one shell. The electron configuration for silver is  $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^1 4d^{10}$ , or it can be abbreviated as  $[Kr] 5s^1 4d^{10}$ . Silver's oxidation can either be  $2+$  or  $1+$ . Isotopes are elements with the same atomic number (same number of protons) but different number of neutrons. The two natural stable isotopes for silver are  $^{107}\text{Ag}$  and  $^{109}\text{Ag}$  (107 and 109 neutrons, respectively).

Silver has been known for its antiseptic, antimicrobial and anti-inflammatory properties (Fong et al. 2006). For example, some people drink colloidal silver to improve their health. Silver nanoparticles are used to prevent bacteria in catheters and to reduce infections in burn treatments. One form of silver that is known to kill microorganisms is free silver cations. Free silver cations block the cellular respiration and disrupt the function of bacterial cell membranes (Fong et al. 2006). There are three main structures of bacteria: rods, spirals, and cocci (Pal et al. 2007). Studies have shown that when silver nanoparticles are shaped like the structure of the bacteria, it helps the healing process occur faster than usual (Pal et al. 2007).



Transmission electron micrograph of silver nanoparticles

### Silver Nanoparticles

Silver nanoparticles are tiny grains made of silver atoms with sizes ranging

between 1 and 100 nm. When the size of silver is reduced to the nanoscale, it not only inhibits bacterial growth but it also kills bacteria. These nanoparticles have the ability to attach themselves to the cell membrane of bacteria and change the amount of energy that the bacteria will get (Panacek et al.2006). The binding of the particles to the bacteria depends on the surface area available for interaction. Smaller particles have larger specific surface area available for interaction, and this characteristic provides them with enhanced bactericidal effect compared to larger particles (Roduner 2006). Using scanning tunneling electron microscopy (STEM) and the X-ray energy dispersive spectrometer (EDS), researchers have shown the presence of silver nanoparticles not only at the surface of cell membrane, but also inside the bacteria (Pal et al. 2007). Hence, silver nanoparticles may also penetrate the bacteria and cause damage by interacting with phosphorous and sulfur-containing compounds such as deoxyribonucleic acid DNA (Panacek et al.2006). Furthermore, a contribution to the bactericidal properties of silver is the release of silver ions from nanoparticles; which will be the main focus when discussing the application of silver nanoparticles for diabetic patients wound treatment.

### **Types of Diabetes**

Diabetes is a group of metabolic diseases in which the person has high blood glucose either because his/her insulin production is inadequate, because the cells do not respond properly to insulin, or a combination of both. The pancreas plays a significant role in this disease. Type one diabetes is when the body does not produce insulin. Patients that have type 1 diabetes have to take insulin injections for the rest of their lives. On the other hand, type 2 diabetes is when the body does not produce enough insulin to perform everyday functions. Type 2 diabetes usually occurs in patients who are overweight or obese. Patients who have type 2 diabetes take pills to lower their blood glucose level, similarly to insulin (Mishra et al. 2008).

### **Normal Healing Process for Healthy Patients**

When a person is first injured the first cells to arrive at the wound are neutrophils. The neutrophils are important because they fight off the bacteria trying to invade the body at the site of infection. In addition to neutrophils being found at the wound site there are also apoptotic cells. Apoptosis is a process of programmed cell death. Neutrophils main job when a wound is present is to destroy microorganisms and undergo apoptosis. Afterward, they are consumed by macrophages in a process that does not lead to further inflammation (Mishra et al. 2008).

### **Healing Process for Diabetic Patients**

When a patient's glucose level is elevated this stiffens the arteries and causes the blood vessels to constrict. When a blood vessel is narrow it decreases the amount of blood and oxygen arriving at a wounded area. When a patient's blood glucose level is high, the function of red blood cells that carry nutrients to the tissue decreases. Therefore, this lowers the efficiency of white blood cells that fight infection.

### **Complications of Diabetic Patients**

Diabetes has various complications, including foot and skin complications. Some foot complications include neuropathy (nerve damage), ulcers (vascular disease), and gangrene. When infections become severe, doctors often recommend the amputation of the affected body part. Patients with diabetes are also more susceptible to skin infections and skin disorders. Diabetic patients' foot injuries fail to heal due to a constantly high concentration of pro-inflammatory cytokines. These cell signaling proteins aggravate the inflammation in the wound inducing high concentrations of enzymes, which degrade proteins and hormones that are essential for wound healing (Mishra et al. 2008). In Germany, the amputation rate is approximately 28,000 a year even though doctors use foot ulcers prevention protocols. .

### **Normal Treatment for Diabetic Patients**

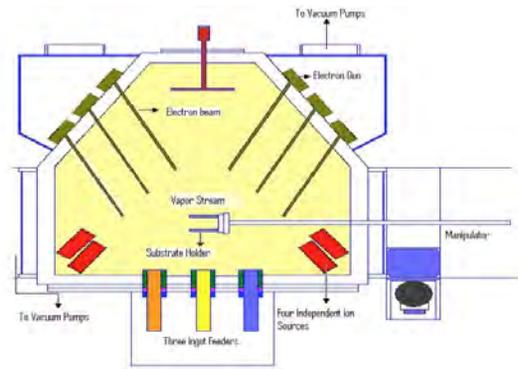
Some common treatments for diabetic patients with foot and skin complications are bioengineered skin substitutes and collagen/ oxidized regenerated cellulose (ORC) wound dressing (Mishra et al. 2008). Allogeneic bilayer culture is a bioengineered dressing developed from neonatal foreskin and consists of living cells and structural proteins that help with the healing process of foot ulcers. ORC is a sterile, freeze-dried matrix sheet. ORC absorbs inflammation and creates a soft biodegradable gel that is able to bind and inactivates some of the destructive enzymes described above, which have been shown to detrimentally affect the wound healing (Mishra et al. 2008).

### **Silver Nanoparticles for Diabetic Patients Wounds**

An experiment was done with three different types of nanocrystalline wound products, Acticoat™, Acticoat 7, and Acticoat Absorbent™ (Fong et al. 2006). They all work at reducing the size of a wound by fighting bacteria, but the rates at which they fight off the bacteria and heal the wound are different. These products contain three or five layered dressing which are made of silver mesh containing silver nanocrystals (Fong et al. 2006). The nanocrystalline silver is said to release clusters of extremely small and highly reactive silver particles (Fong et al. 2006).

Acticoat is made by a process called physical vapor deposition (Fong et al. 2006).

Argon gas is introduced into a chamber; the chamber constitutes the anode (electrode attracting negatively charged ions- anions) and silver is used as a cathode (electrode attracting positively charged ions- cations). Upon electric discharge, argon cations are formed and accelerated towards the silver cathode. The impact of the argon ions on the cathode knocks out “bundles” of silver atoms. The ejecta are the silver nanocrystals. Made of 30 to 50 atoms, they measure approximately 15 nm (Fong et al. 2006).



When Acticoat is mixed with sterile water and placed on wounds it releases silver cations (Fong et al. 2006). This causes the inactivation of bacterial cell DNA, cell membrane damage, and binding of insoluble complexes in microorganisms (Fong et al. 2006). When mixed with water again, the Acticoat, releases clusters of silver cations onto the wound. A continuous release can be observed for up to three days with Acticoat™ and seven days when using Acticoat 7 (Fong et al. 2006). Sustained release of silver ions has a bactericidal action providing effective management of odor, reducing the risk of wound spread, and preventing infection (Fong et al. 2006).

A way of preventing infection is to control the levels of bacteria on the wound because it is impossible for a wound to be bacteria free. When a significant amount of bacteria are present they can cause extreme disturbance in the healing process of the wound and in worst-case infections. Bacteria are capable of this because it is competing with host cells for nutrients and oxygen (Fong et al. 2006). In addition bacteria waste products are toxic to host cells.

Using Acticoat™, an experiment was performed on six patients with ulcers. All of the patients' ulcers had been present for a different amount of time. The more recent venous ulcers took less time to heal. Meanwhile the older venous ulcers took more time to heal. For example, a 5-month-old ulcer was healed with Acticoat™ in 194 days, and a 5-week-old ulcer took 27 days to heal. In another case Acticoat™ was used again instead with patients that had decubitus ulcers. One patient's ulcer was 24 months old and it took 27 days to heal. Another patient that had an ulcer that was 2 weeks old healed in 14 days (Fong et al. 2006).

### Benefits of Using Silver Nanoparticles

Diabetic patients always have to be mindful of what they eat because if they do not have a balanced diet, wounds like ulcers may occur. Research has shown that using silver nanoparticles helps speed up the healing process although scientists are still looking into using silver nanoparticles for wound treatment. Silver is known for its antimicrobial properties and making silver into nanoparticles has shown how effective it can be.

Diabetic patients can still use regular treatment instead of silver nanoparticles but why should they? The faster the wound heals the better for the patients. Usually when the wound does not heal the patient needs to have that body part amputated. If more research is done on silver nanoparticles and it can really benefit diabetic patients, there will be fewer amputations. Regular treatments, such as allogeneic bilayer cultured skin equivalent or ORC can help patients avoid amputations. Some cases of diabetes are worse than others (Mishra et al. 2008). For example a family can all have diabetes but if they all eat healthy food and try to take care of themselves, their cases of diabetes would not be as severe as another family who is constantly eating fast food or not attending regular check-ups with their doctor.

Based on my research, it would be very effective to use silver nanoparticles to help diabetic patients heal their wounds.

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# Are People Born Evil?<sup>1</sup>

Rachel Lazar

## Abstract

As long as evil has existed, people have pondered over its source, hoping to somehow make the incomprehensible explainable. This research paper has searched for answers as to the roots of evil, focusing primarily on whether an individual can be born evil, and if not, how an individual can become evil, and if they can ever lose the power of choice over their actions. Looking through the lenses of both the Classical and Positivist Schools of Criminology, findings showed that individuals cannot be born evil, and that the innate human moral mind, favoring non-evil acts, lies in the amygdala, posterior cingulate, and medial prefrontal cortices of the human brain. Evil is performed by an individual choosing to disregard their moral mind or by an individual with a damaged moral mind who has lost the freedom of choice over their actions.

Philosophers, psychologists, doctors, professors, and most human beings on this earth have thought about the cause(s) of evil. For as long as evil has existed, people have pondered over its source. It is natural to crave a single explanation for the sources of evil, as maybe then something so incredibly inconceivable would have some form of a rational explanation. If we could pinpoint one specific cause of evil, perhaps we may even be able to prevent it (Schechter, 2004, p. 247). Fortunately or unfortunately, as of today, we have not found a single direct link to the source of evil. That is not to say that we have not discovered strong influences that would predispose an individual to evil activity, as the bravest of scientists have done extensive research in these areas, formulating numerous theories over the years. Some theories have been discredited shortly after they were put forth, some have proof of strong validity, and almost all have been, and currently are, highly controversial. To say that we may never pinpoint that one specific cause, though, should not stop us from studying contributing factors to evil activity.

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<sup>1</sup> Completed under the mentorship of Prof. Grace Trotman for POL 64: Crime and Punishment.

While only scratching the surface of a subject as complex as this, this paper analyzes two major schools of thought, the Classical School of Criminology and Positivist School of Criminology, focusing primarily on whether individuals can be born evil, and if they ever lose the freedom of choice over their actions. Research shows that individuals cannot be born evil, and that the innate human moral mind in one's amygdala, posterior cingulate, and medial prefrontal cortices—what makes us human—must be either disregarded or damaged before an inhumane act can be performed. If the innate moral mind is disregarded, the individual responsible for the act had freedom of choice over their actions, and can be deemed evil. If the innate moral mind is damaged in an individual, they have lost the freedom of choice over their actions, and therefore although the act may be evil, the individual themselves cannot be deemed evil.

On any given day, thousands of juveniles between the ages of seven and sixteen are incarcerated in one of New York City's Department of Juvenile Justice Centers: Horizons, Crossroads, and Bridges, otherwise known as Spofford. According to The Correctional Association of New York, most of these juveniles are charged with non-violent, low-level offenses and do not pose a threat to public safety ("Juvenile Detention," 2005). Many of these are adolescents who were raised in poverty, had attended schools with limited resources, came from broken homes, and were abused or neglected as children (Kelly, 2004). Andre Holder, an adolescent who served time in Spofford Juvenile Center stated, "I started selling drugs because my mother wasn't financially stable. I had two brothers and two sisters... she was on welfare... it was really complicated for us" (Kelly, 2004). His story is an example of thousands more like him.

Then there are cases like Jesse Pomeroy. Jesse was fourteen when he was arrested for sexually abusing seven boys, and then the snatching, cutting of, and vicious murder of four-year-old Horace Mullen. When Horace's small body was shown to Jesse and Jesse was asked if he had killed the little boy, he responded with a nonchalant, "I suppose I did" (Ramsland, 2013), and didn't show even the slightest hint of regret. Or, there is the case of the 15-year-old boy who stood coolly in his cell when he was approached by a law student just last year, in 2012. "I raped an 8 year old girl," he said to the law student with a cocky smile. "Anna (elder brother), I wanted to. Supera irunthuchu (it was super) Neengalum try pannunga (You should also try)." There was a kind of psycho sparkle in his eye, the law student noted, as a chill ran up her spine ("Life as I See It," 2012).

There seems to be a difference between adolescents who sell drugs to afford food for their siblings, like Andre Holder, and the adolescents who brutally murder and viciously rape in an inhumane way, and who later show no remorse for their actions, like Jesse Pomeroy. While one has some form of explanation and is non-violent, the other seems to have no explanation at all, and uses incomprehensible violence. This begs the question: what is evil? And are some people simply born evil?

The word evil is vague, yet it is an adjective that instantaneously brings to the minds of most brutality, maliciousness, and horror. In order to better understand what it means to be evil, let us first understand what is meant when the word evil is used. On March 27, 1964, an earthquake at the magnitude of 9.2 shook the state of Alaska so violently that 128 innocent people were killed, but we do not refer to the earthquake itself as

evil. When Hurricane Katrina licked our shores in 2005, it was a horrible event, but we did not call Hurricane Katrina evil either. Acts of nature, or natural disasters, are termed ‘*pathos*,’ not ‘*evil*,’ by Games Gilligan, in his book *Violence* (Gilligan, 1997). Initially, many would hypothesize and assume that because a natural disaster is not conscious of what it is doing, it cannot be deemed evil. But, when an animal devours another animal for food, it is most definitely aware of what it is doing, yet the animal is not referred to as evil either. A fox seeking out the weakest raccoon in the pack to pounce on has a deliberate plan and is quite conscious of what he is doing, yet the fox is not evil. Even a lion that preys upon a small child, specifically choosing one child over another because it looks juicier, we don’t view as evil (Gerber, 2008). Humans are the only species who we, at times, call evil. What is unique about humans, then, and what is the key element that needs to be added to something that is bad, to make it maliciously evil?

One of the first recorded literature pieces discussing what separates humans from all other things and species was written by the philosopher Aristotle, as documented in *Nicomachean Ethics* by authors Terence Irwin and Gail Fine.

“What then could this be?” Aristotle writes. “For living is apparently shared with plants, but what we are looking for is the special function of the human being; hence we should set aside the life of nutrition and growth. The life next in order is some sort of life of sense-perception; but this too is apparently shared, with horse, ox and every animal. The remaining possibility, then, is some sort of life of action of the part of the soul that has reason. Now this part has two parts, which have reason in different ways, one has obeying the reason in the other part, the other as itself having reason and thinking.” (Irwin & Fine, 1996, p. 206)

This is a simple yet profound awareness. That human beings having the ability to reason is what separates us from earthquakes, hurricanes, and from all other animals. When we use the word reason, we are referring not to the intellectual thought processes of awareness, like the other animals have, but what we call the human moral mind (Gerber, 2008). Our ability to reason is not something we choose to have but is something inherent. It is something automatically produced by the human mind, and is not initially learned from life experience or from the environment. So, a better definition of evil is: when an individual has a human moral mind consisting of the ability to reason, yet performs a brutal and malicious act anyway. Forensic Psychiatrist Michael Welner of the New York University School of Medicine defines it as, “An intent to cause emotional trauma, to terrorize or target the helpless, to prolong suffering and to derive satisfaction from it all” (Schechter, 2004, p. 20). That, with a presence of a human moral mind, is how we can define evil.

Harvard University Professor Joshua Greene, together with Princeton University Professor Jonathan Cohen, conducted extensive research on moral decision making, their goal being to learn where exactly this “human moral mind” lies in the brain. A series of tests were performed at the Princeton University’s Neuroscience of Cognitive Control Laboratory on normal, healthy individuals. The individuals were put in fMRI machines, were shown texts and images of moral dilemmas, and were asked to make moral judgments and decisions (Gerber, 2008). The following paraphrased scenario was presented to them: You are a teenage girl who became pregnant. You managed to hide your pregnancy

by wearing baggy clothes... One day at school you begin to go into labor... you rush to the bathroom and give birth in a stall, quietly, alone, and afraid. You are not ready to care for the child. Part of you wants to throw the baby in the trash and pretend it never existed so you can move on with your life. Is it okay to throw away your baby so you can move on with your life? (Greene, 2005)

Every one of the individuals tested said it would not be okay to throw away the baby, and most answered this fairly quickly. What the fMRI tests showed was not significant activity in only one “human moral mind spot” of the human brain, but a complex grid of neurotransmitters in the amygdala, posterior cingulate, and medial prefrontal cortices were activated (Greene, 2005). The brain’s natural activity in those areas resulted almost instantaneously in the mind silently screaming, ‘No!! Don’t kill the baby!’ in the healthy brains of the individuals tested.

If what separates humans from everything else is our moral mind—one that is innate, automatic, and that we do not choose—can there be activation in the amygdala, posterior cingulate, and medial prefrontal cortices, yet one performs acts of evil anyway? How was fourteen-year-old Jesse Pomeroy able to brutally murder four-year-old Horace Muller without a trace of regret? How was 20-year-old Adam Lanza able to calmly walk into Sandy Hook Elementary school on December 14, 2012 and murder 26 people, 20 of them innocent children between the ages of five and ten, and how were Hitler and Nazi Germany able to conduct genocide on a scale so large? How was Jeffery Dahmer able to rape, murder, dismember, and then consume the bodies of 17 boys and men? What drives a person, what is happening in their brains, and how are they disregarding the innate human moral mind when they perform these malicious acts of evil? Our mouths have been wide open in front of the television countless times. We have been dumfounded, asking the same questions over and over. How is someone able to do that? Why? It seems like they must be plain crazy. And then we follow the cases, the charges, the defenses, and we try our hardest to make sense of the malicious acts of evil.

The Classical School of Criminology, put forth by Jeremy Bentham and César Beccaria in the mid-18th century, was the earliest theory of criminology to try and explain evil (Masters et al., 2011). They believed that violent criminal behavior is an outcome of an individual’s conscious choices. Based on what we know today about the brain from Professor Greene and Cohen, essentially what Jeremy Bentham and César Beccaria believed—and what the Classical School of Criminology believes—is that an individual who performs acts of evil has an innate human moral mind, and consciously performs an evil act anyway. How though? How is it possible for one to have this moral mind yet still perform acts of evil? The Classical School of Criminology was the first dramatic and bold theory and is of course entitled to much research and explaining.

One theory to explain how an individual can have a moral mind and still perform evil was put forth by political theorist, Hannah Arendt (1906-1975). Arendt was a German-American Jew who fled Nazi Germany during World War II, and who has published works that have been incredibly controversial. One of her famous publications, published in 1963, was called *Eichmann in Jerusalem: A Report on the Banality of Evil*. Her book was in response to Eichmann’s trial in Jerusalem, Israel, after the Holocaust. Her thesis

was that although Eichmann was a lieutenant colonel and one of the major organizers of a Holocaust that brutality tortured and murdered 6 million men, women, and children, he performed the evil actions not because he was innately evil, but because he was simply 'doing his job,' and following orders (Arendt, 1963). Essentially, he disregarded the moral mind's tendency to favor non-evil acts. Arendt explains this by saying ordinary people who are not "cold blooded" simply follow orders and therefore do things they would never do on their own. She coins the term "Banality of Evil," saying the individual stops thinking for his or herself and chooses to fall into plain thoughtlessness. She says falling into thoughtlessness can happen to anyone and that evil in this sense may be the most dangerous of them all.

My hypothesis is that the psychological concept of cognitive dissonance explains this. Cognitive Dissonance is the discomfort one feels when one is acting in conflict with one's thought processes (Merriam-Webster, 2013), or one's human moral mind. A smoker's innate natural human moral mind tells them they do not want to harm their body, and that they would like to live a long and healthy life, free of cancer. Yet the actions they take every time they light up a cigarette are in direct conflict with that cognition. The theory of Cognitive Dissonance says that in order to reduce internal discomfort, one will either add an additional cognition ("I will quit smoking one day soon, so it's okay"), or decrease the importance of the cognition ("the lung cancer advertisements are all exaggerating, it won't happen to me"). This way, a smoker can enjoy a cigarette without feeling highly uncomfortable and guilty every time. Adolf Eichmann followed orders that were in direct conflict with his natural human moral mind, so in accordance with the Cognitive Dissonance theory, he perhaps chose to decrease the importance of the cognitions he had against what he was doing, enabling him to fall into "thoughtlessness." Although Cognitive Dissonance can help us begin to understand how an individual can become evil, consciously or subconsciously disregarding the human moral mind and falling into thoughtlessness is still an individual's choice. The banality of evil and Cognitive Dissonance can help explain how evil can be propagated, but neither theories give proof that the individual has lost the power of choice over their actions.

In August 1971, Philip Zimbardo conducted the Stanford Prison Experiment at Stanford University, which later evolved into an exceptional window into the human condition and expressions of evil. Twenty-four male students were selected at random and placed in a mock prison. Twelve were given the identity of prison guards, and twelve were handcuffed in the middle of the night and given the non-identity<sup>2</sup> of an inmate. Zimbardo wanted to see how the psychology of these individuals would play out when given powerful, or powerless, identities such as these. What happened was so dramatic and horrifying, that the experiment ended abruptly after only six days. The twelve mock prison guards became physically and verbally abusive to the mock inmates within a matter of hours. Inmates were stripped naked and degraded, were forced to repeat their assigned numbers over and over again, and several had their mattresses taken away so they had to sleep on hard bedframes. Even Zimbardo himself conformed and took on the role of super inten-

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<sup>2</sup> This is referring to the fact that inmates are called by number rather than by name, and are stripped of their respective individualities

dant and let the abuse drag out longer than necessary (Gerber, 2008). Some mock guards alarmingly began showing genuine signs of sadistic behavior. Before the experiment, the guards were regular, normal, respectable members of society. When put into this experiment, they followed orders, became unoriginal by simply taking on a role, and fell into thoughtlessness. Again, Cognitive Dissonance can explain this, but still, the individual is choosing to fall into thoughtlessness, and perform the acts of evil. This theory is incredibly hard to swallow, because the idea that someone would be in control of what they are doing, and choose to fall into thoughtlessness anyway, disturbs every bone in our bodies—although that is what the Classical School of Criminology believes.

The Positivist School of Criminology, spearheaded by the father of criminology, César Lombroso, emerged in 1850, claiming the exact opposite of the Classical School of Criminology. Positivists believe that human beings commit evil not because they are consciously pushing past the human moral mind and choosing the evil, but rather because they do not have freedom of choice over their actions. The positivists claim that criminal behavior is a product of biological, social, and psychological forces over which the human being has no control (Masters et al., 2011).

The biological leg to the Positivist School of Criminology was called atavism. Atavism is the idea that criminals, at conception, have genetic throwback and subhuman traits, leading them to perform malicious brutal acts of evil later in life. Although atavism has been completely discredited, science has definitely looked at the biology of individuals who perform evil by reviewing their genes. Genetics is the branch of biology focusing on the inheritance of Deoxyribonucleic acid (DNA) from ancestors to children, and how the DNA displays itself in ones phenotype as well as their personality (Petechuk, 2004). As technology becomes increasingly advanced, a field of study called Gene Chromosome Theory has advanced in such a way that we are now able to locate exactly where along the double helix DNA a specific gene with genetic information lies, even before a baby is born. Be it ethical or not, this has opened the doors to immense power that we have over small or unborn children. If there was an “evil gene” swimming around the human gene pool and landing on chromosomes, and we could locate it, we could test and treat that gene, and possibly prevent evil in a major groundbreaking way. Having a baby born with an evil gene would be ethically confusing, yet this would be a simple explanation and an excellent preventative measure for evil. Researchers have not stopped looking for that gene. The label some use for a criminal is a “bad seed,” stemming from William March’s 1954 novel about a young homicidal child who inherited her traits from a mother she never met, although no proof was established (Newton, 2006). In the 1960s, researchers pursued the “XYY Syndrome,” saying individuals born with an extra “Y” (male) chromosome, inherited an extra dose of “maleness” and were therefore committing acts of evil, although this was discredited as well, based on not enough evidence (Newton, 2006). Sandy Hook shooter, Adam Lanza, has had his DNA analyzed over the past eleven months numerous times. Although scientists have not given up, as of this month, November 2013, a direct link between a gene and the expression of evil has not been found (Smith, 2013). The evidence suggests that people cannot be born evil.

The biological component to the Positivist Theory is not complete though. What

scientists have seen when looking at the brain is that neurons are fired in the amygdala, posterior cingulate, and medial prefrontal cortices when an individual makes a moral decision. Damage to those areas of the brain during one's life has been shown to limit moral sensibilities in a person, even if all else about the individual appears normal (Greene, 2005). The most celebrated of these cases was the case of Phineas Gage, a 19th century railroad worker in Vermont. A terrible work accident caused a metal rod to shoot straight through Gage's neck and out the top of his skull, shattering most of his prefrontal cortex. Gage survived the accident and after several weeks of recuperation appeared to have all mental capabilities accounted for. Several months later, Gage began showing signs of wild, lawless and troublesome behavior, whereas before the accident he was a gentle and kind young man. Part of his brain that participated in moral judgment had been shattered, and so his moral sensibilities took a fall as well. On the biological side, although one cannot be born evil, damage to the amygdala, posterior cingulate, or medial prefrontal cortices may cause an individual to have significantly less freedom of choice over their actions.

The social aspect of the Positivist School of Criminology has been stretched wide, with multiple dimensions to numerous social theories put forth. Society itself is always changing; therefore the theories put forth are continually changing as well. The Social Learning theory states that a person's behavior is based upon observation of behaviors of others around them, and the consequences or lack thereof, to those behaviors (Masters et al., 2011). Albert Bandura and his colleagues performed the famous and influential experiment called the "Bobo Doll experiment" in 1961. Thirty-six boys and 36 girls from the Stanford University Nursery School were split into several groups. Some of the groups watched a model physically and verbally abuse a blowup bobo doll over and over again, and some observed a non-aggressive model do none of that, but rather treat the bobo doll nicely. Results showed, amongst other observations, that as soon as the adult left the room, the children who had watched the aggressive model, began beating the bobo doll, whereas the children who did not observe that, did not hit the bobo doll (Cherry, 2013). In recent years and months, this theory has been used to see if, or how, violent video games children play may be influencing presentations of violence as well. What an individual observes can definitely influence their behavior, although there is no proof that because they observe evil activity, they then lose the power of choice over their actions.

The Strain Theory of Violence says that strong outside pressures heavily influence one to act violently, and the Social Control Theory says individuals act violently because they have limited belief systems (Masters et al., 2011). Although these theories have validity, and do show how the influences of these factors increase presentations of violence or evil, there is no proof they cause one to lose the power of choice over his or her actions. The same goes for Emile Durkheim's Anomie Theory, which states that individuals express violence because they were previously alienated to the point where they felt hopeless, isolated, and frustrated; or Howard Becker's Labeling Theory, which states that when an individual is tagged as bad, they begin to act out their label (Masters et al., 2011); or how being born into a low socioeconomic status (SES) family influences violence, like many believe—amongst tens of other theories.

The third aspect to the Positivist's School of Criminology is the psychological

aspect, and is perhaps most intriguing to many people. Something we cannot ignore is the psychology behind why the percentage of victims who later become victimizers is incredibly high. James Gilligan, a prison psychiatrist who has worked with the most violent of criminals, published his views in a book titled *Violence*, where he takes the reader on a journey through the minds of violent offenders. The theory of evil he puts forth is that only the living dead can kill the living, and that after a childhood or lifetime of torture, one literally becomes a living dead person. Only at that point can the individual intentionally cause emotional trauma, terrorize or target the helpless, prolong suffering and derive satisfaction from it, like forensic psychiatrist Michael Welner of the New York University School of Medicine had defined evil (Schechter, 2004). Gilligan writes, in *Violence*,

“In the course of my work with the most violent men in maximum security settings, not a day goes by that I do not hear reports—often confirmed by independent sources—of how these men were victimized during childhood. Physical violence, neglect, abandonment, rejection, sexual exploitation and violation occurred on a scale so extreme, so bizarre, and so frequent that one cannot fail to see that the men who occupy the extreme end of the continuum of violent behavior in adulthood occupied an equally extreme end of the continuum of violent child abuse earlier in life” (Gilligan, 1997, p. 45).

Gilligan writes about one inmate who was “deliberately locked by his parents in an empty icebox until he suffered brain damage from oxygen deprivation” (p. 46). Inmate Harold R., who was in prison for several brutal murders, had a fully scarred body with misshapen limbs. “His mother repeatedly assaulted him as a child—in his sleep, with an axe; by throwing him out a window; by setting him on fire; and so on” (p. 46). And Donald C., who committed suicide in prison, although not before describing “having been subjected in childhood to both heterosexual and homosexual incest and pedophilia by both parents and several other relatives... being passed around nude from adult to adult at parties as kind of a sexual party favor” (p. 47). Donald’s stories were corroborated by his brother, who was also in prison, after his suicide. Harold Schechter in his book, *The Serial Killer Files*, states that fourteen year old Jesse Pomeroy’s father liked to strip him naked and flog him half to death for the slightest infraction” (p. 252). The psychology here is that after a lifetime of abuse, the individual becomes so incredibly numb, they are as if dead and they continue the cycle of violence and evil. Although victims of child abuse have absolutely been statistically proven to have a predisposition for violence—almost all violent offenders have been victims of abuse; even they have not lost the power of choice over their actions. Yet there are countless individuals who were victims of trauma as horrible as what was just read and who do not grow up to be murderers and rapists.

A second important psychology aspect to the positivists we must dive into is mental illnesses. When an attorney pleads “not guilty by reason of insanity,” they are usually referring to the individual having a mental illness, and psychiatrists are called to the stand to testify. The *McNaughton Rule* we abide by in New York when pleading not guilty by reason of insanity requires proof that at the time the offense occurred the accused did not know what he was doing, or, even if he knew what he was doing, he did not understand that it was wrong (Masters et al., 2011). Essentially, the individual was not in control, and therefore did not have freedom of choice over their actions. The majority of individuals

suffering from mental illnesses are not proven to be more violent than healthy individuals at all. There is only a very small sliver of individuals suffering from mental illnesses who are heavily susceptible to show signs of violence. Those are the psychopaths and psychotics and let us define both.

Almost all known serial killers, for example, have been deemed psychopathic although technically, psychopaths are not legally insane. They do know the difference between right and wrong, and the scariest thing about them is that they actually seem so normal. Most are fairly intelligent and rational human beings. For example, Jeffrey Dahmer, one of the worst serial killers of all time, actually calmly spoke to the police regarding sending one of his escaped victims back to his house, where he then proceeded to slaughter him (Schechter, 2003). Psychopaths will perform their killings in hiding, proving that they do know what they are doing is wrong. The most alarming sign of a psychopath, is that underneath their “masks of sanity,” a term coined by psychologist Harvey Cleckely, they are absolutely incapable of love, of caring, of empathy, and of feeling sorry for anyone but themselves (Schechter, 2003). The psychopath takes pleasure in the pain of others (maybe the most chilling part of it all) and shows no sign of guilt or remorse. Psychopaths tend to exhibit traits even as children. Schechter writes, “While other little boys are daydreaming about scoring the winning run in a Little League game, or becoming a member of the X-Men, these budding psychopaths are already lost in all-consuming reveries of sadism and mass murder” (Schechter, 2003, p. 259). The psychopath knows the difference between right and wrong, and therefore does not fit the mold of legal insanity, but just does not care. Are psychopaths in control of not caring, or have they lost the power of choice over that?

In 2009, Carla Harenski of the MIND research network presented a study in which the psychopathic and non-psychopathic brains of prisoners were scanned while individuals were looking at pictures of different moral content. Some were simple pictures, while some alarmingly immoral, graphic, and disturbing. They were first asked to assess aloud how offensive the images were, and both the psychopathic and non-psychopathic inmates had the same responses, logically. This proves again that the psychopaths know when something is morally wrong. Their brain scans showed something very different though: when morally disturbing pictures were shown to the groups, the non-psychopathic brains showed activity in the ventromedial prefrontal cortex, the anterior temporal cortex, and the amygdala, whereas the psychopathic brains did not show a neurotransmitter activity increase in those areas (Hamman, S., Harenski, C., Kim, S., 2009). Although logically the psychopath may know right from wrong, the moral mind—what makes humans different from all other species—is thinned and damaged in their brains. How fitting then that even before the term “psychopath” was coined in 1981 by German psychologist Julius Koch, American Novelist Herman Melville called individuals of this profile as having “moral insanity” (Schechter, 2003). Although not legally insane, psychopaths may be the first group of individuals, after ones who have had accidents damage their moral minds, that, based upon their brains, may have lost the power of choice over their moral actions. This is even while having the ability to differentiate between right and wrong. Evil has been defined as performing horrific actions with the presence of a human moral mind.

Without the presence of a human moral mind then, the act may be evil, but the individual themselves cannot be deemed evil.

When someone is psychotic, they are suffering from psychosis. Psychosis means they are suffering from hallucinations and delusions; they see things that are not there, they hear voices, and they are engulfed by bizarre beliefs (Schechter, 2003). Unlike psychopaths, who seem outwardly normal, these individuals have completely lost touch with reality, both internally and externally. Herbert Mullen was a psychotic serial killer in the 20th century who heard voices telling him to burn his penis with a cigarette, and so he did. The voices got louder as the years went on, telling him to kill people to prevent an earthquake, and so he abided and did that too. Mullen had schizophrenia with psychosis, and ultimately brutally murdered thirteen random victims (Schechter, 2003). Most violent offenders who have been diagnosed as suffering from psychosis do their time in a psychiatric hospital and not a prison, as they do fit neatly in the McNaughton Rule of Insanity box. They have lost touch with reality and lost their ability to differentiate between right and wrong. They are not disregarding their human moral mind, but rather their mind is damaged. Individuals suffering from psychosis during the act of evil make up the second group of individuals who are not in control of their actions, and therefore cannot essentially be deemed evil.

As long as evil has existed, people have thought about its source, trying desperately to grasp something that can make the incomprehensible somewhat explainable and so maybe evil can be prevented in the future. The Classical School of Criminology and Positivist School of Criminology were studied at length, focusing mainly on whether individuals can be born evil, and if they can ever lose the freedom of choice over their actions. Research shows that individuals cannot be born evil, and that one's moral mind, favoring non-evil acts, lies in the amygdala, posterior cingulate, and medial prefrontal cortices. If the innate moral mind is disregarded by the individual, the one responsible for the act had freedom of choice over their actions, and can be called evil. If the innate moral mind is damaged in an individual, they have lost freedom of choice over their actions, and although the act is evil, they themselves cannot be deemed evil. One's moral mind—what makes an individual human—must be either disregarded or damaged before an inhumane act can be performed: that is the root of evil activity.

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# Confirming the Impact Origin of Terrestrial Meteorite Craters on Earth

## Criteria for Recognition in Large and Small Craters<sup>1</sup>

Layton Neil

### Abstract

Meteoritic impacts are devastating yet important for the evolution and growth of a planetary body. Understanding the importance of meteoritic impact cratering involves identifying and categorizing the origin of the craters found on the surface of the Earth. It is important to note that not every crater identified on Earth has its origin from an impact event; that is, some craters may result from terrestrial geologic activities such as both active and dormant volcanoes, and other plate tectonic movements. Due to the dynamism of the Earth, impact craters are usually not well preserved (with few exceptions, for example, the Barringer Crater in Flagstaff, Arizona), but are altered by natural processes such as weathering, erosion or burial while any remaining evidence of the projectile which formed them is also rapidly erased, since meteorites are unstable in Earth's atmosphere. With these natural problems, it was necessary to develop systemic criteria that could be used to identify the existence of an altered 'meteoritic' crater (French, Koeberl 2009). Craters resulting from an impact involve a projectile (i.e. meteor) travelling at tremendous velocities, impacting an area sometimes called the target area (or target rock), whereby the impactor transfers its energy to the target rock, resulting in the formation of a crater. As a result of shock energy being transferred to the impact area, the target rock experiences shock deformation, producing a range of petrographic features evident in impacted rocks that may ultimately be converted to impact melt. Recognition of these impact products is critical to unambiguous identification and confirmation of impact craters origin. For only the presence of shock metamorphic effects and in some cases the discovery of pieces or traces of the meteorite are generally accepted as an unambiguous evidence for an impact [crater] origin (French B, Koeberl C. 2009). As of 2009, about 175 impact craters or struc-

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<sup>1</sup> Completed under the mentorship of Prof. Kieren Howard for EPS 38: Introduction to Earth Science.

tures have been identified on Earth using criteria defined by French and Koeberl (French, Koeberl 2009). However, impact craters range in size from less than a kilometer to hundreds of kilometers, and deformation effects are expected to be proportional to the size of the impactor and velocity it is travelling- meaning diagnostic impact features are more rapidly formed in large craters. This can make it difficult to confirm the impact origin of small craters where these features may not be well developed thus new methods have to be tested and possibly implemented when studying some of these craters which will lead to recognition of more structures in the future. The purpose of this paper is to give an outline and explanation of the criteria used to identify and confirm the origin of the known impact craters, and to make possible suggestions as to 'newer' criteria that can be used to identify those impact structures that do not fit in the criteria already established. Close attention will be given especially to small craters likely to be the most under-represented in the geologic record.

## Introduction

Meteoritic impacts play a very important role in the dynamics and development of terrestrial planets. Impacts can shape, modify, and to some extent redefine the geological structure of a planetary body's surface (planets, natural satellites or 'moons', meteoroids, asteroids, and comets). For example, the surface of the Earth's satellite, otherwise called the moon, is covered with well preserved impact craters, which depicts the extent to which meteorite impact can alter the surface of a planetary body. Meteoritic impacts which are most often thought to be a medium of mass destruction and eradication (such as the extinction of the dinosaurs; at Chicxulub, Yucatan Peninsula Mexico. [Seeds and Backman 2011]), are in fact an essential component for the growth of planetary bodies. In the early solar system, collisions between meteoroids travelling at relatively the same speed led to a sticking process known as accretion (Seeds and Backman 2011), resulting in the growth of planets.

By definition, a crater is a circular geological feature on the surface of a planetary body which is either a result of an environmental geologic activity (such as volcanic craters formed by the plate tectonic movement), or as a result of an impact from a meteor (which is commonly known as an impact crater). During an impact event, the meteor is travelling through the atmosphere with incredible speed (termed hypervelocity and up to 20km/second) and kinetic energy (the energy a body has because of its motion), which is then instantaneously released onto the impact zone. In this sense meteorite impacts are in fact a very simple process where a large object hits a bigger object travelling at very high speed, and locally releases enormous amounts of energy instantaneously (French, Koeberl 2009). This energy is then 'used' in the excavation of the crater, shock metamorphism (changes in rock mineralogy) and shock deformation (shock wave features typically disrupting textures) of the target rocks. While the impact process can be viewed simply in the broadest terms, shock products are often complex and it is these that form the criteria for crater identification and the discussion that follows. In general, the greater the magnitude of the

impact and more coherent the structure of the target rocks, the more likely it is that there will be shock deformation, metamorphism, and the greater the size of the resulting crater. In practical terms this means that the established criteria used to identify and confirm the origin of a crater are much more easily applied to large structures. After describing mechanisms of cratering and the existing criterion for crater formation, the paper will specifically address the problem of confirming the impact origin of small craters in sedimentary rocks and outline why it is imperative that we improve our ability to recognize impact craters in geologic record.

### Impact Cratering

Historically, impact cratering was not viewed as an important aspect of geology by the scientific community, which is evident in the fact that there are not many geologic records with scientific analysis of such structures. Impact craters are geologic features that have the same circular appearance as volcanic craters, which in a sense explains the past lack of extensive scientific data about them, since they were typically assumed to be volcanic without further investigation. Further, because impact crater formation has never been observed by humans, its details have never been recorded. Bevan French, a scientist from the Smithsonian institute stated that the sudden release of the large amount of energy involved in an impact event is too great in quantity and of such magnitudes that it cannot be duplicated in a laboratory (French B, 1998). Scale modeling of the impact event is somewhat difficult to achieve because the cratering process is far more complex (French 1998) than what is physically observed, and thus would not accurately yield all the scientific anomalies that would occur during an impact event, therefore all knowledge of impact cratering mechanics is indirect, meaning that data are gathered from different theoretical and experimental studies (French 1998). Combining all these theories and experimental data will give a basic understanding of what happens during an impact as described below. However, since the event cannot be observed in a laboratory or naturally, then the empirical data that was derived cannot be stated with firm confidence that this is exactly what happens.

Impact cratering on a planetary scale is an important surface modifying process (French, Koeberl 2009), which means that an impact crater can offer a topographical diversity to a once flat and 'undesirable' area such as Meteor Crater in Arizona, which further diversifies the ecosystem that will once again colonize the impact area. With that said, the term "impact crater" is used in short for the term hypervelocity impact crater (French 1998), which, as the term denotes, is a structure formed by a projectile that is large and structurally coherent enough to travel through the atmosphere and strike the surface with tremendous amount of energy without ever slowing down. According to French and Koeberl, who are both scientists that study this phenomenon, typical large stony projectiles with diameters ranging from 0.5-10 kilometers, with masses between 10<sup>9</sup>-10<sup>16</sup> kilograms and geocentric velocity between 20-40 kilometer per second (kms-1), will have a resulting kinetic energy between 10<sup>15</sup>-10<sup>20</sup>J ( French et al. 1998). Thus, the size of the resulting crater is proportional to the size, speed, and energy of the projectile, which can be tested in a laboratory by using scale models with a different sized impactor travelling from different distances, which will vary the speed upon impact. Smaller projectiles, which are usually

less than a few meters in size, will lose most of their original velocity and resulting kinetic energy during passage through the atmosphere due to disintegration and ablation (French 1998), thus resulting in the formation of what is called a penetration crater or penetration funnel (French 1998). These types of craters can normally be found after a meteor shower event; see for example Sikhote-Alin (Russia) meteorite shower in 1947 (French 1998).

Depending on the amount of force and energy involved during the excavation of a crater, the resulting crater can either be simple or complex. Simple craters are bowl shaped and less than 5km in diameter on Earth. Impacts that release enough energy to make craters larger than 5km in diameter result in more complex craters that typically feature a prominent uplifted central peak.



**Fig. 1a.** Showing a complex crater with a central uplift- the Manicouagan Crater in Northern Canada, an estimated 200 million years old crater and 70km in diameter.



**Fig. 1b.** Showing a simple crater (bowl shaped), 1.13km in diameter- Pretoria Saltpan Crater.

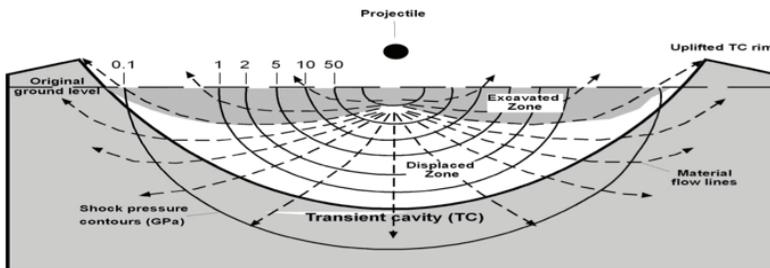
### Criteria for Confirming Impact Craters

It can be easily assumed that the presence of fragments of the impactor would be preserved in or around the crater after collision, making recognizing impact easy, but this is unfortunately not the case with few exceptions. During the impact event the projectile is also subjected to a tremendous amount of pressure ( $>100\text{GPa}$ ) along with extreme heat that causes it to melt and vaporize completely (French B, Koeberl C 2009). As such, there are rarely any recovered fragments, and even if there were, the period of time that a meteorite can survive on the Earth's surface, even if it is made of iron metal, is only a few hun-

dred thousand years. This means that if the crater has been there longer (>few hundred thousand years) weathering effects will likely be sufficient to completely erase any evidence of the impactor, which is why searching for preserved fragments to use as evidence for a crater origin is a hopeful but futile effort. This leaves evidence for shock effects or a trace chemical signature of the impactor as the only means to confirm the impact origin of a crater (French, Koeberl 2009).

### Shock Effects (Deformation and Metamorphism)

During an impact event, the tremendous amount of force and energy that is involved is sometimes on the order of magnitude with that of an erupting volcano, for example the eruption of the Tambora volcano, in Indonesia in 1815, had an energy index of 1020J (French, Koeberl 2009). That amount of energy released at a single point of contact during an impact, plus the amount of force and pressure at the same point are enough to cause changes in the mineralogical structures of the target rock or impact zone. Shock metamorphism, as defined by French, is all changes that occur in minerals resulting from the passing of shock waves at extremely intense pressures (French et al 2009). Sure enough, it follows that just as the ripples on the surface of water decrease in intensity with distance, the same effect occurs as the shock wave travels away from the point of contact, which explains the difference in shock effects as the distance increases. For instance, the initial pressure near the impact point can very well exceed >100GPa (depending on the size of the impactor) and decrease to pressures <10GPa as distances increase. Induced shock effects systematically vary with increasing shock energies and, in rock samples, are observed at a multitude of scales from microscopic fractures in mineral grains to macroscopic brecciated rock fabrics and shatter cones.



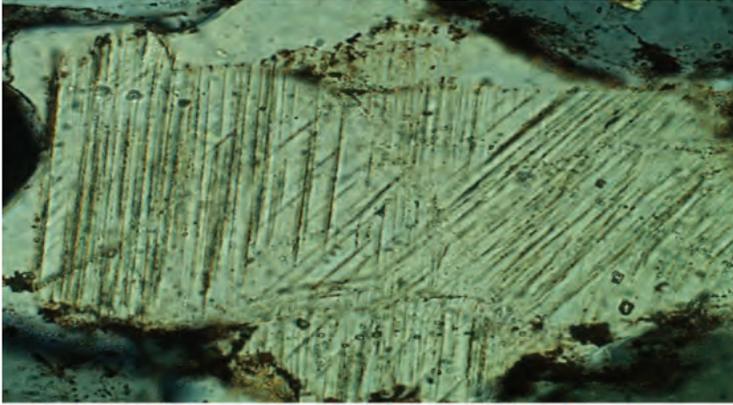
**Fig. 2.** Showing the shock wave passing through the target rock from the impact point. Shock wave intensity decreases with increase distance from point of contact.

## Microscopic Shock Effects

Microscopic effects as the term denotes are deformation features that are too small to be seen with an unaided eye. Thus microscopes have to be used in diagnostic phase analysis. These microscopic fractures are best observed in quartz grains mainly. The value of quartz as a geologic shock wave indicator stated by French, is not only due to its abundance (quartz is the most abundance mineral at Earth's surface) and durability, but also its tendency to develop a range of unique deformation features over a range of shock pressures (French, Koeberl 2009). Shock waves that emanate from an impact alter the mineralogical structure of the grains progressively, first forming planar fractures in quartz grains. These fractures do not cross grain boundaries and are usually 0.5-5mm long, depending on the size of the host grain (French, Koeberl 2009). Due to the fact that shock waves travel in a certain direction, the planar fractures that appear in the quartz grains are oriented in the direction the wave travels. Planar fractures are produced by shock waves that are <10GPa, these are pressure within the range of those produced by natural tectonic processes such that it can be argued tectonic forces might also produce planar fractures. However, low-pressure laboratory experiments were carried out which concluded that planar fractures from these low pressures could be a criterion for demonstrating the impact origin of craters.

Planar deformation features, PDFs, are the most diagnostic microscopic indicators of impact shock. PDFs consist of multiple sets of thin parallel closely spaced planes that cover the entire width of individual quartz grains (French, Koeberl 2009). Often PDFs exist in 2-3 distinct orientations. Experimental data indicates that PDF could suggest that they form at a higher shock pressure >10GPa that only impact may produce, meaning their presence is diagnostic of an impact origin. These fractures, PF's and PDF's, are used as important criteria even if the quartz grain gets filled in by fluid inclusions from geologic activities such as hydrothermal activity or sedimentation processes. The durable grains can be etched with acid to remove the unwanted materials and analyzed for deformation features. This is more complicated than it seems, because natural quartz exhibits a variety of planar and quasi-planar deformation features that are formed under normal endogenic geological conditions (French, Koeberl 2009). It is essential to be able to successfully distinguish between the natural deformation and shock deformation features in the quartz grain.

During an impact event, the target rocks are experiencing tremendous pressure and energy, which in turns causes the temperature in the area to rise exponentially. This increase in temperature is well above the melting points of the minerals in the target rocks, in any given impact, large or small, a significant temperature increase (post shock) >1500 °C which is sufficient to melt and decompose minerals (French, Koeberl 2009). Impact melts can hold some distinct features that indicate extreme temperatures and pressures, for example lechatelierite, or silica gels found in melted rocks [quartz grains] indicate that temperature  $\geq 1750$  °C well above the normal near-surface geologic process (French, Koeberl 2009). The presence of melt and these high temperature mineral phases is therefore also conclusive evidence that the crater in question is of an impact origin.



**Fig. 3a.** Showing Planar Deformation Fractures sets in quartz from Foelsche Crater in the Northern Territory of Australia.



**Fig. 3b.** Showing high temperature mineral phase (lechatelierite or silica gels) in impact glass with polarized light microscope.

### Macroscopic Deformation

There are several macro scale deformation features that can be found at an impact site that was formed as a result of an impact, most prominently a range of breccias. However, since breccias can also be formed by other natural geologic processes on Earth, these are ruled out as evidence for impact origin unless they contain impact melt or mineral grains bearing PDF sets. There is, however, a distinct macro feature that is used as evidence for impact origin, but it depends on the location at which it was found. That feature is known as a shatter cone. Shatter cones are distinctive conical fracturing patterns in a target rock that are formed at low shock pressures (French 1998 ch.4). Conical features can be formed by other natural processes such as wind abrasion, in which rock surfaces are exposed to constant bombardment of fine particles in the wind that wears or deforms (like sandpaper) the surface in a unidirectional, conical pattern. On the contrary, shock-shatter cones are not only surface features but a deformation that is throughout the entire rock structure, which is why this deformation feature can be used to confirm a crater origin.

## Meteoritic Chemical Signatures

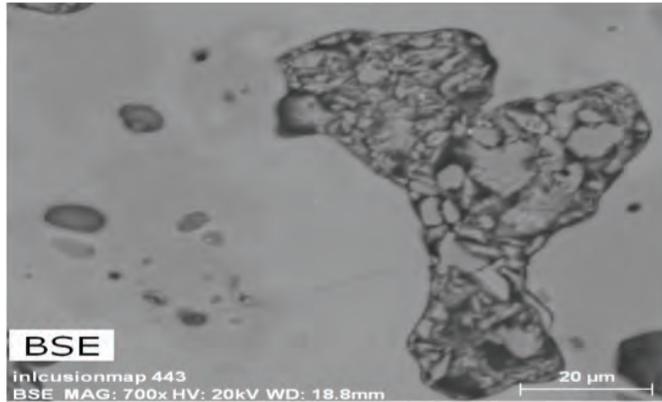
It is important to remember that meteors are fragments of the building blocks of planets that did not accrete and melt during planet formation, and are therefore left to form the asteroid belt (origin of most meteorites). Meteorites can leave a detectable chemical signature during an impact because even though terrestrial planets (e.g. Earth) were formed from the same meteorite components, the meteorites preserve a chemical and isotopic signature that allows identification of their contributions to impact melt rocks. This situation arises since, once accreted the larger planet sized bodies undergo a process called differentiation in which melting causes certain siderophile elements (for example, Platinum Group Elements, PGE, such as iridium and cobalt) to move towards the center of the planet bound to metallic phases, meaning left over asteroids that didn't differentiate preserve a primitive composition enriched in PGE's relative to the rocks on terrestrial planets. During an impact, the projectile is vaporized and mixed with the large volume of terrestrial debris or ejecta (French, Koeberl 2009), thus leaving trace chemical signatures of the impactor in the form of PGE's. One typical example in which a PGE was used to confirm the origin of a crater is the Chicxulub crater in Mexico, where the abundance of iridium typically found in meteorites was discovered in a layer of the rock in and around the crater. Despite the potential for REE chemical signatures to establish the origin of a possible crater, the actual analytical process that this entails is often too complex to be practical, a fact not often appreciated (French, Koeberl 2009).

### Possible New Criteria for Establishing Crater Origin

These shock metamorphic products are the features that scientists used to determine the origin of known craters on Earth (approx. 175 established craters) that have survived erosion and other natural geologic processes. However, confirming the origin of small craters is often difficult to do especially since there is often a lack of shock metamorphic effects (Koeberl et al 1998). For small impacts the resulting energies may be so low as to result only in an incipient evidence for shock effects (for example planar fractures, PFs) that may be easily erased by natural processes. For example, the Auelloul crater in Mauritania, Africa showed evidence of natural healing in which the deformation veins were slightly erased by fluid inclusion trails (Koeberl et al 1998). This is an illustration of why using the shock effect criteria will not work for all craters. Especially for small craters that are found in sedimentary regions. A rarity of shock evidence in rock minerals is a common problem (Koeberl et al 1998). One such crater is the Darwin crater in Tasmania, Australia. Darwin crater is a simple crater in sedimentary rock, in which no diagnostic shock effects have been discovered (Howard, Haines 2007). In order to confirm the impact origin of craters like these, other criteria and approaches may be needed.

By using the "un-established" Darwin crater as an example, it can be seen that even with the lack of shock diagnostic effects at the crater site there is a possible way to link such a crater to an impact event. By carefully analyzing the impact glasses produced at the Darwin crater, fragments of the target rocks, a few microns in size, have been found embedded in these glasses. It is important to remember that during an impact, once the projectile hits the ground and releases its energy, the target area is instantly fragmented

and vaporized; at this point as molten ejecta moves through the air and cools, micrometer sized fragments of target rock that were not molten could become encapsulated in orbs found in the glass. These orbs or “bubbles” found in the glass as shown in Figure 3, act as an insulator and preserver for these rock fragments. By matching the mineralogy and composition of the rock in and around the impact site, and the rock fragments that are found in the glass, it could be possible to link the glass to the crater and confirm its origin: this work is underway.



**Fig. 4.** Image showing thin section with fragments of original target rocks from Darwin crater, Tasmania, Australia embedded in the impact glass.

### Reason for Identifying Impact Structures

Establishing the origin of craters identified on the surface of the Earth is not only an important aspect of geologic (geophysical) science, it is also important in regards to the economic value that some of these structures hold. Impact cratering is a process that involves tremendous pressure and extremely high temperatures which can trigger mineralization processes in the target (rocks) area that may hold significant economic values (Reimold et al 2005). Some of these economically valued resources could have been pre-impact and were excavated during the cratering process or may owe their existence directly to the impact process. In these cases they are called “syngenetic minerals” (Reimold et al 2005). These resources offer lucrative business ventures for the country in which they are found, yielding billions of dollars per year from mining and extracting these resources. For instance, the Cu-Ni and PGEs ore bodies at the Sudbury structure have a current value of US\$1.5-2 billion per annum (Reimold et al 2005), and this is but one of the many structures that offer enriched ores and significant economic value. For example here are some other craters and the types of economic value they possess: Kara- impact diamonds (Russia), Cloud Creek- hydrocarbons (Wyoming USA), Chicxulub – hydrocarbons and impact diamonds (Mexico), Meteor Crater- silica and Museum (Arizona USA) (Reimold et al 2005). The list goes on as many different craters in different parts on the world offer different economic interests.

Not all craters offer any economic resources especially small simple craters. These

craters however offer scientific knowledge about the bombardment history of the Earth and may offer insight as to the frequency or periodicity of these impacts and the broader significance of impacts on Earth's history.

### Conclusion

Confirming the origin of terrestrial craters is based on established criteria that are notably observed and a common occurrence at impact structures. However, these criteria are usually more easily seen in large craters which involved a greater magnitude of energy and pressure than that of smaller craters which usually involves less energy and pressure resulting from a smaller size of the projectile. This can make identification of small craters very difficult and therefore, it is imperative that newer criteria are sought to confirm crater origins. Improved recognition of craters will provide a greater understanding of the frequency and significance of impacts in Earth's past and future evolution. Undoubtedly, an impact of such a magnitude that it forms large craters would prove to be catastrophic if it were to happen in the presence of humanity, identifying and studying more impact craters will yield valuable knowledge that may somehow protect "us" from future impact events.

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# Taming the Sugar Beast<sup>1</sup>

La Vaughn Peniston

## Abstract

In the United States of America, approximately 12.6% of non-Hispanic Blacks have diabetes mellitus and 51% are obese. Growing up on an island where walking is the main mode of transportation, and physical activity was always done for fun, I did not predict a future with type-2 diabetes mellitus. This case study is in an attempt to return to my pre-diabetic weight in order to prove that type-2 diabetes can be controlled at this point. I have dieted and exercised and failed at meeting my goal, but I am not a failure. I am more equipped to tackle this situation in the future and hopefully will fight the “sugar beast” and win.

“Lifestyle modification, including both healthy eating choices and increased physical activity, is essential for weight management and diabetes prevention” (Garber 2012). I have news for you; I am obese and I have type-2 diabetes mellitus. Is it now possible to tame the “sugar beast”? Taber’s Cyclopedic Medical Dictionary explicitly defines diabetes mellitus (DM), often referred to as diabetes, as a chronic metabolic disorder which results either from failure of the pancreas to produce insulin (type-1 DM), or from insulin resistance, with inadequate insulin secretion to sustain normal metabolism (type-2 DM). It is marked by hyperglycemia or high glucose levels in the blood and is symptomatic often with frequent urination (polyuria), excessive thirst (polydipsia), and increased food consumption (polyphagia). Type-1 DM usually occurs in children, while Type-2 DM occurs mostly in the obese population and in middle-aged people with sedentary lifestyles. Diabetes mellitus presents a slew of complications including damage to the blood vessels, nerves, kidneys, and retina, which often times results in coronary and peripheral vascular disease, peripheral and autonomic neuropathies, amputations, end-stage renal failure, and blindness respectively.

Knowing that the consequences of having diabetes mellitus can be fatal, I have

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<sup>1</sup> Completed under the mentorship of Prof. M. Vanderbeek for NUR 21: Nursing the Ill Adult I.

decided to embark on a journey to see the effects of the disease if I attain my pre-diabetic weight. “Weight reduction is usually accomplished by a combination of reduced calorie intake and increased physical activity. Insulin sensitivity is reported to improve within a few days of lowered calorie intake, even before the patient loses a measurable amount of weight” (Frey, R., 2011). Although I know this is a difficult task to accomplish, I endeavor to do my best despite whatever challenges that I may encounter. This is an important journey in my life. I would like to break the cycle of diabetes mellitus in my family by ensuring that in the future my children would know how to make better decisions about their health. I believe that when I was a child, if I had one stern parent who would not have permitted me to have an extra slice of cake or three scoops of ice cream, that today I would not be in this situation of having a chronic illness that slowly damages the body organs. Conversely, I was afforded a good education, which taught me health education and nutrition and I still ended up in this predicament.

### Case Study

I am La Vaughn Peniston, a 36-year-old Afro-Caribbean female, and I have diabetes mellitus (type 2) for the past six years. I have a medical and family history of DM (type 2), hypertension or high blood pressure, and hyperlipidemia better known as high cholesterol. I am 5 feet 7 inches (67 inches) and weigh 115 kilograms (252 pounds), with a body mass index (BMI) of 40. My body circumference measurements are: bust/chest, 48; waist, 52; and hips, 46. My abnormal laboratory values from September 4, 2013 are: High density lipoprotein (HDL), 38 (normal range: > 40); hemoglobin A1C, 10.4 (normal range: 4.2 – 5.7); blood glucose level, 276 (normal range: 65 – 99). Diabetic medications: metformin (Glucophage) 1000mg, twice daily; glipizide (Glucotrol) 10mg, twice daily; sitagliptin (Januvia) 100mg, once daily; Hypertension medications: chlorthalidone (Thalitone) 25mg, once daily, Aspirin 81mg, once daily; and cholesterol medication: simvastatin (Zocor) 40mg, once daily. I do not smoke, nor do I consume alcohol. My physical activity is limited mainly to commuting to and from Kingsborough Community College, CUNY via the city transit system.

Over the period of two months, I will attempt to lose at least 30 pounds, which will exceed my pre-diabetic weight (225 pounds) to 223 pounds. If this fails, I will try to lose approximately 25 pounds, which will be 10 per cent of my total weight bringing me to 228 pounds. “In recent years, researchers have found that even a modest weight loss — usually defined as 10 percent of the patient’s pretreatment weight — is enough to control or at least improve insulin resistance and other health complications of obesity” (Frey, R., 2011).

I will make lifestyle changes and consume a healthier, well-balanced diet in smaller portions, and increase my physical activity. I will omit direct sugar, fruit juices, soda, and fast foods while increasing my intake of vegetables, water, whole grains, and fruits. I will also keep a journal of my exercise, menus, and glucose monitoring during this time, and also about my emotional state and will give a month’s report on my progress. I

am somewhat apprehensive, because actively trying to lose weight is not as easy as thinking about losing weight. Many people have failed in this endeavor and even when there is a success story, many times there is a significant weight increase afterward — especially when it is a diet and not a lifestyle change. I also worry about not having a partner to accompany me on this journey. I think when it comes to weight reduction it is always better to have someone to be an encouragement and a motivation.

Several years ago on a doctor's visit, I was told to consider an easier way of losing weight, such as the laparoscopic adjustable gastric banding, also called the lap band. This surgery takes a part of the upper stomach and places a band around it to reduce the size resulting in a smaller pocket for the food and limits your food intake.

Long-term observational studies have shown considerable improvements in glycemic control, as well as improvements in associated cardiovascular risk factors and a reduced risk of cardiovascular disease, among patients who have undergone bariatric surgery (laparoscopic adjustable gastric banding or Roux-en-Y gastric bypass), as compared with obese patients who have not undergone surgery. Benefits have been noted particularly among very obese persons with a shorter duration of type 2 diabetes and in association with procedures that limit the absorptive surface (bypass surgery). (Ismail-Beigi, F., 2012)

However, when I contemplated this option, I realized that I did not want to deal with side effects of the lap band surgery, such as acid reflux, inflammation of the stomach lining, vomiting due to overeating, and even malnutrition because I may not get adequate nutrients based on my portion sizes. I would have to eat regular, small meals and that is quite difficult, especially with the hassle of school — I often consume large, infrequent, and rarely healthy foods, although I enjoy it. I hardly ever prepare my own meals because I do not enjoy cooking and rely on my mother for meal preparations. I am of a West Indian background and my calorie intake comes mainly from carbohydrates: ground provisions such as potato, eddoes, tannia, yam; and breadfruit, homemade breads, cake, fritters, doughboy, and fried dumplings (names may vary in the U.S.); it is a struggle to resist the temptations of these delicious foods especially when my mother constantly prepares them in enticing dishes and quantities. It takes someone with discipline and tolerance to overcome this challenge that is set before me.

Another suggestion made by my primary doctor was that if I lose my belly fat, which is a significant amount, and return to the weight that I was before becoming a diabetic, I would be able to control my diabetes and possibly be rid of the disease. I was skeptical of this information; I wondered how one could get rid of diabetes? Would I be able to have the same eating habits as I did back then? Is my pancreas going to produce more insulin if the fat is decreased? I recently read an article on CNN.com regarding Actor Tom Hanks revealing during an interview on the David Letterman Show that he has type-2 diabetes mellitus. He also stated on that interview that his doctor told him if he can return to the weight that he was in high school it would assist him in controlling his diabetes. Mr. Hanks said that his response to the doctor was, "Well I'm gonna have type-2 diabetes." He went on to say that there was no way he was going to weigh what he did in high school because at that time he weighed 96 pounds. It is nearly impossible for him to lose that much weight, especially at the age of 57, when it is harder to adjust to a new way

of life. That is pretty disheartening news to learn that one has to lose approximately half their total body weight in order to control this disease. I was never told that I have to lose that much weight, but I know that I am obese and losing at least one hundred pounds would place me in a healthy weight range and definitely give me the control I need to beat this carbohydrate-hating disease.

On a different occasion, my endocrinologist proposed that I find a hypnotist or even an anonymous group for overeaters. I laughed at this internally and filed it in one of the many drawers in the back of my brain. I can admit that I have an unhealthy relationship with food. I am an emotional eater and I do love food; sometimes I am on a “see-food” diet, meaning whenever I see foods that I love to indulge in, mainly sweets, I eat. This has always been that way, but as I get older my physical activity has greatly decreased. Living in the West Indies encouraged being outdoors. The climate is conducive to outdoor activities all year round, whether it is bike riding, hiking, walking, and playing various sports, including swimming. Having migrated 13 years ago, my lifestyle became more inactive especially within the colder months. I tend to hibernate when I do not have pressing assignments outside of the comfort of my home; in other words, I have become a “couch potato”. Television has become one of my greatest companions, and the new world of cable has grasped me at the hands with the remote to my 46-inch smart TV. I often eat while engaging with this “buddy” because I enjoy my food better. A nutritionist once said to me that this encourages overeating, and I have observed this over time. My life has been a roller coaster throughout the years. The comfort that I receive from food, especially the spicy, finger-licking fried chicken from Popeye’s or the mouth-watering Angus beef burger and fries from McDonald’s, have felt like a pick-me-up on the days when life has thrown me lemons and I was too lazy to shop for ingredients to make a lemon pie.

I know that psychologically I have to deal with these issues, but is hypnosis the answer? Sometimes I question if there is a deeper issue than just dealing with day-to-day stress that make me rely on food as a coping mechanism, and when has this really started? I know with dedication I am able to achieve this, but so far not so good. I joined Weight Watchers but cannot afford it anymore, and I was not a member long enough to adapt the habits of a lifestyle change. The meetings were inspiring because it was not just a TV advertisement showing weight loss, but these people became real to me. They motivated me to lose weight and even on days when I lost one pound I knew that I was not alone and I had a group a people cheering me on. However, this was almost a decade ago and now that I have full-time college work, and no frequent income, I cannot be a member of weight watchers or any similar program geared towards weight loss. This is why I have decided to embark on this journey all by myself. I think I have gathered adequate information through the years to make wise decisions about my food and exercise regimen. I have this honor’s contract as a motivator because I want to show results, along with a still, small voice in my head saying, “You can do it; anything is possible.”

I started out on this journey by first limiting my portion sizes to the size of a fist. My lunch and dinners consist of vegetables, mainly steamed because it is my preference. I tried my best to have complex carbohydrates instead of simple ones as they yield more roughage within my diet; for example, my breakfast would be 1 cup of oatmeal, which has

4 grams of dietary fiber instead of 1 gram of dietary fiber given with 1 cup of corn flakes. Foods rich in fiber have fewer calories and they tend to provide a sense of satiety faster and for longer periods. This also means that less food will be consumed and snacking will be limited. The consumption of a high fiber breakfast usually paved the way for eating healthy throughout the day because I felt pleased about my first choice of food for the day and it encouraged me to continue making wise food decisions all day long.

An example of a day's meal plan is as follows:

**Breakfast:**

1-cup oatmeal with 2% milk (approximately 54 grams)

**Snack:**

4 strawberries (approximately 30 grams)

**Lunch:**

1 small bowl of vegetable soup (unsure)

**Snack:**

10 almonds (approximately 3 grams)

**Dinner:**

1 McDonald's Premium Southwest Salad with Grilled Chicken  
(approximately 28 grams)

**Snack:**

1 Glucerna Chocolate Peanut Mini Nutrition Bar (approximately 10 grams)

According to the American Diabetes Association's website, carbohydrate counting is a way of keeping track of the amount of carbohydrate intake to help in managing diabetes mellitus. Doing this prevents major blood glucose spikes during the day and the levels can be within goal range. My goal, as suggested by the website was 45-60 grams per meal (270-360 grams per day). I spaced my meals, including snacks about two hours apart to keep my metabolic rate at a higher pace than usual (an increased metabolism equals weight loss).

It is important to keep track of the foods that you eat so that it is readily available for carbohydrate counting and as a tool for seeing what foods were eaten during the day and what the blood sugar level was at those postprandial times or two hours after meals. Monitoring blood glucose levels at home is very essential to controlling diabetes mellitus and is usually specified by a doctor when they should be taken. Personally, I think that a diabetic should be compliant with the checking of blood glucose as with their diabetic medication. A normal blood glucose level is 70-110 mg/dL and I tried my very best to stay within that range for faster test results and below 200 mg/dL for a postprandial result. I have not always achieved this goal because I may have an emotional day and partake of

another slice of whole wheat bread with whatever I am pairing it with, which leads to an undesirable blood glucose level.

My greatest struggle was incorporating physical activity with my diet. As long as I planned ahead what my meals were going to be for each day, and prepared a majority of those in advance, I knew that changing the way I ate would be successful. But increasing my physical activity meant that I had to subtract from my free time, from things that I enjoyed doing, to sweat and ache, which I was reluctant to do. The first morning I went out to the neighboring park, I was definitely not motivated. The sight of people walking in and around the park seemingly happy did not inspire me; neither did the trees and the cool weather cheer me on. My spirit fought within me as I began to feel a burning sensation in the muscles of my thighs, but I stuck it out as I felt that I would have been a failure. I remembered the days as a teenager waking up daily in the early morning hours and putting on my only pair of tights to walk a mile up a winding road and jogging it all the way back down. In those days exercise felt like an accomplishment, but these days it feels like labor. My exercise regimen for a week was comprised of walking, stair-climbing, and light weight lifting. They were not difficult to execute; however, they did not bring a sense of satisfaction.

At the park I would see others playing tennis or racquetball and even basketball, which appeared to be enjoyable. Not only did I view a durable tennis racquet as unaffordable, but also I did not have a partner. Had I given it some thought and planned in advance, I would have solicited someone to accompany me on this journey; this led to my failure. I could not help but think of my life and all the poor decisions I have made. I thought about being 36-years-old and not having a partner who would be my best friend; pushing me along this journey, encouraging me when I feel down, and applauding my accomplishments. After three weeks on that journey, I compromised with the tempting voice and had fast food. This led to less physical activity and more fast food, and before I knew it I was back to square one.

There were also stressful situations, including school that provided that outlet of not preparing foods at home and eating out more, choosing fast food to satisfy my hunger. There were times I wished that this was not an option. I began to wonder if there were fast food restaurants in rich neighborhoods and how many rich people, other than Tom Hanks, have type-2 diabetes mellitus. Why is type-2 diabetes mellitus prevalent in the African-American community? The American Diabetes Association posted on their website the statistics of a 2007-2009 national survey of people by race or ethnicity diagnosed with type-2 diabetes and aged 20 years or older. In ascending order non-Hispanic whites, 7.1%; Asian Americans, 8.4%; Hispanics, 11.8%; and non-Hispanic Blacks, 12.6%. Are these statistics proving that African-Americans are underprivileged and work twice as hard to make a living, or after being fatigued from working two jobs that fast food or unhealthy, cheap choices are what are available? What percentage of these groups have inherited diabetes and how many have developed it from obesity and lack of exercise? In a 2006-2008 national survey among Blacks, whites, and Hispanics, the Centers for Disease Control and Prevention reported that “compared to whites, Blacks had 51% higher and Hispanics had 21% higher obesity rates.” I can only assume that there is a direct correla-

tion between obesity and type-2 diabetes mellitus in the African-American community. I do not whole-heartedly blame the accessibility of unhealthy foods and the inaccessibility of healthy organic fruits and vegetables as the only cause of type-2 diabetes epidemic within the black community, but I am also taking responsibility in failing to prove that everything is possible and attainable as long as there are resources, dedication, and discipline. I have failed on this task and I remain with the question, “can type-2 diabetes mellitus be controlled upon attaining your pre-diabetic weight although being overweight/obese?” However, failing a task does not define me as a failure. I am not a failure. I have made strides because I lost nine pounds for a total of 243 pounds, two inches from my previous measurements, and my previously 10.4% hemoglobin A1C level is now 9.4%. I have identified my weaknesses and now I am better armed with the knowledge to go forth and continue to my efforts in fighting the “sugar beast”, type-2 diabetes mellitus.

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# Neo Rauch

## A Transmitter of Social Modernism<sup>1</sup>

Alex Royt

It is not uncommon for us to imagine artistic expression being trampled under the boot of political dominion, without any way of expressing its captivity. Osip Mandelstam's infamous poem *Stalin Epigram* serves as an acute example: written in 1934 after having witnessed the effects of the famine in Southern Ukraine, the text purportedly landed the poet in prison several years later during the Great Purges in the Soviet Union, where he ultimately perished:

We exist in a country grown unreal and strange;  
No one ten steps away hears the talk we exchange.  
But when chances for half-conversations appear,  
We will never omit the Kremlin mountaineer.  
(Mandelstam, trans Maing-Delic, 448)

There are those artists, like Mandelstam, who remain articulate in an atmosphere of total subjugation. Arno Breker, a sculptor admired by Adolf Hitler and several leaders of the Nazi Party, was a notable case of a talented individual being in the right place at the wrong time. Having accepted the patronage of the Nazi regime, like the filmmaker Leni Riefenstahl, would forever taint his works in the public's eye.

In the case of the contemporary artist Neo Rauch (1960- ), we are witnessing an artist attaining his most prominent status and viewership in open society, but with works exhibiting creative tendencies that are derived from an experience of having once lived in an atmosphere of pressure, control, and stagnation. Born in Leipzig, East Germany in 1960, Rauch's work is characterized by figures of various time periods being pushed against backdrops of totalizing systems where they inhabit uncontrollable surreal landscapes. Bernhart Schwenk and Hans-Werner Schmidt, author and editor of a recent book of Rauch's collected works that were exhibited in Leipzig and Munich in early 2010, noted

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<sup>1</sup> Completed under the mentorship of Prof. Caterina Pierre

that “ultimately, it remains obscure which goals the figures pursue, and we can see them as being closely related to robotic beings or toy figurines” (Schmidt, Schrenk 4). The automation of bodies, the sense of direction and oppression of movement mirroring toy poses, may point to Rauch’s interest in recognizing the ways in which people become figurines in plays of power and control.

In Rauch’s work, we see the expression of a freed perception that carries the Mandalstam motto of the “unreal and strange,” brought out of the confined East Germany where Neo Rauch grew up. Rauch, who studied at the Academy of Visual Arts Leipzig, exhibits an agglomeration of styles that can be anything from popular culture to academic experimentation. Arthur Ludow, in an article for the *New York Times* in 2006, calls to attention Rauch’s formative years, growing up in a time when he “was young enough to absorb the imagery of comic books, television and computer graphics that shaped the stylistic tastes of his generation” (Ludow web). While his formal, artistic education provided him with access to American and European abstract paintings from the 1950s, Rauch recalls being unable to see these works “except in ‘shabby black-and-white reproductions’” (ibid web).

But the influence of Socialist Realism and Leipzig painters may only reveal half of Rauch’s foundations as an artist. Retaining the fanatical spectacles and forms of Socialist Realism painting, taking influence from Leipzig artists, acquiring the expressive nature of 1950’s abstract expressionism, and incorporating the comics and television programs of his adolescence, we see motifs in Rauch’s work that cannot refrain from breaking apart, having embedded within them a sense of tearing and replacing, the canvas like a wall bombarded with oil graffiti. We sense that we might be falling into a dream, where the real and the unreal are tearing at each other.

Painting, as a medium that can give discourse to idea and fantasy, comes into question throughout Rauch’s work, who is “interested in both the genesis of paintings as well as their public reputation within the context that . . . is ought to be described more aptly as the ‘operating system art’” (ibid 7). This notion of system/painter discourse is a prominent one that we shall return to.

The link between Rauch’s art and Socialist Realism requires at least a brief sketch as to the way art was appropriated in totalitarian states, and what constituted the rise of the aesthetic known as Socialist Realism, which allows us to better gauge how much of this aesthetic factors into Rauch’s paintings. Historian Igor Golomstock has explained that on the most basic level, dictatorial states employ art as a tool to express and manifest their ideologies. He writes, “In totalitarian systems art performs the function of transforming the raw material of dry ideology into the fuel for images and myths” (Golomstock, xi). Such things as the mythical might of the people or the greatness of a leader are formulations with no home. They are not a concern of the public until art is used to propagandize them, imbed them into the public consciousness as the essential pronouncement of a states’ right to rule. Paintings like Aleksandr Gerasimov’s *Lenin on the Tribune* (fig.1) project private political mythology onto the public sphere, and this becomes the primary relation of art to any ruling regime: to entertain the ideology of the state and make it a part of the society’s structure.

On a more subconscious level, totalitarian art is useful to the manufacture of history where it otherwise is not found, with personified, idealistic scenes that can provide empathy to the public in their daily struggles under such regimes. In the unattributed painting *Mao with Peasants in Kwangtung* (fig.2), we see Mao Zedong and a group of field workers/townsfolk walking on a path, smiling at the harvest and that prosperity which is promised with a Communist future. Whether this particular moment happened or not is unimportant, but that it provides the people with an ideal that they must follow by evoking a mythology of events that may or may not have happened, allows those in power to consolidate their position with a self-referential recreation of history possible through art. The walking troop display a type of unity that is perversely isolated, where only a certain persona is allowed to the scene of history being remade and thereby elevating a fabrication to the status of real.

The origin of the Socialist Realist style that would come to concern Neo Rauch's work specifically lies in immediate cultural developments of Russia following the tumultuous end of the First World War. KOMFUT (Communist- Futurists) were the emergent group of artists that are associated with setting the foundations for Socialist Realism in painting and architecture. The groups 'Programme Declaration', published in late January 1919, states that "all forms of life, morality, philosophy, and art must be re-created according to Communist principles. Without this, the subsequent development of the Communist Revolution is impossible" (Harrison, Wood 333). Mending the vanguard revolutionary zeal of Bolshevism with the bold modernist push of Italian Futurism, the group proclaimed a manifestation of their art and imprint of their world view on the changing society around them. Communism to members of KOMFUT seemed to be the logical ascendant to that radical art which had come in the period before and during the war. KOMFUT members were not altogether interested in the Communist ideology as an end in itself, but as a means to an end. Having strong avant-garde roots, KOMFUT retained a creative individuality which they hoped would flower with the outcome of successful revolution, where everyone would be able to do according to their means. This is echoed in the Declaration, with such sayings like, "It is essential to start creating our own Communist ideology" (ibid 333), and "It is essential to summon the masses to creative activity" (ibid 333).

The Futurists, having occupied all the top positions in art schools, departments, and workshops in the early 1920s, proceeded to establish themselves in the climate of revolution. Golomstock writes how that system of government sponsored projects "(Narkompros, IZO, INKHuk, VkhUTEMAS) completely dominated the whole field" (Golomstock 14). Everything from ideology to administration of art was now at the disposal of the revolutionary Futurists. All other art was deemed "left art," distinguished clearly from the avant-garde, and was seen as counter revolutionary, leading many artists such as Mark Chagall and Wassily Kandinsky to leave Russia for good (ibid 20).

The ideal of a liberated creativity flourishing in the revolutionary clime of mass action, held by KOMFUT members and affiliates, would be betrayed in favor of a thrall under the Stalinist Regime. By the 1930s, the art of the Modernists was being bulldozed in the Third Reich and USSR, replaced with totalitarian models of artistic expression that

were largely indebted to the progressive services and manifestos of those same Modernists. Totalitarianism had applied an unquestionable egalitarianism on the creation and production of art in the sense that nothing could deviate from the course placed by the regimes in power. Golomstock underlines the key irony of this development. The Russian Futurists, before becoming the enemies of the state, were the preachers who first proclaimed this “ideological doctrine as uniquely true and universally obligatory.” (ibid 21). In a remarkable way, their artistic ideals were appropriated and used to manufacture a totalitarian aesthetic of art. Instead of being the vanguard revolutionaries spearheading the assault of infinite possibilities that seemed at hand, Golomstock remarks that in retrospect “Their social prophecies turned out to be a utopian dream.” (ibid 21). Like leftist art the Russian avant-garde became demarcated, and its artists suffered a faith from which there was little hope of escape.

Similarly, the Nazi State deemed modernist and leftist art “degenerate” and staged exhibitions of the works as if they were pieces belonging to far removed cultures. This was another tactic of Nazi propaganda that dehumanized anyone who didn’t fit with the party program. During his trip to France after the German occupation in 1940, Adolf Hitler remarked unabashedly after having visited some salons and galleries on French art: “Are we to be concerned with the intellectual soundness of the French people? Let them degenerate if they want to! All the better for us!” (ibid 65). This official party doctrine on the arts was influenced by the thought of ideologues like Alfred Rosenberg, who decried the state of the European intelligentsia as “an intelligentsia which . . . bears the features of degeneration” (Harrison, Wood 412). In the racial worldview expounded by the Nazi Party, there could be no deviation of culture, thought, and identity in society.

In Neo Rauch, we find early twentieth century modernism breaking forth on the canvas, incorporating the Socialist Realist development instead of ignoring it. Rauch’s work appears like a release of hidden subconscious potential with a colorful and provoking play of societal history, including within it the role of the artist in the midst of change. His work seems especially directed at playing around with the theme of how history interjects through time and constantly resurfaces, colliding with human bodies that become bent out of proportion amongst a phantasmagorical landscape.

In Rauch’s earlier work, Abstract Expressionist and Pop art influences are at the forefront. In the painting *Sucher* (fig.3), where a man with a detector walks past the paint cans in the foreground, there is a sense of creative rediscovery retained and missed. Editor Tim Sommer writes how this particular work is the “*pièce de résistance* about the life of an artist as Neo Rauch sees it” (Schmidt, Schrenk 33). The beam of light, having missed the painter, might be a symbolic gesture that points to the notion of how artists might not be aware of the origin of their ideas and inspiration. It is as important for an artist to examine their creative process as it is to focus on the subject of the painting. As Sommer puts it, “the painting presents a juxtaposition and confusion of production and apparatus . . . the artist in this painting is armed and diligent, but are his methods suitable, his zeal well-aimed?” (ibid 33). The man with the detector is the embodiment of the question of inspiration and how it makes the work of an artist possible. The light beam will hit the canvas and settle a little dust on the cans, but will the artist notice the occurrence or only

the finished piece? Rauch's paintings revel in this type of collapsing symbolism, and he is an artist whose influences may at any point become the subjects of the piece. This is especially notable of the Socialist Realist style that seeps into his paintings. Motifs and personalities acquire various historical and cultural forms, and hence we find a link between the present day and the modernist era that was stilted and fractured in its developments by dictators, ideologies and war.

The lucid language of the paintings builds houses out of symbols. In Rauch's *Paintings* art critic Uwe Tellkamp analyzes the themes of constructed reality and their abstract epistemology, writing that "to come to know transrealistic pictures is to step into their construct: of the dream that is called reality, and of the reality whose messengers are dreams" (Tellkamp, VIII). Rauch's works ask the viewer to step into the discombobulated realm of artistic expression, akin to stepping into a willing discourse with a reality that has only signposts and signals to point the way, but which, like a dream, takes us where it desires we go. These works take reality itself to be an elongated dream that becomes distorted and cut up with a multitude of histories vying for a spot in our consciousness.

An article by Jan Verwoert from 2005, written in *Frieze Magazine*, called to attention a side of Rauch's public image that we have thus far not discussed. Several interpretations of Rauch's work have made the claim that "by re-staging and emptying out the heroic iconography of Socialist Realism in his paintings, Rauch commemorates the death of the ill-fated state-socialist Utopia of the German Democratic Republic, the system under which he grew up" (Verwoert web). Verwoert himself argues that Rauch's work, far from being truly an analysis of a collapsing history, "seems to aim less at the deconstruction of an obsolete ideology than, in fact, at the restoration of a questionable sense of German identity" (ibid web) Rauch's work constantly features workers and certain laborious tasks that reoccur in history, and many people call into question the "distinctive taste of German-ness" (ibid web) of those paintings. Yet, it seems a strange criticism to rile at an artist when they, in a self-aware manner, assess their own origins and display their attempted assessments to the public.

Artist Johnathan Messe writes in his piece on Rauch, which is printed in the aforementioned *Paintings*, "NEO RAUCH paints everything with the PULSE HAND of SAINT JUST" (35). Saint Just was an infamous Jacobin who served on the Committee of Public Safety in the French Republic, responsible for instituting a policy of terror during the middle years of the French Revolution and justifying its actions on the need to combat any suspected counter revolutionary sentiments in the name of public good. Messe's writing might seem to confront the notion that Rauch intends a certain meaning in his works or that he is pigeonholing his art into a political framework. By striving to fit the artist into a critical interpretation, the accusations brought against Rauch that he is retreading outdated figurative painting or masking certain nationalistic traits might ignore the strength of the paintings. They entertain many artistic and political associations as related to one another and question their viability within society and the individual. What separates Rauch's painting from the propaganda of the Soviet yesteryear are his self-conscious approach to the notion of propaganda, artistic ego and how public persona factor into the artist's creativity.

Rauch's paintings feature a unique use of anachronism that allows for various levels of interpretation about the contexts and ideas of artistic, political and social history. Anachronism can be witnessed in paintings like *Kommen wir zum Nachsten* (fig.4): a young man, who shares a frank resemblance to Saint Just, sits at a table, pointing to a pinkish paper. Another man with tied hands, bandaged head, and bloody apron stands next to a woman who looks straight at the devilish Saint Just at the table. Meanwhile, Just looks to his right hand, which is reaching into a stereotypical bureaucratic briefcase. Is this an attempt to deceive the bound man, or to reveal some incriminating evidence? Whose blood is on the apron of the bound man? Why is his head bandaged? The modern-outfitted workers in the background work on constructing the adorned guillotine. The interpretative nature of the symbolism can be construed either as an attempt to understand, rather than, yet again, misunderstand and remake nationalistic fervor or refer to something like the nationalism of the past, a technique many modernists were apt to abuse, despite their praise of unique progress.

There is a transcendental freedom in Rauch's work that harkens back to the Futurist idea of creative individuality. His work embodies a personal dream theater of history and presents a vital current that is necessary in contemporary art, allowing us an access to the history which might oftentimes be ignored. With Rauch's painting, we get a chance to venture into our desires, and find throughout history similar feelings and ideas. Rauch's art allows us to examine our contextual surroundings, which in turn, are examining themselves back through the audience.

Rauch's works do not refrain from challenging the art of his predecessors and the spirited times under which they lived. He seems to recognize his influences at every step, but with caution; he gives us a window into his unique perspective. In his works, we get the sense that Modernism, Socialist Realism, 19th century Nationalism, all those aspiring utopian dreams, and the aftermath of reality they brought forth, haven't left us, and they anticipate our reaction. Neo Rauch continues to justify further study, as an artist who looks and wonders at the past, present and future; and as an artist that articulates the pandemonium and corrosion of the idea of art for art's sake; an artist for whom color and objects are the case in point of his concentration. He is an expressive modern social realist in an unreal world.

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Fig 1. Gerasimov, Lenin on the Tribune (1929)



Fig 2. Mao with Peasants in Kwungtung, unattributed



Fig 3. Rauch, Sucher (1997)



Fig 4. Rauch, Kommen wir zum Nächsten (2005)

# Gender Bias in Substance Abuse Counseling

Defining Issues, Exploring Solutions<sup>1</sup>

Gitty Weinbaum

## Abstract

The topic to be explored is how to maintain effective and professional counseling skills with women experiencing substance abuse issues in the face of strongly held counselor convictions on gender roles, and the propriety of women using illicit substances. A sound therapeutic alliance is the foundation for successful treatment outcomes, with the counselor's ability to maintain a tolerant and objective outlook being paramount in setting the relationship dynamic. After relating gender to the more broadly articulated body of multiculturalism, this paper will examine the value of cultural competence and sensitivity in the counseling dyad, and address ways of training counselors to maintain objectivity, and perhaps even overcome their biases, in the face of their culturally habituated attitudes concerning gender roles.

Those who engage in the helping professions, among them mental health practitioners and their ancillaries, have an awesome responsibility. The wellbeing, and possibly the very life, of their client lies in the counselor's ability to fully engage, objectively and empathically, in the therapeutic alliance. It is safe to say that the therapist's outlook and feelings are a vital determinant in the success of the counseling relationship and treatment outcome (Imhof, 1991). Furthermore, the impressions that are formed by the counselor of their client, whether or not based upon bias of any sort, may overshadow the underlying issues that are supposed to be the focus of work done with the client (Sexton, Whiston, Bleuer, Walz, 1997). Any antipathy or negative attitudes that are present might even be subconscious, so that both counselor and client may be unaware of them, nonetheless, they subtly influence the dynamics of the counseling relationship

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(Selzer, 1957). As such, it stands to reason that it is unethical to counsel clients while under the influence of bias (Korman, 1974), and a conscientious counselor will make all efforts possible to minimize prejudicial thinking to the best of his/her abilities. The management of bias issues takes on added urgency particularly concerning clients with substance abuse issues, who face the added stigma of addiction (Imhof, 1991).

### **Stereotyping and Gender Bias in Substance Abuse**

It is human nature to classify things. We have a need to categorize in order to make sense of our world, and all the information that the mind is flooded with (Taleff, 2006). A problem arises when our classification system goes awry—when in our quest to categorize everything, we either oversimplify or classify incorrectly. Stereotyping is one such “classification fallacy” as Taleff (2006, pp. 108) terms it, where the presumption of specific “attitudes or behaviors are (applied) to an entire group” (pp. 109).

One common social locator that lends itself to stereotypical thinking is gender. Traditionally, the dominant culture’s value system has shaped public norms (Sue, Arredondo, & McDavis, 1992), including what are considered appropriate behaviors for different categories we assign to the population, such as gender, age, social class and so on. To illustrate: according to Heilman and Parks-Stamm (2007), prescriptive gender stereotypes are value-based expectations we have of how men and women “should be” (pp. 58). In other words, they are the “attributes and behaviors (that we believe) are appropriate” for each gender (pp. 58). They offer direction as to conduct that society considers proper for men and women to participate in (Burgess & Borgida, 1999), and serve to normalize societal values. When gender stereotypical behaviors are breached, they engender social sanctions, such as shunning or disapproval (Cialdini, & Trost, 1998).

Historically, women have always been held to a higher moral standard than men. Social denunciation has always been more severe towards women who violate accepted norms. This is especially so for women struggling with substance abuse. Their struggle is compounded because of the stigma that society attaches to women with substance abuse problems. This stigma most likely comes from the attitude that a woman struggling with substance abuse has failed in her role as the primary parenting caregiver, the traditional role given to a woman by society (Mignon, Faiia, Myers, & Rubington, 2009). At play, too, may be what is known in Latin American culture as *Marianismo*—the assumed purity, innocence, and spirituality that is idolized in womanhood.

Often, women who abuse substances are perceived as being promiscuous, making them easy targets for sexual exploitation (Tjaden & Thoennes, 2006). This in turn contributes to perpetuating this perception, and negates the wholesome image that many cultures value in their women.

In many traditional cultures, where gender roles and norms are strictly outlined, a family’s reputation may become sullied with the exposure of a female-addict family member, who is more likely to be shamed and abandoned than a male addict would be (Mignon et al., 2009). Communal shunning is liable to make it even more difficult for the

addicted female to seek the help needed in order to rehabilitate, further reinforcing her pariah status. This societal trend underscores the necessity of counselors cultivating a bias-free outlook; disenfranchised women might be more apt to accept help from a tolerant counselor operating within a non-judgmental environment.

The views and opinions that counselors hold about gender roles tend to affect their judgment of their client, and if ignored, these views may become embedded, possibly affecting treatment outcomes (Stabb, Cox, & Harber, 1997). This notion is especially compelling when counseling women with substance abuse issues, who in addition to engaging in already stigmatized behavior, also go against acknowledged gender specific behaviors, posing a challenge to even the most culturally competent counselor. Women who do not conform to expected social roles, as demarcated by the accepted norms of general society, are often seen as being psychologically unhealthy and are evaluated in a more negative light (Costrich, Feinstein, Kidder, Marecek, & Pascale, 1975). According to Robertson & Fitzgerald (1990), these clients, who veer from socially expected behaviors as befitting their gender, so defined by conventional standards, are sanctioned and more apt to be labeled pathological, with obvious repercussions in the counseling relationship and their treatment outcome.

### **The Value of Cultural Competence in Combating Bias**

The key to overcoming bias lies in the counselor's ability to synthesize familiarity of different cultures along with treatment methods suitable to the values promoted within these cultures, an approach otherwise known as cultural competence. But what exactly is culture? According to Matsumoto (1994), "(c)ulture is the set of values, beliefs, and behaviors, shared by a group of people, communicated from one generation to the next via language or some other means of communication" (pp. 15). Put plainly, culture highlights a particular population's way of experiencing life and understanding the world.

Because one of the hallmarks of culture is how it differentiates people, it follows that in addition to the traditional view of culture- meaning ethnicity and nationality- age, mental and physical challenges (think: Deaf culture), gender, and the myriad of ways that people define themselves can be cultural descriptors, as well (Ivey, Ivey, & Simek-Morgan, 1993). Indeed, this is the trend being embraced in the mental health community. While some holdouts still consider multiculturalism in the traditional sense of including simply racial and ethnic groups, more and more, it is being seen as encompassing a wider definition- including gender, sexual orientation, and so on (Sue et al., 1992).

For those counselors harboring any culture related bias, it would be helpful for them to consider multiculturalism as a recognition of the complexity inherent in each person- not only client, but counselor as well- and the need for all people to be viewed in terms of the multiple identities they hold (Enns, Sinacore, Ancis, & Phillips, 2004). With regards to women, especially those being counseled, they need to be examined within a broader framework than just their gender; they need to be recognized for the multiplicity of identities that contribute to their *weltanschauung*, or worldview. In this way, prescrip-

tive gender stereotypes that might stand in the way of focused counseling may be moderated.

Having confirmed the significance of culture and cultural competence in the counseling domain, we can now expand on specific principles that characterize its proficiency. Sue et al. (1992) believe that counselors who exhibit cultural competence appreciate the diverse social norms that exist and respect them. They are non-judgmental when facing beliefs contrary to their own. Among the dimensions of cultural competence standards set by Sue and Sue (1990), there are two that stand out which are especially relevant to gaining the skills needed in overcoming cultural bias, with specific reference to gender: (a) the importance of counselor self-knowledge- an understanding of their beliefs, cultural heritage, and biases, and (b) the importance that perception of the client's worldview plays in the counseling process.

To be culturally competent, counselors must be aware of their thought patterns; i.e., their beliefs and the way they react to situations because of those beliefs (Arredondo, 1999). They must continuously examine their thinking patterns in relation to bias, values, culturally cultivated attitudes and so on, and be aware of how this mindset reflects on the counseling process (Sue & Sue, 1990). A fundamental in establishing a successful counseling alliance is that counselors be able to identify specific biases they hold in order to be able to remedy them.

Moreover, culturally proficient counselors value and respect the worldview of clients with diverse cultural beliefs, and do not judge cultural practices other than their own negatively. And though not enjoined to embrace this worldview as their own, counselors should be able to accept it without judgment (Sue & Sue, 1990).

While this concept is true of all mental health disciplines, it is especially applicable in regards to counseling people with substance abuse issues, which comes with its own set of prejudices. Clients need to be viewed within the context of their environment and the "larger social forces" that shape it, in order to understand the presenting pathology (Sue et al., 1992, para. 22). Oppression, trauma, and dysfunctional family structure can lead to substance abuse, which may be seen as an escape from the negative reality of the client's life experiences. An understanding of how the client's life narrative may have helped influence pathological behaviors such as substance abuse, can aid the counselor in processing his biases (Sue et al., 1992).

However, in order to effectively apply unbiased thinking, it is not enough to simply understand the client's worldview. It is vital for the counselor to critically examine his own cultural habituation, as well, in order to appreciate the socio-political system to which they both belong (Sue et al., 1992). Counselors need to be aware of how their cultural heritage, socio-economic bracket, and religious backgrounds shape their worldview and influences their psychosocial interactions. They must be cognizant of the tremendous impact this can have on the counseling process. (Sue et al., 1992). Building upon this concept, we can say that the cultural upbringing of a counselor influences their interpretation of pathological or inappropriate behaviors; i.e., what is normal and what is abnormal (Sue et al., 1992). From the information put forth here, it is evident that culture and gender appropriateness is essentially a social invention. What is inappropriate in one culture may

be deemed appropriate in others, underscoring the importance that an understanding of the client's social and cultural worldview plays in the quality of care they receive from a counselor.

### **Methods to Develop Cultural Competence and Gender Sensitivity**

With the value of cultural competence established, what needs to be explored is if biased thinking is amenable to modification and, if so, what methods can be used to effectively achieve that goal.

The stereotypical tendency, evident in biased thinking, is an automatic response, unconsciously stimulated by situational prompts, a process otherwise known as priming (Brewer, 1988; Fiske & Neuberg, 1990). However, studies have indicated that while stereotypical thinking is reflexive, acting upon the stereotype; i.e., applying the stereotyped information in reasoning and decision-making processes may be avoidable (Blair & Banaji, 1996). In essence, even if a counselor is conditioned to assume that female addicts are promiscuous (priming), the counselor does not necessarily apply that stereotype to an actual female substance abuser being counseled.

Cognition plays a pivotal role in modifying the priming instinct. A conscious intention by the bias holder to be unprejudiced, through focusing on the bias object's qualities instead of the stereotypes linked with his or her social group (Neuberg & Fiske, 1987) has been proven very effective in diminishing bias. This is an example of the primacy that the counselor's thought processes play in affecting their feelings towards and interactions with their clients. Cognitive Behavioral Therapy (CBT), which at its core aims to highlight maladaptive thinking and modify it, is uniquely suited to this goal (Beck, 1992; Thase & Beck, 1993). CBT can be a valuable tool for use in combating gender bias. By examining culturally influenced beliefs about gender roles, and understanding the fallacies inherent therein, it becomes possible to minimize, if not eliminate this bias. Thoughts condition our behaviors (Meichenbaum, 1993), so it stands to reason that by re-ordering our thought processes, we can effect change in our perception and behavior towards people we might otherwise view with suspicion or distrust (Faubert, Locke, & Lanier, 1996), or as possessing a lower moral compass.

Beck's (1976) model of cognitive restructuring is a four-fold process: a) becoming aware of one's thoughts b) learning to recognize maladaptive thought patterns c) substituting accurate cognitions for the inaccurate ones d) getting feedback that reinforces the new accurate thought processes. This model can be adapted to work with many modalities, and functions particularly well in repairing stereotypical thinking. To illustrate: avoiding or overcoming gender bias in substance abuse involves first awareness that the bias exists, then identifying its unsoundness. One would next attempt to replace the convictions that led to the bias, perhaps by viewing the substance abuser in his context as a distinct individual with many characteristics, instead of the overriding identity of addict. Finally, the headway one can make by counseling a client who feels accepted might act as the reinforcing agent.

Engaging in critical thinking, one of the fundamental steps in cognitive behavioral therapy, may also be used as a stand-alone tool; another helpful instrument in the arsenal of cultural competence. By examining how knowledge and gender are socially constructed entities, we can more easily dismiss the bias that results when these mores are violated. The formation of knowledge is subjective, “influenced by the cultural norms, biases, and worldviews of (the) experts” (Enns et al., 2004, pp.420) presenting them; as such, they are subject to shifting cultural attitudes. Similarly, gender and, by extension, its associated and accepted behaviors, is socially structured, making it possible to reconstruct existent gender models instead of perpetuating them (Knudson-Martin & MacFarlane, 2003). In other words, it is not necessary to accept conventional gender role constructs: they can be reshaped to suit current realities.

One of the most fundamental means of gaining cultural competence lies in the training a counselor receives. Multicultural training has been proven to reduce bias in counselors-in-training (Kiselica & Maben, 1999). Furthermore, studies have indicated that programs promoting a culturally aware ambience engender greater cultural competence in counselor trainees (Dickson & Jepsen, 2007), and are an integral contributor to students’ assimilation and appreciation of the value of cultural competence. Culturally sensitive programs offer an environment where students can engage in meaningful multicultural exchanges that can serve to break down ingrained bias (Dickson, Jepsen, & Barbee, 2008), and provide a safe environment where they are free to explore and ultimately process their cultural belief systems.

The counselor training experience offers multiple ways for a student counselor to attain cultural competence skills; and utilizing a variety of learning strategies serves to ensure that students absorb these skills (Tomlinson-Clarke & Ota Wang, 1999). With regards to gender bias, selected readings and informative lectures imparting specific knowledge about cultural mores and principles (Reynolds, 1995), particularly relating to women in various cultures, would be useful. Additionally, class discussions and role-play are effective vehicles for exploring personal value systems, with possible bias being uncovered (Dickson et al., 2008) during these interactions. Discussions of gender roles in different societies, and role-playing counseling encounters with women experiencing addiction, can assist the counselor trainee to formulate appropriate responses and interventions, free of observable bias. The underlying theme of this discussion is that the foundation of all counselor-training opportunities is a safe learning environment, where students feel free to explore their outlook (Imhof, 1991), not only of substance abuse and of gender, but also of any problematic issues they expect to come up against in their practice.

Working with clients who may be the focus of a counselor’s bias can be another useful instrument the counselor may use to gain an appreciation for cultures other than his own. This cultural exposure can facilitate the counselor’s attainment of the necessary sensitivity to marginalization experienced by clients from specific cultures who break with accepted social and cultural norms (Sue et al., 1992). This is especially so in the case of women substance abusers, who in many cases end up violating two accepted social norms, one by abusing substances, and the other by being a woman abusing substances, a taboo in many cultures. In the same vein, seeking contact opportunities with members of other

cultures, outside of the counseling realm, serves to move the counselor from role of helper (Sue et al, 1992), with its implicit connotation of power that may be further entrenching the counselor's (possibly subconscious) belief in his moral superiority.

While relevant educational experiences underpin effective counselor preparation, making use of effective supervision, in order to help process any initial biases (Imhof, 1991) that might arise from this experiential learning experience, is a valuable adjunct. A qualified supervisor is a trained professional who can help the counselor acknowledge personal feelings that may taint the therapeutic alliance, and which may ultimately, negatively affect the treatment process (Imhof, 1991). Supervision can involve individual direction; however, group and peer supervision also offer excellent opportunities for input from counselors and trainees who may be dealing with similar issues (Imhof, 1991).

Another approach used in multicultural training is the utilization of the existential theory of counseling, which emphasizes universal qualities shared by all of humankind. Focusing on concepts such as love, life, and death, which "transcend culture" (Enns et al., 2004, pp. 421), serves as an equalizer that may encourage the breakdown of stereotypical thinking. When dealing with a client who is the object of bias, such as gender and substance abuse, it is helpful to concentrate on the human experiences shared by all of mankind, such as pain, disappointment, and joy. By reaching inward to access these transcultural themes, the counselor will be more able to relate them to the client's experience-reinforcing their commonality and minimizing their differences.

Finally, it is helpful if counselors have undergone the therapeutic experience, as clients, in order that they may fully understand the progress of their own emotional maturity, from the perspective of an objective professional- their own therapist (Imhof, 1991). Exploring the interplay of bias, emotions, and values with a trained professional aids the counselor in examining and processing these issues in a dispassionate manner. Gender roles and biases can be considered within the context of the counselor's upbringing. The trained professional brings neutrality to the assessment of the counselor's life experiences, and allows the counselor to examine these issues in a safe, non-judgmental atmosphere.

## Conclusion

In the counseling profession, successful, unprejudiced assessment and treatment hinges on the recognition of bias and negative gender attitudes on the part of the counselor, and a concerted effort to remedy them, when present. Many channels exist to advance this goal. However, the counselor must be prepared that the exploration and scrutiny necessary to this endeavor will, in all likelihood, be emotionally taxing; challenging long held cultural beliefs and analyzing ingrained thinking patterns is a demanding process. Nevertheless, it is only by undergoing this rigorous examination and putting in the work by implementing what was learned, that destructive viewpoints threatening the well-being of disadvantaged clients can be eradicated. The counselor's credo to "do no harm" obligates counselors to do everything possible to ensure that their clients receive the very best of them; their clients deserve no less.

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# Analysis of Neoliberal Economic Policies on Food Security in Less Developed Countries<sup>1</sup>

Jorge A. Rolon

## Abstract

In this paper I study the effects of neoliberal economic policies—as implemented through the Structural Adjustment Policies of the IMF—on the economies of Less Developed Countries, particularly in terms of their effect on the food security of native populations. Based on the study of various academic sources, I consider both the historical context and modern realities of the position of Less Developed Countries within the global economy, how this position is influenced by neoliberal economic policies, and what effect it has on food security. I present the conclusion that modern integration into the globalized economy has had a negative effect on food security outcomes in Less Developed Countries.

**T**his paper considers global food insecurity—that is, the population that lives in hunger, or fear of starvation—in the context of global food systems. In 2011 the World Bank estimated that roughly 935 million people are food insecure (Austin, McKinney, Thompson 68). We cannot begin to consider the reasons for, nor the solutions to, the problem of world hunger without examining its relations to the political and economic realities of the modern world, and the way in which these realities affect how food is produced and distributed globally. In order to examine these relationships, we must explore the historical background that underlies modern global food systems. Since 98% of the food insecure population lives in what are known as the Less Developed Countries (LDCs), collectively referred to as the Global South, this examination will be specifically oriented to the interaction and dependency between these countries and the developed

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<sup>1</sup> Completed under the mentorship of Prof. Jason Leggett for POL 5800: Environmental Politics.

world of Europe and North America both historically, as well as in the context of the modern globalized economy (Thompson 69). This interaction has taken the shape of a global division of labor, between the developed countries and the LDCs, between industrial and agricultural production, respectively. In investigating the modern correspondence between the LDCs and the developed world, we will pay special attention to the actions of the multilateral lending institutions—the International Monetary Fund (IMF), the World Bank (WB) and the World Trade Organization (WTO, formerly known as the General Agreement on Tariffs and Trade or GATT), which are managed, essentially, by the political and economic powers of the developed countries. These lending institutions have come to exert a great deal of influence on the politics and economies of LDCs.

We will consider two conflicting theories on the role of these organizations in promoting food security through economic initiatives. Both theories take into account the historical relationships between the Global South and the developed world in the scope of the world economy. The first we can refer to as neoliberal economic theory, that which ostensibly guides the policy of the multilateral organizations. This approach, based in the classical economic concepts of Adam Smith and David Ricardo, holds that the poverty and hunger experienced in LDCs are the result of historical, economic underdevelopment and that the solution to this problem is greater integration into the global economy, with a focus on the LDC's comparative advantage in agricultural production. The other, known alternately as World Systems Theory or Dependency Theory posits the opposite: that it is precisely the integration into global economy that maintains the systematic inequality between north and south. The globalist export-oriented economic strategies in LDCs cause agricultural production to be geared away from meeting local sustenance needs in favor of production of cheap agricultural inputs (such as cattle feed) for export to developed countries. These inputs are used to produce costlier manufactured consumer goods, which obtain a greater rate of profit for the developed countries, thus further contributing to imbalance between themselves and the LDCs. It is known that enough food is produced globally each year to provide each person on earth with an adequate and healthy diet (Thompson 69). Therefore, we can assume that any population has the potential for food security, given that they have access to either (1) employment that provides wages capable of procuring nutrition at its cost in local markets while still providing for the other necessities of modern human life; or (2) the land and resources needed to agriculturally produce their own food. In order to appraise the validity of the neoliberal approach of the multilaterals, we must gauge its effect on these two variables.

The origins of modern economic relationship between the global north and south lie in the European colonial era of the eighteenth and nineteenth centuries, and in the emergence of the global marketplace and the process of industrialization that occurred during this time. Several political and economic processes played out in this span that would plant the seeds for the subordination of the LDCs to the developed countries. One of these processes is referred to by scholars as the resolution of what is known as the “agrarian question”—namely, what was to become of the rural agrarian societies of Europe as the European economy moved towards industrialization? (McMichael 631) The answer to this question would lie in the creation of various institutions that would come

to define the modern nationstate and the international economy. These institutions were born of the need for countries to rationalize the destabilizing aspects of the “free market.” When rural European societies were threatened by their introduction into the market of cheap agricultural products produced in the colonies, the response of metropolitan governments was the creation of protectionist trade laws designed to shield local producers from the competition by levying steep import duties (McMichael 633). The protectionist trade laws (along with central banks to regulate currency, and labor regulations to stabilize labor relations) would characterize the regime of managed capitalism that would emerge from the colonial era. This system was oriented to the goals of securing global sources of raw input materials and cheap food products necessary for industrialization. At the same time, it promoted the corresponding mobilization at home, thus forging a competitive advantage in the global marketplace. The role of the areas that would become LDCs in this paradigm was to provide the sources of economic exploitation on which the countries of Europe would build this industrialization. From the nationalcapitalist model emerged the FordistKeynesian economic model, which is based on the integration of agriculture and industry and buoyed by a protected, highwage economy of mass production and consumption (McMichael 636).

In the midtwentieth century, when the process of decolonization occurred in what was then known as the Third World, the local elites that controlled the newly independent LDCs would attempt to replicate the FordistKeynesian model which had become the standard economic model of nationstates (McMichael 635). However the political and economic realities of the last half century, which emerged as the consequence of the patterns of preceding decades, would make the goal of independent economic development unfeasible for the countries of the developing world. By the time that they emerged as independent nations, capable in theory of controlling their economic destiny, the developed countries had a multicentury advantage in terms of developing their own economic prowess. They were in a position to outcompete the LCDs in the global economy and thus undermine their efforts to create sustainable economic development through the FordistKeynesian model. By the last decades of the twentieth century, as the worldwide economic standard moved away from the FordistKeynesian model, the Western powers increasingly exerted influence in LDCs, steering them to the desired economic course through the unilateral organizations such as the IMF.

For the populations of the emerging LDCs, the mid twentieth century held great promise of increased economic security and self-sufficiency, and as a result, a stabilization of improved living standards. These hopes were strongly tied to the area of agricultural production within FordistKeynesian system under the process of Import Substitution Industrialization (ISI). To create the economic conditions necessary for rapid industrialization, the governments in the LDCs needed to implement the administrative and regulatory institutions that would allow them to direct resources towards their political and economic aims. The LDCs, as their developed counterparts had before, would need to provide their urban workingclasses with access to affordable food that would keep the wages paid to them by industrial companies manageably low. This would be managed through government intervention in the internal marketplace, through subsidies, price controls, and cheap

credit from central banks. The other devices that were used to this end were the technologies of the so-called green revolution—various novel agricultural inventions and techniques, including genetically modified crops, synthetic fertilizers, and use of pesticides. These technologies, along with the reorganization of the rural areas away from sustenance farming and towards the American family farm model were to provide for the cheap and plentifully available food that would fuel industrialization. The necessary industrial inputs would be obtained from the developed world through the export of tropical agricultural products produced in great number through green revolution technologies (McMichael 637).

As has been mentioned, the realities of the global economy, often created through the influence of the developed world, stood as barriers to this process. The first hitch in the plan, so to speak, was the increasing use of technological substitutions, created in the First World, for tropical export products, such as sugar and vegetable oil, which LDCs relied on for income. By the 1980s, the U.S., the world's greatest sugar importer, had cut imports in half through the use of artificial sweeteners (McMichael 640). A pattern emerged in the economic balance between the advanced countries and the emerging Global South—the South's weak economic position relative to the Western powers made them subservient to the economic directives of the developed world. Conditions in the First World would dictate those in the Third World. The efforts of the LDCs to increase agricultural production came to fruition (with 100% increment in centrally planned LDC economies by 1989), however the influence of the north would produce a system which would orient the distribution of this production away from feeding local populations, and building economic stability. Though this increase in production in the LDCs might have ideally induced a decrease in the developed countries, quite the opposite occurred. Agroexporting by the U.S. and Western Europe increased in the late twentieth century, particularly in grains. Farm subsidies quadrupled and doubled in the U.S. and Western Europe respectively. This flood of cheap agricultural products into the world market naturally had the effect of depressing prices. The diminished prices negatively affected the terms of trade for the LDCs. As an example, Argentina saw their earnings in cereals and vegetable seeds, which made up 50% of their export earnings, decline by 40% in the 1980s (McMichael 638). The lowered prices for agricultural commodities, compared to those of industrial input products, would exacerbate negative balance of payments that would harm the economies of the LDCs and eventually serve as the reasoning behind the economic policy direction of the unilateral organizations. The LDCs gradually transformed into food deficit regions. Overall, the ratio of imports to exports in LDCs rose from 50% to 80% between the 1950s and the 1970s. Every country in Latin America, save Argentina and Uruguay, switched from being exporters of grain to importers (McMichael 641).

Increasingly, the agricultural products produced in LDCs were those tied into the global agro-industrial regime that emerged in the second half of the twentieth century. This system was directed towards the exportation of agricultural inputs used in the manufacturing of food commodities intended for affluent Western diets—specifically fresh fruit, vegetables, and animal protein. The general effect of this trend was to displace traditional agriculture in favor of feed crops such as corn and soy used in livestock farming. The im-

balance in trade between north and south—with high value inputs going north, and cheap grain going south— further reinforced the global division of labor and food dependency, as well as the economic subordination of the LDCs. Concurrently, the displacement of traditional agriculture meant the displacement of rural populations, who were expelled from the land or converted into contract laborers for agribusiness firms. Some countries lost as many as half of their small agricultural producers since the 1980s (Tapella 675).

Beginning in the 1970s, the multilateral institutions, in particular the IMF, would use the increasing balance of payment troubles of the LDCs to impose the postFordist or neoliberal, economic order on them (Petras, Brill 428). In exchange for loans from the IMF to service their debt, the governments of many LDCs allowed the institution to craft economic policy in their countries. The approach of this policy was to further encourage agroexporting—the tropical climates of the LDCs providing a theoretical comparative advantage in such, allowing them to foster a positive balance of trade. However, inundation of the world market with exports drove prices even further down, worsening the terms of trade for the LDCs.

The increased “opening” of the LDC economies meant a further increase in imports and agribusiness investments from the developed world. It also meant that as conditions of Structural Adjustment Programs (SAPs) required by the IMF for countries receiving loans, policies geared towards any kind of self-sufficiency were to be eliminated. This meant tariffs, quotas, subsidies, price caps, and any other measures designed to protect local consumers and producers from the turmoil of the world market. To be cut, as well, was government spending on social needs such as jobs, housing, healthcare, and education. Governments were encouraged to reduce their involvement in their economies to a minimum; to privatize state-owned banks and companies. In countries experiencing economic recession, these policies would take a harsh economic toll on an already suffering poor and workingclass.

In 2012 Kelly F. Austin, Laura A. McKinney, and Gretchen Thompson conducted a study, published in the *International Journal of Sociology*, of the food security outcomes in 75 LDCs where the export-oriented strategies of the IMF have been utilized. The results clearly refute the premise of the neoliberal theories of development in LDCs. Increased integration into the global economy is shown to have no positive effect on food security. This is demonstrated in the data on correlations between several variables and hunger. Food production itself had no significant relationship to levels of hunger (Thompson 80). As the increase in production in LDCs since the implementation of SAPs has been great, this indicates that it is distribution and not production that is the key to the alleviation of hunger, since more food has not fed more people. Factors that mitigated hunger were higher levels of education and healthcare expenditures. Additionally, higher levels of military spending correlated to more hunger, but battle deaths did not—indicating that it is the diversion of revenues from social spending, rather than disturbance of production due to war, that is affecting hunger. The evidence that increased food production does not alleviate hunger, but social spending does. This indicates that it is the distribution rather than production of food that affects hunger in LDCs, and that SAPs, which promote exportation and reduction in social spending are responsible for increased hunger. These

results, no doubt, greatly inform us on what conclusion to reach regarding the effectiveness of the neoliberal approach in reducing food insecurity. We find that the answer as to whether this approach has been effective in providing the two criteria we established as measures of providing food security earlier, is an emphatic no. In terms of providing jobs and wages capable of procuring adequate nutrition, we see that SAPs have meant fewer jobs due to restrictions of the state sector of the economy, and lower wages due to the reduction of government intervention in the marketplace. Cuts in social services mean an increased cost of living. We also observe that the displacement of agricultural smallholders by multinational agribusiness has undoubtedly had a negative effect on the ability of rural populations in LDCs to survive through sustenance farming. It is fair to conclude then, that it is not the lack of integration in the global economy that sustains the high levels of hunger in LDCs, but the subordinate position they occupy in relation to the First World within the global economy; and that this subordinate position is manifested in the marginalization of the economic interests of LDCs in favor of those of their economic superiors. As long as the developed countries continue to guide global economic policy through the pursuit of their own internal interests, the populations of the LDCs will suffer the consequences of this inequality.

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# Antioxidant Titration Method for General Chemistry Lab<sup>1</sup>

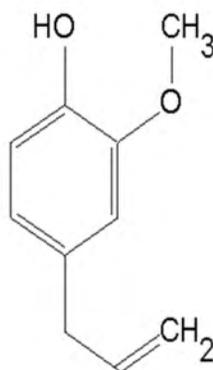
Peishan Chen

## Abstract

Antioxidants attract general public attention because of their health benefits, such as their anti-inflammatory and anti-cancer properties. In this report, the FRAP assay is used to test the antioxidant capacity for clove oil and eugenol. The method can be adopted for use in the General Chemistry lab at Kingsborough Community College. Students learn techniques such as the use of UV-Visible spectrophotometer, concentration calculations, dilutions using glassware, tabulating data, and processing data using software. The experiment allows students to comprehend antioxidant capacity and rates of chemical reactivity, while learning about natural antioxidants and the principles of green chemistry such as atom economy, safer solvents, and design for energy efficiency.



**Figure 1.** Dried clove  
(binomial name: *Syzygium aromaticum*)



**Figure 2.** Eugenol  
(4-allyl-2-methoxyphenol)  
The major ingredient in clove

<sup>1</sup> Completed under the mentorship of Prof. Homar Barcena for CHM 3200: Organic Chemistry 2

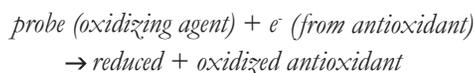
## Introduction

Free radicals are highly reactive chemical species that may attack biological macromolecules and lead to protein, lipid, and DNA damage. They are referred as reactive oxygen/nitrogen species (RONS), which include superoxide anion ( $O_2^{\cdot-}$ ), hydroxyl ( $\cdot OH$ ), peroxy ( $ROO\cdot$ ), alkoxy ( $RO\cdot$ ) radicals, hydrogen peroxide ( $H_2O_2$ ), singlet oxygen ( $O_2^1$ ), and peroxy nitrite ( $ONOO\cdot$ ). They are responsible for cell-aging, cancer, oxidative stress originated diseases such as cardiovascular disease<sup>2</sup>, diabetes<sup>3</sup>, chronic obstructive pulmonary disease<sup>4</sup>).<sup>1,5</sup>

The presence of antioxidants even at low concentration can significantly delay or inhibition of the substrate oxidation by free radicals.<sup>5</sup> Antioxidants are usually categorized into two classes: primary or chain-breaking antioxidants and secondary or preventative antioxidants. Primary antioxidants react with free-radicals, and thus the oxidized antioxidants are stabilized due to the resonances. Secondary antioxidants usually contribute electrons to the oxidizing agent, which can retard the rate of oxidation.<sup>7</sup>

In order to understand the kinetic, thermodynamic, and mechanism *in vivo*, the fundamental understanding of antioxidants chemistry *in vitro* is needed. The mechanisms that antioxidants scavenge or inhibit RONS are generally classified into two categories: antioxidant activity and antioxidant capacity. Antioxidant activity is used to detect the kinetics of a reaction between an antioxidant and the prooxidant (radical) it reduces. In other words, the antioxidant activity is used to detect how fast an antioxidant can reduce the oxidizing agent. On the other hand, antioxidant capacity is used to measure the thermodynamic conversion efficiency of an oxidant probe (oxidizing agent) when reacts with an antioxidant. Thus, the antioxidant capacity is used to measure how much an oxidizing agent can be reduced by an antioxidant.<sup>6</sup>

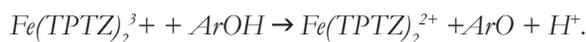
There are two antioxidant assays: hydrogen atom transfer (HAT) based assay and electron transfer (ET) based assay. ET based assays involve two components in the reaction: antioxidants and oxidizing agent that serves as a probe. The mechanism is based on the following electron-transfer equation<sup>7</sup>:



Reduction of the probe by electron from an antioxidant causes a color change, which allows monitoring of the reaction. Antioxidants react with a suitable fluorescent redox-potential probe (oxidizing agent) by either increasing or decreasing the absorbance of the probe, while the degree of color change is correlated to the concentration of antioxidants in the sample. Examples of ET decolorization experiments include 2,2'-azinobis-(3-ethylbenzothiazoline-6-sulfonic acid)/Trolox-equivalent antioxidant capacity (ABTS/TEAC) and 2,2-di(4-*tert*-octylphenyl)-1-picrylhydrazyl (DPPH) assays. Ferric reducing antioxidant power (FRAP) and cupric reducing antioxidant capacity (CUPRAC) are ET based assays that show increase in absorbance at a corresponding wavelength as the

antioxidants reacts with the chromogenic probe. The mechanism of the probes rely on electron transfer to the metal, where the lower valencies of iron and copper form charge-transfer complexes with the corresponding ligands.<sup>6,12</sup> These “turn-on” detection may be more sensitive than decolorization experiments.

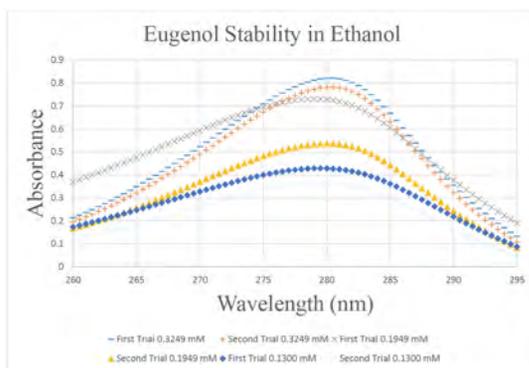
Clove (Figure 1) is an herb that is prevalent in ancient Asia, and well known as anesthetic<sup>8,9</sup> and analgesic drug<sup>10</sup> used in dentistry. Eugenol (Figure 2), the main ingredient of clove, is an organic aromatic compound that confers antioxidant property. In this paper, the ET based FRAP assay is used to develop an undergraduate-based experiment to detect the antioxidant capacity of clove oil. Clove oil purchased from Walgreens may be compared with a pure eugenol standard. The FRAP assay monitors an increase in absorbance ( $\lambda_{\text{max}} = 595 \text{ nm}$ ) as the antioxidant reacts with a chromogenic probe. The probe utilizes the lower valence of iron,  $\text{Fe}^{2+}$ , which forms charge-transfer complexes with the 2,4,6-tripyridyl-s-triazine (TPTZ) ligand, following the mechanism:<sup>6</sup>



The rate of increase in absorbance of the antioxidants is monitored by a UV spectrophotometer over a period of time. The antioxidant capacity of clove oil can be compared with the eugenol standard by calculation, as well as, graphical analysis.

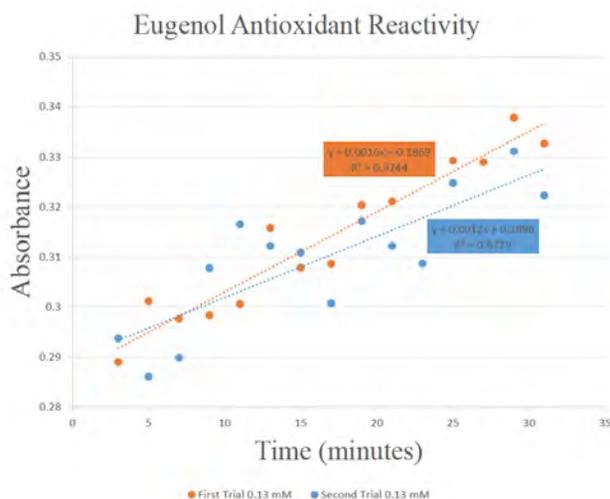
## Results and Discussions

Spectrophotometric analyses of the eugenol standard was initiated to determine the stability of the compound under ambient conditions. Figure 3 shows duplicate samples with same concentration that were prepared on the same day. Although sample 1 (0.3249 mM eugenol) shows consistent absorbance maxima, sample 2 (0.1949 mM eugenol) and sample 3 (0.1300 mM eugenol) show lower absorbance, which are likely due to oxidation from air. Nitrogen gas sparge is needed for the solvents for the experiment in the future in order to obtain a consistent absorbance maxima, and maintain the integrity of the samples.



**Figure 3.** Three different concentrations of duplicate eugenol samples were prepared on the same experiment day, 0.3249 mM, 0.1949 mM, and 0.1300 mM. The vary absorbance maxima of antioxidant eugenol samples show the samples may get oxidized from the air.

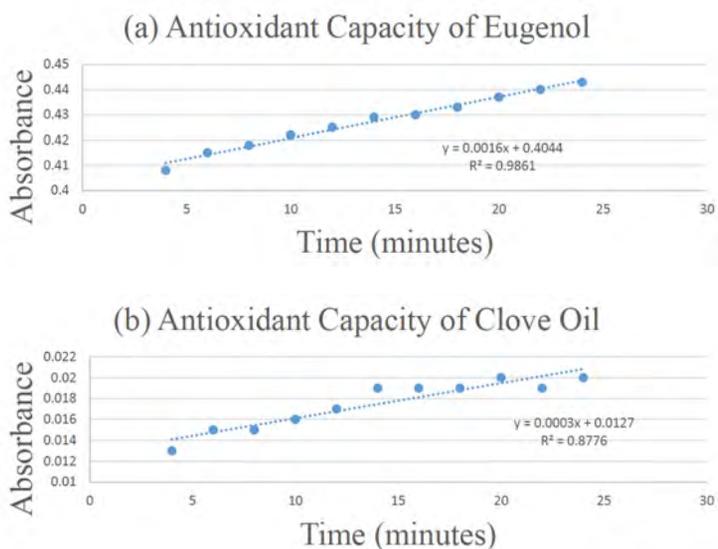
The antioxidant stability was further verified by studying the antioxidant capacity of same concentration eugenol samples in two consecutive days. Data points (15) were obtained from each experiment, while one outlier was taken out of consideration. Figure 4 shows the antioxidant capacity of 0.13 mM eugenol samples, and the subsequent decrease in slope after one day of incubation. These data suggest that the antioxidant capacity is measurable under our experimental conditions, however oxygen in air could give a lower antioxidant capacity if reaction mixtures do not get de-oxygenated.



**Figure 4.** Eugenol (0.13 mM) was reacted with FRAP oxidizing reagent using fresh solution (first trial) and a one-day old solution (second trial). The lower antioxidant capacity of the second trial shows that the antioxidant reacts with air.

To test if a commercially-sourced clove oil has similar antioxidant capacity as pure eugenol, and if it is measurable, a solution was prepared in ethanol. The concentration for the clove oil solution is unknown, however it can be adjusted to match the absorbance of the known concentration of eugenol sample. Following Beer's Law ( $A = \epsilon cl$ ) the concentration of the antioxidants in the sample and the standard (0.16 mM) are approximated to be the same, assuming eugenol is the only antioxidant present.

Titration with FRAP oxidizing reagent was performed on the same day. The absorbance increases as the eugenol antioxidant reacts with the FRAP oxidizing agent. Data was obtained by monitoring the absorbance maxima over a 24-minute period. Thus the linear equation for each of the antioxidants suggests the antioxidant activity, in another words, the slopes of linear equations suggest how much the FRAP oxidizing agent is reduced by the antioxidants. Steeper slopes indicate higher antioxidant activity. Figure 5 shows that eugenol has a higher antioxidant activity since its slope is much larger, 0.0016, compared to the slope of the sample of clove oil, 0.0003. The regression coefficients ( $R^2$ ) of each graph indicate that the quantitative experiments are reliable and consistent. However, the antioxidant capacity of eugenol is more reliable because it has a larger  $R^2$  value.



**Figure 5.** FRAP assay is applied to compare the antioxidant capacity of standard eugenol (0.16 mM) (a) and filtered clove oil (unknown concentration) (b) during a 24-minute period. Both of the antioxidants have a comparable absorbance maxima at  $\lambda_{\text{max}}$  (280.5 nm). Thus, both of the antioxidants are considered to have approximated same concentration of eugenol. Slope of antioxidant capacity of eugenol is much larger than the slope of antioxidant capacity of clove oil suggest that other compounds inside the clove oil may suppress the antioxidant capacity of clove oil.

The discrepancy between clove oil extract and eugenol antioxidant activity is reasonable. Although it was assumed that the concentration of eugenol and clove oil were the same by UV absorbance maxima, clove oil may have other components that have similar absorbance as eugenol. It is also likely that the lower antioxidant activity of clove oil may be due to impurities, as this sample is commercially sourced.

### Applications to Green Chemistry

Kingsborough Community College is one of the first signers of the Green Chemistry Commitment in the nation. As a contribution to this commitment, we are adopting greener chemistry practices for our students' laboratory experiments. The antioxidant titration method in this study are designed for green chemistry. The Twelve Principles of Green Chemistry (Figure 8), such as atom economy, less hazardous chemical syntheses, safer solvents, design for energy efficiency, use of renewable feedstock are applied in the experiment design:

- *Prevention.* This experiment is designed to replace the Mohr's method titration, which uses heavy metals such as silver and chromium
- *Energy Efficiency.* Experiments are performed at ambient temperature and pressure
- *Benign solvents and auxiliaries.* Ethanol and water are used in the reaction, while iron is a benign metal.
- *Renewable feed stocks.* Clove oil is a natural product.
- *Design for degradation.* Clove oil and eugenol are biodegradable.

- *Inherently benign chemistry for accident prevention.*

During the lab, students not only learn the concept about the titration process, but also observe that the reaction is happening because of the chromogenic reagent. They are able to see how natural antioxidants such as clove oil work.

## Conclusion

A spectrophotometer titration technique is applied to measure the change in absorbance for the reaction of clove oil and eugenol with FRAP oxidizing agent. Thus, the FRAP assay may be adopted for the General Chemistry lab. Students will be able to use the UV-Vis spectrophotometer, calculate the concentration of solutions, tabulate data, formulate graph, and understand the activity of antioxidant compounds. Through experimentation, students will also learn the principles of green chemistry, such as the use of renewable chemicals and natural products. For consistency of the antioxidant capacity, all of the solvents should be sparged by nitrogen gas prior experiments in the future.

## Chemicals and Instrument

Ethanol, acetate trihydrate, 2,4,6-tripyridyl-s-triazine (TPTZ), and Ferric chloride ( $\text{FeCl}_3$ ) are from Sigma Aldrich.

Hydrochloric acid (HCl) from Fischer.

Eugenol from Kodak.

Clove oil from Walgreen.

BLACK-Comet UV-VIS Spectrophotometer from StellarNet INC.

UV-VIS-NIR Sources – Low Output Power SL5-CUV from StellarNet INC.

GENESYS 20 Spectrophotometer (student UV-Vis spectrophotometer) from Thermo Scientific.

The following procedure was determined to be the best conditions for the FRAP titration of eugenol and clove oil:

## Procedures

### 1. Solution Preparation<sup>11</sup>

40mM HCl: dilute 0.667mL 6 M HCl to 100mL deionized water.

20mM pH 3.6 acetate buffer in deionized water: dissolve 5.444g sodium acetate trihydrate to 2 L deionized water, adjust pH to 3.6 using 6 M HCl.

20mM FeCl<sub>3</sub> in deionized water: dissolve 0.3244g FeCl<sub>3</sub> to 100mL deionized water.

10 mM TPTZ in 40 mM HCl: dissolve 0.3123 g TPTZ to 100 mL 40 mM HCl.

FRAP oxidizing reagent (Figure 6): 10 mL 20 mM pH 3.6 acetate buffer, 1 mL TPTZ in 40 mM HCl, and 1 mL FeCl<sub>3</sub> in deionized water.

FRAP reaction solution (Figure 7): 9 mL FRAP oxidizing reagent, 0.9 mL deionized water, and 0.3 mL antioxidant sample.



**Figure 6.** FRAP oxidizing agent  
10 mL 20 mM pH 3.6 acetate buffer  
1 mL TPTZ in 40 mM HCl  
1 mL FeCl<sub>3</sub> in deionized water

**Figure 7.** Fresh FRAP reaction solution  
9 mL FRAP oxidizing reagent  
0.9 mL deionized water  
0.3 mL 0.16 mM eugenol in ethanol

## 2. Eugenol Stability

Prepare 6.498 mM Eugenol in ethanol as stock. Dilute the stock to three different concentrations in ethanol, 0.3249 mM, 0.1949 mM, and 0.1300 mM. Take UV absorbance of each concentration using ethanol as standard. Mark down the absorbance for each sample at  $\lambda_{\max}$  (280.5 nm). Experiments were duplicated, and data was processed by Microsoft Excel software.

## 3. FRAP Assay: Antioxidant Capacity

This procedure is modified from Benzie et al. Prepare the fresh FRAP oxidizing agent every day prior the experiment.<sup>11, 12</sup> Take UV absorbance of FRAP oxidizing agent using 20 mM pH 3.6 acetate buffer in deionized water as blank. Write down the absorbance of the FRAP oxidizing agent at  $\lambda_{\max}$  (595 nm). Prepare the fresh FRAP reaction solution and take UV absorbance of FRAP reaction solution for a fix time using 20 mM pH 3.6 acetate buffer in deionized water as blank. Write down the absorbance of the FRAP reaction solution at  $\lambda_{\max}$  (595 nm).

To calculate the antioxidant capacity, formula  $\text{Antioxidant Capacity} = \frac{\text{Absorbance of Reaction} - \text{Absorbance of FRAP oxidizing agent}}{\text{Absorbance of FRAP oxidizing agent}}$  is applied. Process the data into an Absorbance vs. Time (minutes) graph, and obtain the linear equation and regression coefficient for each experiment.

## Acknowledgement

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<sup>12</sup> Thaipong, K., Boonprakob, U., Crosby, K., Cisneros-Zevallos, L., and Byrne, H. D., 2006, Comparison of ABTS, DPPH, FRAP, and ORAC assays for estimating antioxidant activity from guava fruit extracts, *J. of Food Composition and Analysis*, v. 19, p. 669-675.

<sup>13</sup> The Twelve Principles of Green Chemistry, 2013, American Chemical Society, <http://www.acs.org/content/acs/en/greenchemistry/about/principles/12-principles-of-green-chemistry.html> (December 23, 2013)

# Horoscope Word Art<sup>1</sup>

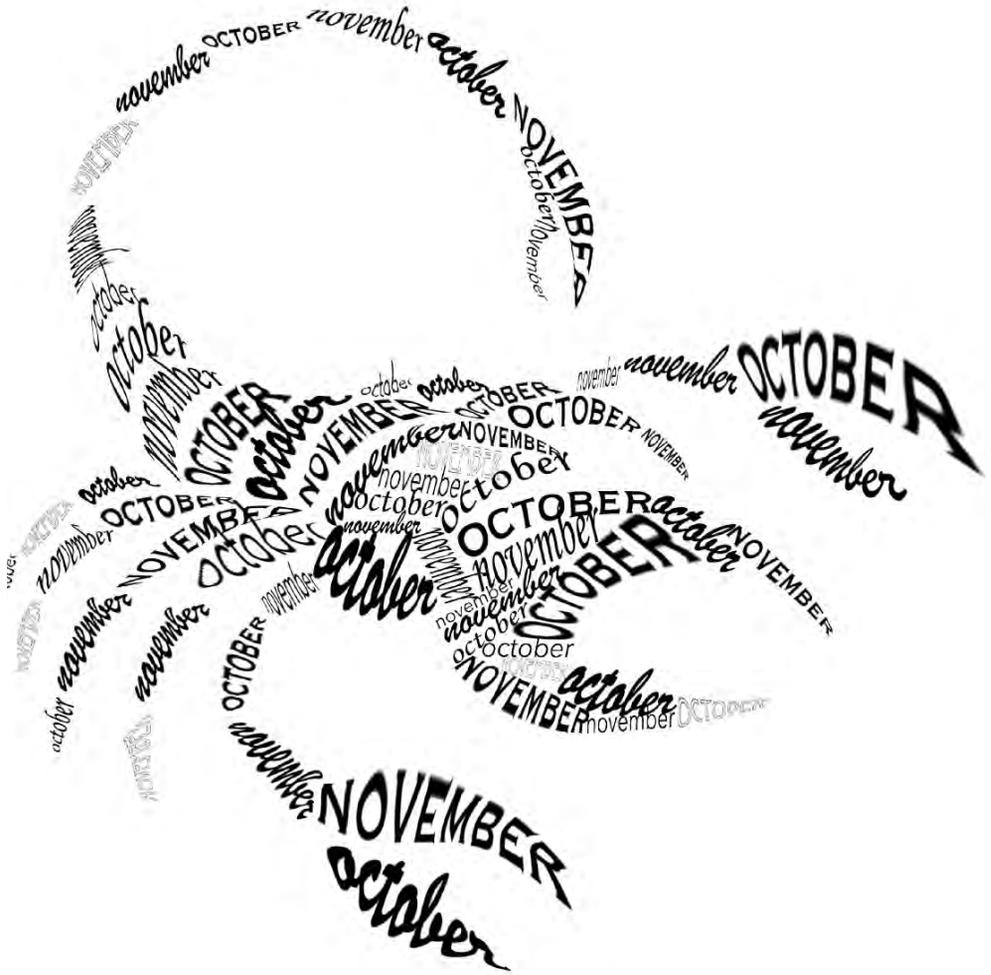
Avivit Kasberg

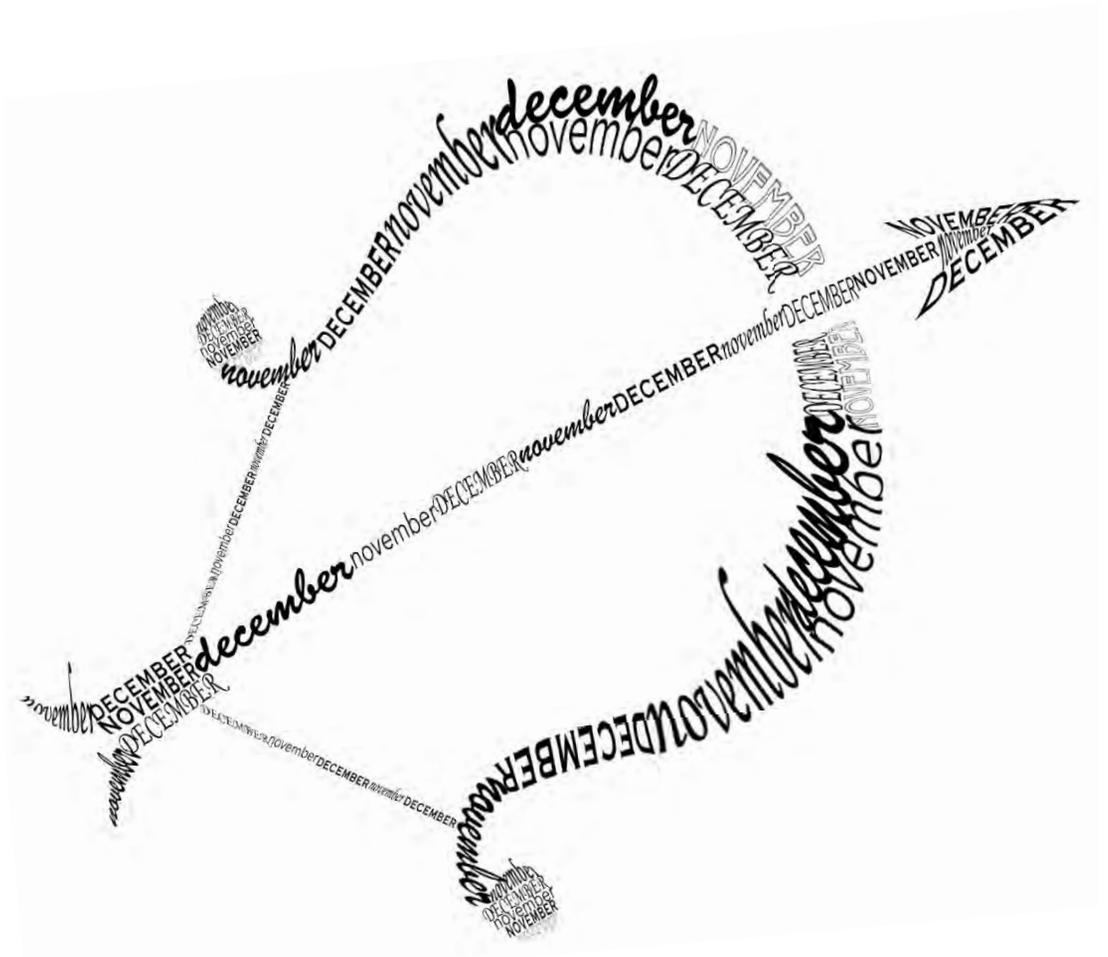
I took Art 74 on Fall 2013 with Professor Valarie Sokolova, and she encourages me to attend her independent study class, so I did. The assignment was to create the Horoscope symbols from typography. Then I came up with the idea to create all symbols images from the months which they relate too. I choose five typefaces that I felt they go along with each other, and create good balance between them. I used the same typefaces for all the symbols. I chose to do it on the computer with the Adobe Photoshop software, which I am very good, and capable to do many things on it. However, at first when I start to approach the assignment I spend a lot of hours on the software to figure out what the best way to approach my own assignment on the software so it will give me the best result. I had to use different tools in the software in order to fit my symbol, so it will look natural and belong where is it. Overall I am satisfied with the result and proud that it came up the way I wanted it to be.

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<sup>1</sup> Completed under the mentorship of Prof. Valerie Sokolova for ART 74: Designing with Type.













## **SUBMISSION GUIDELINES**

### General Guidelines

All manuscripts should be submitted electronically as Microsoft Word 2007 (or later) attachments to Professor Robert Cowan (robert.cowan@kbcc.cuny.edu) and include a working e-mail address and telephone number for both the student and mentor. Submissions should be in 12-point font and double-spaced throughout in a legible typeface like Times New Roman or Cambria.

### Lists of Works Cited

The biggest problem with our submissions is that the citations are woefully insufficient. Articles should include a list of Works Cited and be properly referenced according to the guidelines of the Modern Language Association, American Psychological Association, or other citation system appropriate to the discipline for which they were written. Please do not give incomplete bibliographic references.

### We do not publish:

- Computer science papers that consist mostly of many pages of code
- Art reviews of exhibits that are no longer running
- Class assignments that are letters to officials
- Papers that are basically biographies of famous persons
- Class journals

### We are unlikely to publish:

- Papers that are hand-written, unless they include exceptionally beautifully drawn diagrams
- Overviews of topics, unless they include a summary of recent developments in the field
- Art history papers that have no illustrations of the work being discussed
- Papers by students we have already published, unless they are really much better than other related submissions for that issue
- Personal essays, unless they also make an argument about a topic

### What we are looking for:

- Articles approximately 3,000-5,000 words, which may include notes, diagrams, and/or illustrations
- An argument, not just a summary of other's arguments
- In-paragraph citations that are clearly connected to the Works Cited list
- As few reference sources as possible

### Deadlines

August 1 for the Fall issue and February 1 for the Spring issue.