

Proceedings of  
the 9th Annual  
Thompson Rivers University

# Undergraduate Research and Innovation Conference

Kamloops, BC | April 2014



THOMPSON RIVERS  
UNIVERSITY

# Proceedings of the 9th Annual Thompson Rivers University Undergraduate Research and Innovation Conference

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Thompson Rivers University

*Thompson Rivers University*  
*Kamloops, B.C.*

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## Introduction

The papers in these proceedings were presented at the 9th annual Thompson Rivers University Undergraduate Research and Innovation Conference held March 28 and 29, 2014.

Figurehead to this collection is a short story by Samantha Draper. Written for children, *Hannah Honey-Bee and the Marvelous Garden* speaks to the environmental concerns that permeate our lives and the sustainability questions that accompany them. Inspired by the novels of Margaret Atwood and Douglas Coupland, the story's underlying social, technological and health issues provide the backdrop for the focused research questions of the other contributors.

Questions of sustainability tend to be salient in our conception of the 21st century environment. The paper by Jessica Robinson compares two alternative plant production systems, aquaponics and hydroponics, to determine whether the aquaponic ecosystem might be more sustainable than one which relies more heavily on artificial intervention. The implications for a sustainable food supply are ultimately connected to environmental and health issues.

Health issues are foremost among the questions raised in Draper's story, and are also reflected to a greater or lesser extent in the papers of Quinton Sirianni, Ashley Berard, Olga Fomicheva, and Taran Main et al. Sirianni's research in chemistry compares two compounds that could have applications in the development of new drugs. Berard examines how an on-line support network

helps fibromyalgia patients deal with this painful condition in the face of skepticism from the medical community. Fomicheva turns a more direct gaze on today's medical culture with her inquiry into the ethics of profit and the role played by the pharmaceutical industry in the 21st century. For further insight into the development of pharmaceuticals, the paper by Taran Main, Kingsley Donkor, Laiel Soliman, Colten Wendel and Kevin Ramsey provides a glimpse into the process of drug development, with an examination of a compound potentially useful in the treatment of blindness caused by diabetes.

Societal issues are at the forefront of the paper by Colleen Fines, who explores these from a First Nations perspective with an inquiry into ways in which traditional healing and cultural practices can more successfully address the mental health and substance use issues that lie at the heart of overrepresentation of First Nations, Inuit and Métis individuals in the Canadian Criminal Justice system. Seeking better solutions to criminal justice issues is also the focus of Ryan Khungay's "Barriers to Community and Social Reintegration for Criminal Offenders." Khungay's paper explores the need for greater education about the Criminal Justice System, specifically about the barriers faced by recently released inmates attempting to reintegrate into society. Social workers are increasingly required to address criminal justice issues in their practice and Khungay notes that more and more responsibility is being placed on communities to address offender reintegration; community thus becomes an important factor in creating a better society.

The emphasis on community is a common thread shared by two papers exploring reflections around creating a better world. Jordan Ellis provides a glimpse into David Ley's contributions to the field of geography. Ellis explores such issues as gentrification and "the cultural turn" to examine Ley's impact on our conceptions of urban geography. On a more individual level,

Ariel Little delves into the Canadian literary classic, *Anne of Green Gables*, reinterpreting the way in which Anne and the community into which she is adopted change each other, eventually reaching a successful equilibrium. In her research, Little probes the theme of compromise rather than conformity as a successful solution to our need to adapt to change. Thus, this final paper completes the circle of research and literature that began to form with Draper's short story, reemphasizing the way in which the creative arts and formal research work together for a better world.

The participants in the TRU Undergraduate Research and Innovation Conference bear annual testimony to the high quality of research produced by students at every level of their educational path. The contributions of these young researchers will provide the groundwork for future generations of inquiry, continuing to address the issues of global importance.

# Hannah Honeybee and the Marvelous Garden: A Modern Canadian Writer's Exploration of Ecological Responsibility and Literature

*Samantha Draper*

**English**

**Supervisor:** Ginny Ratsoy



Dedication:  
To all the little heroes with a gigantic job ahead:  
Bee the change the world needs to see

Hannah Honey Bee is the Queen Bee of what was once a great and lively hive of over 100 thousand happy honey bees. The traffic was terrible, but no bee was bothered by that because they loved the company of all their friends and family, buzzing about

their common business in the day, and snoring soundly together all through the night.

Hannah was one of a long line of Queen Bees before her, and her Great Grandma Bee used to tell Hannah stories about a time when every flower used to bloom and most even had more than one blossom. She described how the air was so sweet in May and June, from all the flowers still soft and tender from spring rains, that it filled the skies with a medley of perfume, and if you closed your eyes tight and leaned in just right, you could swear you were being lifted into the air by a symphony of nectar, dancing and swirling over all the hills and fields.

But the air around Hannah's hive, now in the wide open countryside of crowded and browning corn fields, didn't smell like a symphony of nectar anymore. Instead it smelled like poisonous pesticides. Row upon row, upon row, upon row of delicious blue corn flowers were now toxic to any small creature. The People had done it, but none of the bees could understand why. What could be wrong with small creatures in the corn fields doing Mother Nature's delicate work?

The things people did were so strange that sometimes the bees would watch them closely, trying to figure out what they were doing, but they just looked like very confused animals. Some of Hannah's cousins in the South had seen People cutting and clearing vast patches of rich, rain forest, leaving only ragged ranges of tattered, treeless wastelands where once thousands of different plants and animals had thrived.

Bees near the coast talked of how the People took to the waters and built giant floating metal hives on the sea, with ugly, rusting towers, producing big filthy barrels of sludge they called, "OIL." They banged and clanged and drilled deeper and deeper until suddenly, one day there was a disaster! The sea water all

around bubbled up with thick black sap that stuck to the fish and animals and made them very sick. The oily sludge went everywhere! It spread through the waters, wider and wider, washing up on the beaches, sinking below the surface, ruining all the animals' homes and sticking to everything. What a terrible mess the People had caused.

The bees, as well as all the other animals, couldn't imagine what the people were thinking. Didn't they know that the Earth was alive with, and because of, all of the other animals and plants? Hannah's Great Grandma, who had been Queen Bee long ago, told her bedtime stories every night about how the planet was more than just a hive for humans; it was the hive and home of all creatures big and small.

"Everyone must share it and take care of it so that it will go on taking care of us in turn, with warm sunlight and mild weather, clean rain helping to grow delicious food, and fresh air fluttering through sweet fragrant flowers," she said, tucking her in and kissing the fur on her forehead. "That is why a bee's work is so important to Mother Earth, dear; bees pollinate flowers, so that they can bring forth food and so plants can keep the soil and the air and the animals all healthy in turn."

She smiled and paused thoughtfully, "Even though we may be very small, the good Earth has trusted us with a gigantic job: to keep everything in balance. That is a very special job indeed, now isn't it?"

Hannah nodded, wide-eyed with wonder, as Great Grandma Bee continued. "My dear Great Granddaughter, you will become Queen of this great hive someday, and it will be your gigantic job too." Great Grandma Bee's stories always filled Hannah with such hope and strength that she didn't feel like just a tiny little bee, she felt like a heroine in an adventure story, and she

promised herself as she fell asleep each night that she would lead her hive of bees to keep the hive of Earth alive and well.

But now that Hannah was all grown up and Queen Bee herself, she felt very tiny again, like a little, insignificant bee in a world run by People; People who seemed to be interested only in things that were cut down dead, spilt out and sludgy, or blown up into bits.

Then one day Mother Earth must have had enough of the mess the People had made of her marvelous planet, because the People got sicker and sicker and started to disappear. In the wide open countryside near Queen Hannah's hive, there was no one left to fly the planes that sprayed the toxic pesticides over all the fields, or drive the smoking, noisy tractors that cut down all the corn and hustled it away. According to the bees on the Coast, there were no People there either; no one was making the floating cities churn, gurgle and belch. Even Hannah's cousins to the South said there were no People working day and night in the human hives with the tall smoke stacks and loud noises; no one was piling up all the things they'd cut down, rearranged, and painted in bright shiny colours. There were no People drinking from plastic containers, or leaving food rotting inside boxes, inside bags, inside baskets, inside basins, and no People zinging along in those giant metal capsules they called "cars"—a bee could really get hurt if he got in the way of one of those!

All the rush and all the noise, all the horns and hurried faces, all the banging and clacking and shouting over who owns all the things that had come from Mother Earth had stopped. Suddenly, the air was quiet and still.

But the smell of flowers in the wide open fields didn't come back. There was just too much concrete all over the Earth for anything to grow. People had paved over the green fields with



their concrete cities for running their machines and collecting their piles of shiny things, and they had made so much waste running these machines and clogging the skies with dirty pollution, that Mother Nature was going to need a lot of help to make the plants grow again.

But Hannah's hive depended on the plants. The bees depended on Hannah to find them flowers to pollinate so they could make honey, but Hannah knew there was nothing she could do to make the plants grow fast enough. All of the pesticides and pollution had caused her once vibrant hive of over 100 thousand busy, hardworking bees to dwindle down to only 10 thousand hungry, desperate bees. She knew she would have to act fast to find plants somewhere else for her hive to live happily. She was scared to go, but she remembered her Great Grandma Bee's stories. Hannah was Queen Bee now, and she was proud to carry on Great Grandma Bee's gigantic job. So, she set out to journey, no matter how far, to look for a land with flowers enough to revive her hive.



First she buzzed boldly over the corn crop near her hive. It had started to rot since no one was left to harvest it. Peeeeeeew yeeeeeeew! What a smell. The next field used to be part of a ranch, but the fences had all fallen down and the animals had wandered off. The ground was trampled hard. No flowers would grow here any time soon, so she raced on.

A rocky hillside lay ahead, with great big digging machines poised and ready to bite deep into the mountain. They weren't moving now, though, since no one was left to operate them. All the gaping holes that the People had blasted open, looking for shiny gold and jewels, or sooty coal for fuel, just lay there in a mess of rubble. Hannah could smell the gaseous waste that the

blasted pit was leaking into the air, so she flew over fast and carried on in a hurry.

“What a mess they have made,” Hannah said to herself. “Didn’t they know there wouldn’t be anything good to eat or any good place to live deep under the rocks?” Hannah felt sad for the People. They must not have been very bright animals to destroy the Earth, which provided for their every need in life, all in a silly search for shiny toys to pile up and trade around.

Next Hannah came to a bare, dirty place with big metal boxes and lines that looked like ladders running along the ground in all directions... what did the people call them again? Oh yes: “tracks.” The big metal boxes were all joined in a row to a tall, heavy looking one at the front, which was brightly coloured. Nothing was moving anymore though, since there was no one there to move them. Hannah scanned the ground, but there was not a flower to be found, so onward she chugged. She was trying hard to be brave, but feeling very afraid.



“What if I don’t find any more flowers anywhere? What will my hive do?” She sought and searched and buzzed and bustled all day long, but she just couldn’t find enough flowers anywhere to feed her poor hive. With tired wings and a heavy heart, she landed on a bench in one of the Peoples’ empty concrete cities and she hung onto her little crown and cried for a very long time. She was very far from home. There were no flowers left anywhere, and no place in the world for a bee to make honey. Poor Hannah was heartbroken. She cried and cried and cried some more until it got dark. There was an empty Styrofoam cup with a colourful picture of nothing really important and some meaningless symbols arranged in a smiling display. It was lying sideways on the bench beside her, so she shuffled sadly inside to keep warm for the night, and cried herself to sleep. In the morning she would have to find her way home and break the news to the hive that they were all doomed.

When she woke, she smelled the strangest thing. At first she thought she was still dreaming, but rubbing the sleep out of her eyes, she remembered that she was still in the cup on the bench in the deserted city. What was it that she could smell? Was it sunflowers? No, orange blossoms – no, no it was raspberries. Or was it sweet peas? Could it be corn flowers? Or was it bean flower, or thyme, or ... or... sweet, sweet honeysuckle??? Could it be??? No, it couldn’t be... could it? Poor little Queen Hannah’s tummy was rumbling so loudly that it shook the walls of the cup. She hadn’t eaten since she’d left the hive.

When she emerged from the cup, the sweet, welcoming smell stayed with her, and beckoned her, calling to her to come home, sweet home. But where was it coming from, she wondered? Hanna closed her eyes and remembered her Great Grandma Bee’s lessons on locating the sweetest flowers for making honey.

“Close your eyes tight, lean in with your mandibles, stick

out your little tongue and taste for the sweetness in the air, then let your heart tell your little wings where to fly.” Hannah could hear Great Grandma Bee’s sweet, soothing voice in her heart as loudly as she could hear her own stomach growling in ears. She did as she had been taught and followed that soft perfume out of the lonely concrete city. It led her up higher and higher, over what were now pointless parking lots, vacant gas stations, discarded supermarkets and silent shopping malls, past scads of hollow houses, frozen factories and wide stretching spreads of stock-still streets and highways. Up, up, up to the most surprising place. As she rose up beside a large apartment building, she saw the most wonderful, most marvelous, must flower filled garden she had ever seen in her life! There were fruit trees and berries, a few rows of corn, potatoes, tomatoes, green beans and soy; mushrooms and dandelions, mint leaves and chives; carrots, beets, radishes, cabbages, pumpkins and endives; and there in the sun right next to a thick blossoming bush of sweet honeysuckle was a sight that brought tears of joy to Queen Hannah Honeybee’s eyes. It was another bee hive. Woozy from hunger, she buzzed straight over to the honeysuckle bush. Her stomach was so hungry it ached. She bounced from blossom to blossom, eating pollen until she was stuffed; then she curled up on a soft green leaf in the shade of the beehive and took a nap.



When she awoke, a crowd of strange honeybees had gathered around her. She gasped with fright. Would they hurt her? Had she taken what didn't belong to her? She had been so hungry she hadn't even thought of who might *own* the bush. One of the bees, a big one with long wings, came forward to speak.

"Welcome stranger," she said with a gentle smile, "I am Queen Kai. You must have come from a hive far away. No wonder you were so hungry. This garden is all there is left for miles and miles around, but you are welcome to stay here with us and call this your home now."

Hannah's little head drooped and warm tears welled up in her eyes as she answered. "Oh, thank you good Queen, but, I can't stay here with you. You see, I am Queen of my own hardworking hive, and they are depending on me to find them new flowers to pollinate, but there aren't any flowers anywhere anymore, except here in your garden. My hive will surely not survive," Hannah wept, "I am sorry Queen Kai, but I must return to tell them the terrible news."

Queen Kai listened quietly as Hannah told the stories her Great Grandma Bee had told her about sharing and caring for the Earth as one big hive, and about the poisoned fields, the blasted rock pits, the rusting metal machines and the empty human colonies she had seen on her searching journey. When Hannah had finished, Queen Kai reached out her hand to Hannah and said:

“Dear Hannah, your Great Grandma Bee was very right. Legends do tell of a time when the whole Earth was covered in flowers in great open fields, and honeybees had hives everywhere. You see, every bee everywhere, no matter how small, has a gigantic job to do now. We have to restore the planet by distributing pollen as far as the eye can see.” She paused, deep in thought. Queen Kai was a very grand and graceful Queen indeed. She was very large and had a long sturdy torso and an even longer, soft-looking abdomen. She had a beautiful face with strong mandibles that gleaned with pride for her hive, kind eyes, and a gentle smile underneath her noble crown. Suddenly those warm eyes, lit up with the most joyful idea.

“Queen Hannah Honeybee,” she said, “would you lead your hive here, to live and work together to pollinate the Earth back to a healthy, happy hive for everyone?”

Bubbling excitement rippled through the crowd as they murmured and whispered with joy, “Yes, that’s a marvelous idea! Perfect! That’s wonderful! Oh, please Hannah!” Stunned with disbelief she stared at them all for a moment. Her hive would be saved! She buzzed with delight.

“Certainly!” she said with so much gladness that she couldn’t help her little wings from lifting her up in a buzzing burst of happiness. Hannah’s heart warmed and her head whirled with joy. Then something came to mind that made her heart sink again.

“But how shall I ever find my way back home to my hive?” Hannah had suddenly realized she didn’t have any idea of where she was. The Good Queen thought carefully for a moment, nodding kindly with a soft smile, and then lifted her regal mandibles to reply.

“Let me share with you the story of our Marvelous Garden. You see, many years ago while the People of this world were building their concrete towers and collecting their piles of shiny things and whizzing around in their dirty machines making such a great mess of good Mother Earth, there were a few people who saw then that they would have to find a way to live WITH the land, not just take things from it, and so they started this garden. They are the only People left anymore, and they live here among us in this garden: people, plants, animals, bees, all living in harmony. They grow every natural plant, take care of all the animals, and leave no waste, and everybody shares and cares for Mother Earth equally among them. They even take care of us hardworking bees; They talk to us sometimes, thanking us for all we do in pollinating their plants and keeping the garden growing, and they built us this hive to show that we are welcome here to live together with them in the garden. So to honour and respect the good Mother Earth, we welcome you, and your hive, to come and live in harmony with us as well. All you must do to find your way is fly way up high and look around for miles and miles until you see where you came from.”

The good Queen’s wise gentle words reminded Hannah of her Great Grandma Bee’s loving lessons, so she closed her eyes, leaned in with her mandibles, stuck out her little tongue and tasted the air for the scent of home; then she let her heart tell her wings to fly way up high into the sky. She went up, up, up, way up, and looked around just as the Good Queen Kai had said, and there, waaaaaaaaaay off in the distance was the old rotten corn field

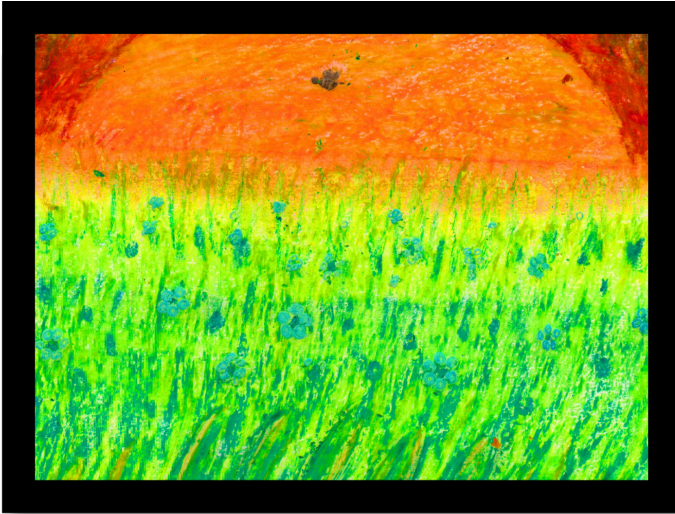


with the abandoned tractor. “That’s it! That’s where my hive is!” She exclaimed. The whole hive was abuzz and a swarm gathered, volunteering to go with her to help them all return.

“Oh thank you all, thank you, so very much. Our hives will be saved and we will go about pollinating until the whole Earth is once again a Marvelous Garden everywhere.”

The End.





### **Bee-In the Moment**

An explanation of an original work of children's literature designed after the zeitgeist phenomenon of contemporary 21st century, acknowledging global awareness of civil responsibility to environmental and societal sustainability.

It is my personal position that ecological responsibility is a course of action long overdue; it now must be taken by human civilization. Being the species that arguably impacts the Earth's delicate ecosystems with the most rapid bombardment of change, it stands that it will be the responsibility of our species to manage that impact so that we may have a more harmonious relationship with our natural environment. Some humans have long known that our lives depend on the health of the world as a whole, but societal life styles of comforts and luxuries, combined with symbolic living, trade and commercialization, have allowed most of us to remain ignorant of the urgent and strong need to find balance

with nature. I believe that, while reform of action is, of course, necessary to the process, reform of thought is the starting point for lasting change. I see that same imagining expressed in the works of Margaret Atwood and Douglas Coupland, particularly in their recent novels, *"The Year of the Flood"* and *"Generation A,"* respectively. These two authors, though very different in style, both speak and act in the public light, actively supporting environmental sustainability; while the majority of their works have been devised for adult audiences, they have both undertaken works of children's literature with the same powerful message of responsibility to the Earth. I have chosen to follow that pursuit in the writing of this short children's story, with the hope that mentoring the upcoming generations in sustainable living and Earth-conscious behavior will establish the reform of thought that is required to achieve that harmonious symbiosis with nature. It may be a practice in Utopic thinking to imagine such a world, but I believe that Utopic thinking is the most truly worthy adventure enabled by literature. For this reason, I have elected to incorporate some of the fundamental ideas from each of the novels mentioned above into the short story of *Hannah the Honeybee and the Marvelous Garden*. From Atwood's *"Year of the Flood"* I have borrowed the notion of the rooftop garden oasis planted in prediction of the downfall of humanity by its own systematic habits of acquisition, and the disappearance of the human race as a result of a sickness brought about by the same ultimate force. From Coupland's *"Generation A"* I have borrowed only the idea of enormous corn fields, and the agricultural processes of cultivation on which mankind now depends. People also manipulate nature with agriculture, overproducing, using pesticides, and exerting commercial control over the product and the process of plant growth, thereby stripping nature of its glory. I believe this story is most effective for audiences familiar with the two aforementioned novels, but without such previous exposure, the story is still valid and motivating with respect to the ideals of both environmental awareness and social responsibility to a community as part of a harmonious sys-

tem of global ecology. It is my hope that it may influence readers as part of a body of work consistent with the zeitgeist notion of being (or *beeing*) 'in the moment', present with the spirit of this time period and the literature and philosophy of this age.

## Aquaponics Vs Hydroponics: The Effect of Differing Nutrient Levels on Plant Growth

*Jessica Robinson*

### **Biology**

**Supervisor:** Susan Purdy

#### **1.0 Abstract:**

*Aquaponics involves creating a small, but highly efficient ecosystem in which plants receive nutrients from fish excretions, and fish receive cleaner water from plant filtration and nitrogen-fixing bacteria. The purpose of this experiment was to compare a newly-started aquaponic system to a hydroponic system.*

*In order to accomplish this, two almost identical systems were assembled with a reservoir, a pump and a grow-bed. In the aquaponic set-up, a fish tank replaced the reservoir and a biofilter was used for solid waste removal. Over a two-month growth period, liquid fertilizer was added to the hydroponic system, while no liquid fertilizer was added to the aquaponic system. Water quality, fish growth, and dried plant biomass were measured every two weeks to see how the two systems compared. As expected, the plants in the hydroponic system outgrew those in the aquaponic system due to a higher concentration of nutrients. However, a few studies published in the last few years have shown that after*

*allowing an aquaponic system to establish a healthy bacterial colony, and ensuring that it has the correct stocking density and size of fish, plant growth in the aquaponic system may be almost exactly the same as that in the hydroponics system (Pantanella et al. 2010, Nichols and Savidov 2011).*

*In this experiment, there was a variety of factors that resulted in the hydroponic plants outgrowing the aquaponic plants. The primary reason was that the hydroponic system had a much higher concentration of nutrients. This was due to a low stocking density of small fish and too many water changes or additions due to evaporation, plant absorption and removal of settled waste. Small fish produce less waste, and with less waste, there are lower amounts of the nutrients that the plants can use readily. Furthermore, in allowing the system to run on its own, it tended towards a more acidic pH, which might have hampered the productivity of the bacteria and stressed the plants and fish. However, if given more time, the fish would grow larger, eat more and produce more waste, thus creating higher levels of nutrients and potentially resulting in identical plant growth in the two types of systems.*

## **2.0 Introduction**

An aquaponic system is a highly efficient, soil-less, ecosystem in which plants receive nutrients from fish excretions, and fish receive purified water from plants. Its counter-part, a hydroponic system, functions under the same principles, but instead of using fish and bacteria to create a mini ecosystem, it relies on substantial additions of synthetic nutrients in order to sustain plant growth.

The idea of growing food without soil is quite old and can be traced back to Aztec Indians raising plants on lake surfaces using floating reed rafts, and old Chinese farming techniques.

Modern aquaponics, however, evolved from the aquaculture industry, which had a need to both increase fish yields and conserve water (Jones 2002).

Aquaponics has undergone rapid change in efficiency and technology in the past decade (Nichols and Savidov 2011). Each system design has its own unique benefits and disadvantages with respect to the growth and maintenance of the three main types of organisms: plants, fish and bacteria. Currently, research is being undertaken to find the design with the highest efficiency and maximized nutrient utilization; this would help make aquaponics a truly viable form of agriculture.

The University of the Virgin Islands (UVI) has played a pivotal role in this process, through the teaching and research of aquaponics under the direction of Dr. Rakocy. The system design used in this experiment is based primarily on the plans previously developed at UVI (Rakocy et al. 2006).

Although previous studies have shown that fish waste does not provide all of the nutrients that plants require, with many systems needing supplementation of calcium, iron and potassium, most of the essential nutrients are supplied in aquaponic systems (Villarroell et al. 2011, Pantanella et al. 2010). In addition, many studies have demonstrated that the combination of plants and bacteria can efficiently remove or convert enough ammonia from fish water to maintain healthy living conditions for both the fish and plants (Tyson et al. 2011, Nichols & Savidov 2011). This research was initiated to examine which nutrients were present in an aquaponic system I designed, and to look at how those varying amounts would affect plant growth, by measuring the weight of the dried plant biomass after two months of growth.

Nile Tilapia (*Oreochromis niloticus*) were used in this sys-

tem because they are a fast-growing and hardy species that is commonly used in aquaculture (Rakocy et al. 2006). As outlined in a study by Pantanella et al. (2010), when starting both hydro- and aquaponic systems from the very beginning, the hydroponics system should see greater plant growth; this is to be expected because all of the plants' nutrient requirements are being met with the synthetic fertilizer that must be added. In a sense, the hydroponic system can be considered ideal for plant growth and I thus utilized it as the control, to which I compared the results from my aquaponic system.

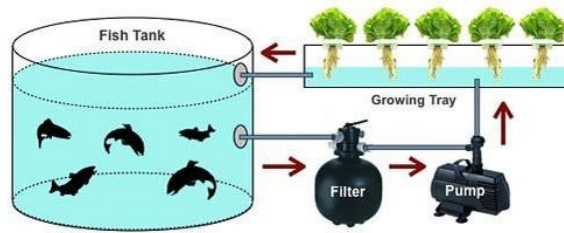
### **3.0 Materials and Methods**

#### *3.1 Overall Design*

The aquaponics design utilized in this experiment followed the general layout presented in Figure 1. Most commonly, circulating aquaponic systems are made using either a media-filled raised bed or a floating raft system; my system was a combination of both (Roosta & Hamidpour 2011). The fish tank was a rectangular 120 gallon (454L) glass aquarium, which held about 100 gallons (378L) of water on average, with a submersible pump placed inside. The biofilter was a three-tiered bucket system and the grow bed was a shallow reservoir that could hold just under 100 litres of water. The pump (Mondi, Pumping Capacity: 1200 gallons/hr or 4542L/hr) was the driving force for transporting water from the fish tank up into the swirl filter; after this, the whole system utilized passive transport through gravity filtration.

The biofilter was the most complex part of the entire system and was made up of two separate parts: a swirl filter (created from an old 20L water jug) and a bucket system (Figure 2). The swirl filter created an area of slowly swirling water, which allowed large particles of fish waste to settle down to the bottom;





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*Figure 1. Basic schematic of the aquaponic system set-up used with a 378L fish tank, a submersible pump, a 20L swirl filter and a 100L grow-bed*

this waste could then be removed by opening a valve at the base. The bucket system had three levels of filtration: the first bucket contained porous clay, the second had gravel, and the third had filter cloth. Each bucket had about 30 holes, each 1 cm in diameter, drilled in the bottom to allow water to flow through to the next level. The purpose of this complex biofiltration system was to remove differently sized particles of waste and allow as many bacteria as possible to colonize on the maximized surface area and break down the separated waste.

After the water went through the biofiltration process, it was then gravity filtered down through a valve on the bottom bucket and into the 100L grow-bed. A white plastic board was placed on top of the grow-bed, which had 25 slots for baskets with porous clay pellets to sit in. These baskets provided a growing medium, in addition to acting as a control to ensure that the plants did not receive any nutrients other than those being delivered by the water (Tyson et al. 2007). The water in the grow-bed was regulated by a flood-and-drain design, in which the water was allowed to fill to a certain point before triggering a drainage mechanism. This drainage mechanism was controlled by a bell-siphon that, when triggered, was responsible for passive drainage of the entire



*Figure 2. Biofiltration system: A raised 20L swirl filter(right) with inflow and out-flow water lines and a bottom valve for waste removal, and an open, three-tiered bucket filtration system (left). The the top bucket contained porous clay pellets, the second held gravel and the third had filter cloth and an outflow water line at the bottom.*

grow-bed; this drainage occurred about every 5 min 35 sec (Fox et al. 2010).

The hydroponics control system was set up in the same manner, but lacked the biofilter, as there was no need for the removal of solid wastes. The same pump model utilized in the aquaponic system was the driving force from the 100 gallons (378L) water reservoir to the grow-bed. The 100L grow-bed also had 25 basket slots and used a bell-siphon to passively drain the water back into the reservoir. Flow rates were adjusted using a series of valves in the water lines so that both the aquaponic and hydroponic grow-beds had a fill time of 5 min 35 sec.

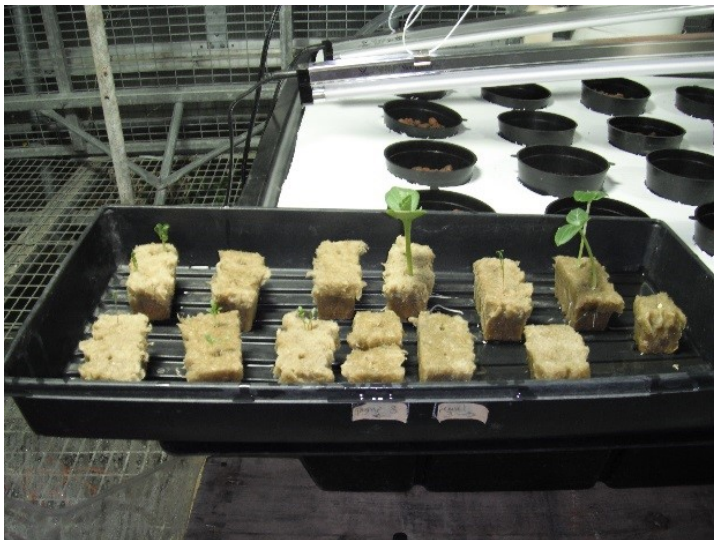
Both of these systems were placed in a mechanized greenhouse, in which humidity, temperature, and pests could be controlled. By using the greenhouse, many variables could be controlled, and very similar growth conditions could be maintained for both sets of plants. In the greenhouse, shade cloth was positioned above the plants to reduce excessive heat in the summer and the plants received supplemental sunlight through grow lights. The grow lights were on a 24 hour cycle for the first five weeks (during the vegetative growth stage) and then on a 12 hour cycle for the remaining five weeks (during the flowering stage).

### *3.2 Plants*

In order to see which plants would thrive in the conditions provided, seven different species were selected: nasturtium, zucchini, bean, cucumber, lettuce, tomato and chilli pepper. These species were chosen based on trials previously completed in a personal, hobby-scaled system, in which these types of plants were successful and showed healthy growth.

The seeds were planted in pairs in moistened moss cubes

(Figure 3) and placed in a small plastic incubator. Once the paired seedlings showed about 2 inches of growth, and roots were evident at the bottom of the cube, they were then placed into the baskets in the grow-beds of both systems. Seedlings that did not both germinate at approximately the same time were not used. To eliminate variation due to nutrient accessibility, plant placement was mirrored in both systems. After seedling placement, the plants were allowed to grow freely and no pruning or alterations were done.



*Figure 3. Moss cubes were placed in a small plastic incubator (plastic lid not depicted) under a set of 24 hr grow-lights for germination until 2 inches of green growth and strong roots were evident in paired seedlings.*

Liquid fertilizer was added to the hydroponics system as per the schedule laid out in Table 1 and 2; no liquid fertilizer was added to the aquaponic system. The nutrient composition and light schedule changed slightly from week 5 to week 6 in order to promote a maximized growth cycle for the plants.

		Week 1 (07/17/13)	Week 2 (07/25/13)	Week 3 (07/25/13)	Week 4 (08/08/13)	Week 5 (08/15/13)
Ultimate Grow A	ml/L	760	1140	1330	1330	1330
Ultimate Grow B	ml/L	760	1140	1330	1330	1330
Concentration		700ppm	1050ppm	1200ppm	1200ppm	1200ppm

*Table 1. Liquid fertilizer program (see appendix for composition) for vegetative growth cycle in a 380L (100gallon) hydroponic reservoir with 24 hr of supplemental light.*

		Week 6 (08/22/13)	Week 7 (08/27/13)	Week 8 (09/11/13)	Week 9/10 (09/21/13)
Ultimate Bloom A	ml/L	760	1140	1330	Harvest
Ultimate Bloom B	ml/L	760	1140	1330	
Concentration		850ppm	1200ppm	1400ppm	

*Table 2. Liquid fertilizer program (see appendix for composition) for flowering growth cycle in a 380L (100 gallon) hydroponic reservoir with 12 hr of light.*

### 3.2a Biomass

After a two month grow-out period, the above-ground biomass for each plant was harvested by cutting it where the stalk met the germination cube. The harvested plants were then placed in individual brown paper bags and put in the greenhouse to dry for about 4 weeks. The dried plants were weighed in their paper bags to obtain a measurement of total weight and then the plant matter was removed and just the paper bags were weighed. Above ground biomass was calculated by subtracting the paper bag weight from the total weight.

Harvesting the plants at the two month mark meant that most of the plants did not have time to produce fruits. Fruits are more difficult to dry and some of the plant species require cross pollination, which would have added more variables into the experiment.

### 3.3 Fish

The fish used in this experiment were warm-water Nile Tilapia (*Oreochromis niloticus*). This species was chosen because it is hardy, fast-growing and commonly used in aquaculture (Rakocy & Brunson 1989). The internal greenhouse temperature was set at 28 degrees Celsius; in the high summer (Mid-July to Mid-August) a chiller was used to keep the water consistently at that temperature if the greenhouse became too hot. Temperature has been shown to be a major metabolic modifier in tilapia and optimal growing temperatures are between 22 and 29 degrees Celsius (Mjoun & Rosentrater. 2010)

Prior to the arrival of the experimental fish, the tanks were pre-cycled using goldfish. By pre-cycling the tank, the presence of goldfish waste would allow bacterial colonies to establish in the biofilter, which meant that there would be fewer harmful ammonia spikes when the tilapia arrived. During the course of the experiment, ammonia levels were monitored and found to be consistently around zero.

A live fish transport permit was obtained from the Department of Fisheries and Oceans and the tilapia were shipped from NOA fisheries in Ontario to Kamloops. After 8 hours of transit in oxygenated water, the acclimatization procedures laid out by NOA fisheries were followed and the tilapia were settled in the tank (Appendix A). Stocking density of tilapia can be as high as 1lb per 7.5L with adequate levels of oxygenation (Rakocy et al. 2006). Only 30 fingerlings were stocked in the experimental tank to create a buffer zone in case there were any problems with the system design, which could result in low oxygen and fish mortality. The tank water was agitated and oxygenated by having a valve from the main pump line that allowed for some of the water being

pumped out of the tank to return. Air stones were the secondary form of oxygenation, in case the pump failed.

The tilapia were free-fed a high-protein commercial fish diet (Table 3, Appendix A: Figure A5 and A6), as appropriate for their maintenance and fast growth (Mjoun & Rosentrater. 2010). Over the course of the experiment, the feeding rates changed from 5g twice daily to 15g four times daily; this rate was established by free-feeding at the start of each week to observe how much the fish could eat in a single feeding. Feeding vigour is a good indicator of water quality, as well as of fish health (Rakocy & Brunson, 1989). Automatic feeders dispensed the amount at set times each day to ensure that feed was provided in small increments many times; so as to limit left-over food and ammonia spikes due to increased waste.

Water quality measurements (of dissolved oxygen (DO), conductivity, and temperature) were taken every few days with a YSI Professional Series (Pro 2030) water meter to ensure fish comfort. Ammonia, nitrites and nitrates were measured with an aquarium test kit (API 5 in 1 Test Strips).

Name	Size	Crude Protein (min)	Crude Fat	Crude Fibre (max)	Ash (max)	Energy MJ/kg	Moisture (max)
BioVita Fry	1.2mm	50%	22%	1.0%	13%	19.6	8.5%
BioOlympic Fry	3.0mm	50%	20%	1.0%	13%	18.8	8.5%

*Table 3. Approximate size and composition of fish feed from Bio-Oregon (see appendix for ingredients).*

As the plants grew, ions and water were absorbed at higher rates and thus, city water (at pH 7.2) was left to sit and dechlorinate and then added in increments of 6-10 gallons (22-38L) every week or as needed. If the water levels dropped too low for any reason, a bobbing sensor would shut the pump off.

### *3.3a Measuring fish*

To ensure that the fish were growing well, and subsequently producing enough waste for the plants to absorb, fish length and girth measurements were taken every 1-2 weeks.

To minimize stress when taking these measurements, ten fish were selected at random from the tank population and placed in a disinfected bucket with tank water. As they became larger, this was changed to two buckets to further minimize stress from crowding. These ten fish were individually netted and placed in a water filled device (Figure 4) and length and girth of each was measured with a ruler. Once the data was recorded, the fish was placed back into the main tank. The measurements were then averaged to represent the size of all of fish in the tank.

### *3.4 Water Samples*

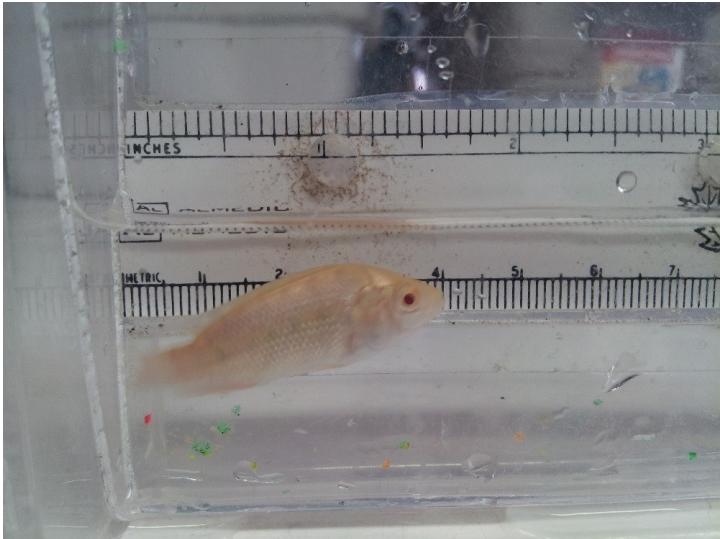
In addition to measuring water quality for fish, water samples were obtained from the hydroponics reservoir, as well as the fish tank every week or two to determine NO<sub>2</sub> and NO<sub>3</sub> levels using an aquarium kit (API 5 in 1 Test Strips). Water samples for these measurements were taken after additions of hydroponic nutrients to provide a better indication of the maximum amount of nutrients present.

## **4.0 Results**

### *4.1 Fish Growth*

The fish grew steadily over the two-month plant grow-out period, averaging an increase of about 2.5 cm in length per month (Figure 5).





*Figure 4. Young tilapia fry being measured (in cm) in an clear plastic measuring container.*

#### *4.2 Water Quality*

During measurement of water quality, I observed that dissolved oxygen (DO) concentration stayed in the 5-7 mg/l range in the area of the tank with the least agitation, so I assumed that the rest of the tank likely averaged approximately 6mg/L (Table 4). This was a more than adequate range for tilapia, as DO should be maintained at 5.0mg/L according to Rakocy & Brunson (1989). The water temperature was consistently 25-28 degrees Celsius, which, as mentioned previously, is the optimal growing temperature for tilapia. Conductivity, a measure of the concentration of dissolved solids, showed a steady decrease over the grow-out period (Table 4).

In the first few weeks, the nitrite (N02) levels were high

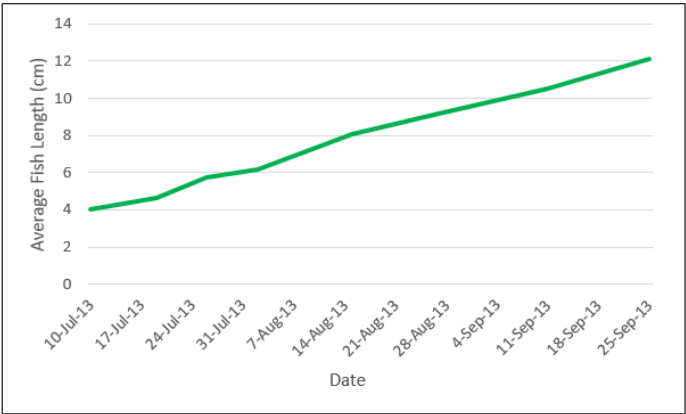


Figure 5. Average fish growth by length (in cm) over a two-month time period (n=10).

	DO (mg/L)		Temp (Celsius)		Conductivity (mS/cm)	
	Low	High	Low	High	Low	High
Week 1 (07/17/13)	5.79	6.87	23.6	25.5	0.2337	0.2879
Week 2 (07/25/13)	5.00	6.73	25.0	28.6	0.2168	0.2792
Week 3 (08/02/13)	5.18	6.63	25.7	28.3	0.2158	0.2296
Week 4 (08/08/13)	5.16	5.81	26.3	28.6	0.2124	0.3554
Week 5 (08/15/13)	5.25	5.63	21.0	28.0	0.1676	0.2083
Week 6 (08/22/13)	6.01	6.42	24.2	26.2	0.1512	0.1645
Week 7 (08/27/13)	5.81	6.62	20.8	26.0	0.1129	0.1303
Week 8 (09/11/13)	5.59	6.06	25.8	28.6	0.1259	0.1411

Table 4. Weekly dissolved oxygen, temperature and conductivity highs and lows; measurements taken at the area of the tank with minimal water movement using a YSI Professional Series (Pro 2030) water meter.

in the aquaponic system, but they then settled out to zero as the experiment progressed (Table 5). Nitrate (N03) stayed fairly consistent around 20-40 ppm over the duration of the experiment in the aquaponic system, which was well within the safe range for the fish. The hardness of the water stayed consistently around 75 ppm and alkalinity was steady at around 40 ppm. The pH experienced

some fluctuations, but again, as the system was allowed to run, it seemed to commonly be in the slightly acidic range.

On the other hand, the hydroponic system had high levels of most analytes, including both nitrites (10 or more mg/l) and nitrates (up to 200 mg/l). Hardness remained around 300 ppm and alkalinity around 40 ppm, which was similar to that of the aquaponic system. The pH was slightly more acidic at 6.2, compared to between 7.6 and 6.4 in the aquaponic system (Table 5). In harvest week (week 9), many of the hydroponic nutrient values were zero as no fertilizer was added and the plants absorbed the remaining nutrients from the previous week.

Date	NO <sub>3</sub> (mg/L)	NO <sub>2</sub> (Mg/L)	Hardness (ppm)	Cl (mg/L)	Alkalinity (ppm)	pH	
Week 1: 07/17/13	0-20	0.5-1.00	75-150	0	120-180	7.2	Aqua
Week 3: 08/02/13	20-40	1	150	0	40	7.6	Aqua
Week 3: 08/02/13	200+	10+	300+	0	0-40	6.2	Hydro
Week 5: 08/15/13	0-20	0	75	0	0-40	7	Aqua
Week 5: 08/15/13	160-200	10	300	0	0-40	6	Hydro
Week 7: 08/27/13	40	0	25-75	0	0-40	6.5	Aqua
Week 8: 09/11/13	20	0.5	25-75	0	0-40	6.2	Aqua
Week 8: 09/11/13	200+	10+	300	0	80	7.0	Hydro
Week 9: 09/21/13	20-40	0	25-75	0	40	6.4	Aqua
Week 9: 09/21/13	0-20	0	0	0	0-40	6.2	Hydro

*Table 5. Water quality measurements taken weekly/bi weekly over two months using an aquarium test kit (API 5 in 1 Test Strips). In week 9, no hydroponic nutrients were added because the plants were being harvested*

### 4.3 Plant Growth

As depicted in Figure 6, the hydroponic system showed greater plant growth for almost all plant types. Total biomass was calculated to be 1045.71g in the hydroponic system, compared to 258.83g from the aquaponic system (Figure 7).

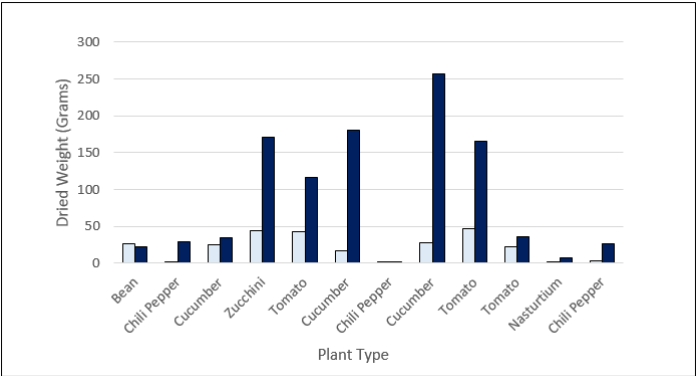


Figure 6. A comparison of the dried biomass (grams) of a variety of plants grown hydroponically (darker bars) and aquaponically (lighter bars) after a two month growth period.

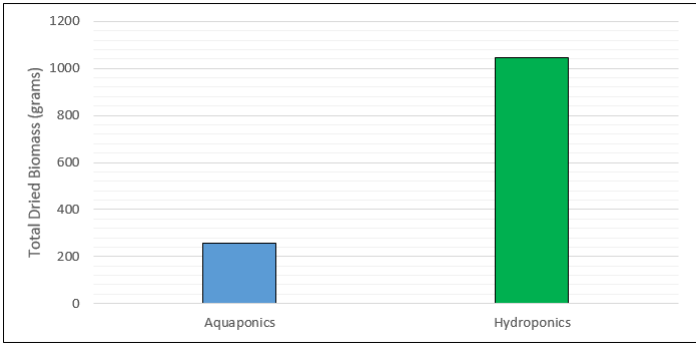


Figure 7. Total dried biomass for aquaponics and hydroponics.

## 5.0 Discussion

As expected, the hydroponic system showed greater plant growth for almost all plant types. Overall, the biomass was five

times less in the aquaponic system as compared to the hydroponic system. While the results of this experiment were similar to those of other studies outlining the initial growth rates of plants in newly started aquaponic and hydroponic systems, there are other studies showing almost identical growth rates between systems that have been allowed to cycle for longer periods of time (Pantarella et al, 2010; Nichols & Savidov, 2011). The mismatch between the experimental systems in this study could be an indication that the hydroponic system was functioning at maximum efficiency due to maximum nutrient input, while the aquaponic system did not have enough nutrients for the plants to thrive nearly as well. The nutrient levels could have been lower due to too many water changes or additions due to evaporation, plant absorption and removal of settled waste. Rakocy (2006) studies showed that if less than 2% of the water is exchanged, nutrient levels start to resemble those found in a hydroponic system. This aquaponic system had a water exchange rate of about 6% every week.

In the aquaponic system, pH tended to be more acidic due to high oxygen levels, which might have hampered the nitrification process, since nitrification occurs best at pH 7.5-8 (Savidov et al. 2007; Tyson et al. 2008). The acidity could have also stressed the plants and the fish, resulting in slower growth. Another factor that may have played a role in reducing plant growth in the aquaponic system was fish size and stocking density (Rafiee & Saad, 2005). Both were relatively low due to the nature of the experiment and the resources available. To increase fish density and growth there would have needed to be better oxygenation technology and increased feedings.

Zucchini, cucumber and tomato grew best in this experiment. This can be attributed to the fact that these plants have higher nutrient requirements and therefore are more efficient at absorbing the ions needed. This is why they are commonly grown in hydroponic greenhouses (Savidov et al. 2007). Differences in

growth among the plant species can be attributed to a few factors, such as access to light and whether or not they were being crowded by a neighboring plant. A study done by Roosta and Hamidpour (2011) also showed that many aquaponic systems are deficient in calcium and iron. There is a possibility that such deficiencies might have caused limited plant growth in this experimental setup as well. In future studies, capillary electrophoresis would be a good option for examining exact nutrient levels so as to determine if these or other nutrients might have been responsible for the limited growth in certain plants. Additionally, taking nutrient measurements at the inflow and outflow of the fish tank, biofilter and plant bed would help to clarify the relationships among nutrient availability, plant nutrient absorption and bacteria efficiency. There is also the possibility that the large root systems of some types of plants (e.g., cucumber) would dominate an area of the grow-bed, resulting in lower nutrient uptake by the plants with smaller root systems (e.g., nasturtium).

Use of greater amounts of porous clay in the grow-bed might lead to an increase in growth of nitrifying bacteria since the higher surface area provided by this type of clay allows for increased colonization. In addition, it would provide a greater zone for roots to benefit from the abundance of ions attracted to the surface charge of the clay (Graber & Junge. 2009; Tyson et al. 2007).

In general, my aquaponic system could use a number of improvements to yield better results, as mentioned above. In the future, it is likely that the plant growth rates could be very similar to those of hydroponic systems if some adjustments to pH were made, water was added less often, the feeding rate of fish was increased and the system was allowed to run for a longer time. Future longitudinal studies could be done to determine how long it takes for an aquaponic system to reach maximum efficiency and which factors contribute directly to the system having compa-

nable growth rates to the high-nutrient hydroponic counter-part (Nichols & Savidov. 2011). In addition, any nutrient deficiencies could be addressed by using a foliar application program, in which plant leaves are sprayed with solutions high in iron or calcium, enabling the plants to absorb those nutrients without causing negative effects on the fish. This was shown to be an effective strategy for aquaponic tomatoes in a study done by Roosta and Hamidpour (2011). It is likely that future studies in aquaponics will investigate the ability of mature aquaponic systems to match hydroponic systems and thus highlight how efficient aquaponics can be as a sustainable form of agriculture. From there, studies could be done to investigate the economic viability and reliability of systems that could be made completely sustainable though the use of solar panels and naturalized fish diets.

## **6.0 Acknowledgments**

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## 8.0 Appendix

### **Acclimation Instructions from NOA Fisheries**

It is important to quickly get your fish into their new tank as soon as possible. However, there are several important steps we suggest you take to ensure the acclimation process goes as smoothly as possible. As tempting as it may be, do not open the insulated container or fish bag inside the container until you are ready to begin the acclimation process. The container protects the fish from widely swinging temperatures, and the bag contains pure oxygen to make sure the fish are breathing easily inside. You should have the following prepared for the fish BEFORE opening the insulated container:

- Fish tank with dechlorinated water at a temperature of 78-84 degrees and a pH of 7.0-8.0. A 10 or 20 gallon aquarium will work quite well as a nursery tank for most orders.

- Heater. If you do not expect your tank water to maintain a CONSISTENT temperature of at least 78 degrees on its own, you will need a small aquarium heater. Set it to 82. It's an ideal temperature for young tilapia.

- Thermometer. To check the temperature on a regular basis.

- Air pump and airstone -To help oxygenate the water.

- Filter We recommend using an air powered sponge filter, but a water pump type will work fine as well, as long as you put some kind of material over the inlet that will still allow water to flow but also keep the small tilapia from being sucked up. Make sure the filter is not too big for your tank. Too much water current will stress the young tilapia.

- Light source

- Young tilapia need light to see their food. We suggest leaving it on 24/7 until they reach 1.5 inches in size.

Steps for Acclimating Your Tilapia:

1. Open the insulated container and carefully remove the bag of fish. The fish will likely seem a little lethargic. Don't panic. This is normal.

2. Place the sealed bag in the fish tank allowing it to float in the water for 15 minutes. This will allow the temperatures between the tank and the bag to equalize, preventing temperature shock.

3. with scissors carefully cut the bag removing the sealing band at the top.

4. Pour a cup of the tank water into the fish bag. After 2 minutes, pour another cup in. Wait another 2 minutes and pour another cup in. This will give the fish some time to adjust to any slight differences in pH.

5. Tip the bag over and gently pour the fish into the fish tank. Be careful not to trap fish in any creases. The fish will usually go to the bottom of the tank and stay there for an hour or two .DO NOT FEED THEM AT THIS TIME.

6. After two hours, the fish should be swimming around in the tank. Give them a pinch of appropriately sized food and watch to see if they eat. If they do not eat, you may have a problem with your water pH, temperature or oxygen level. If there is a problem, check every parameter you can test for and contact us with the results immediately. We'll do our best to try and help.

7. That's it! Enjoy your fish!

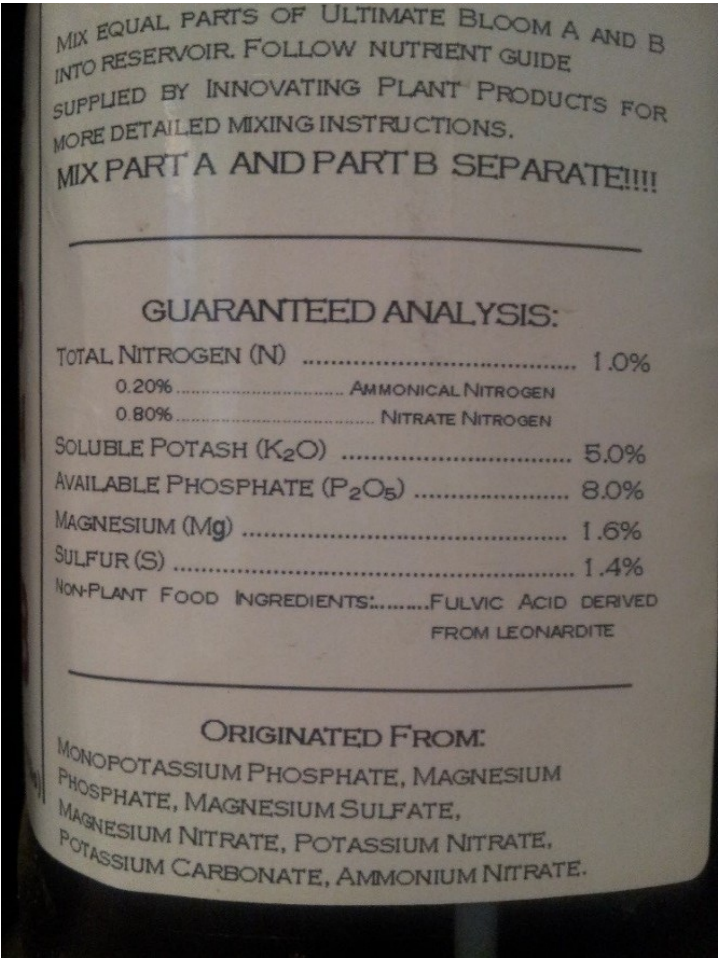


Figure A1. Ultimate Bloom B composition

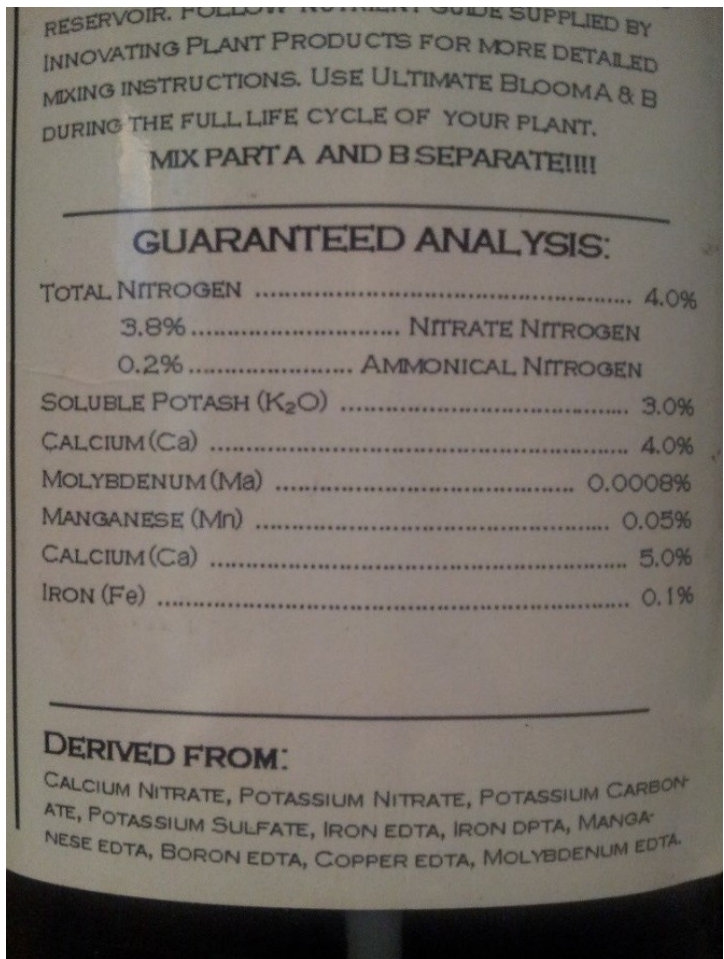


Figure A2. Ultimate Bloom A composition

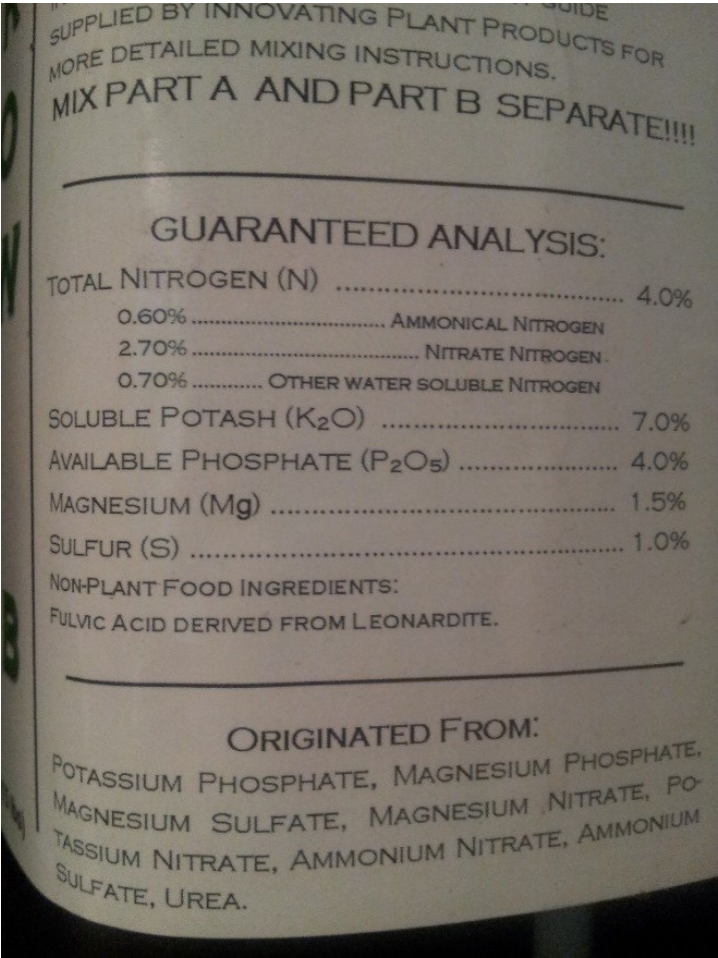


Figure A3. Ultimate Grow B composition

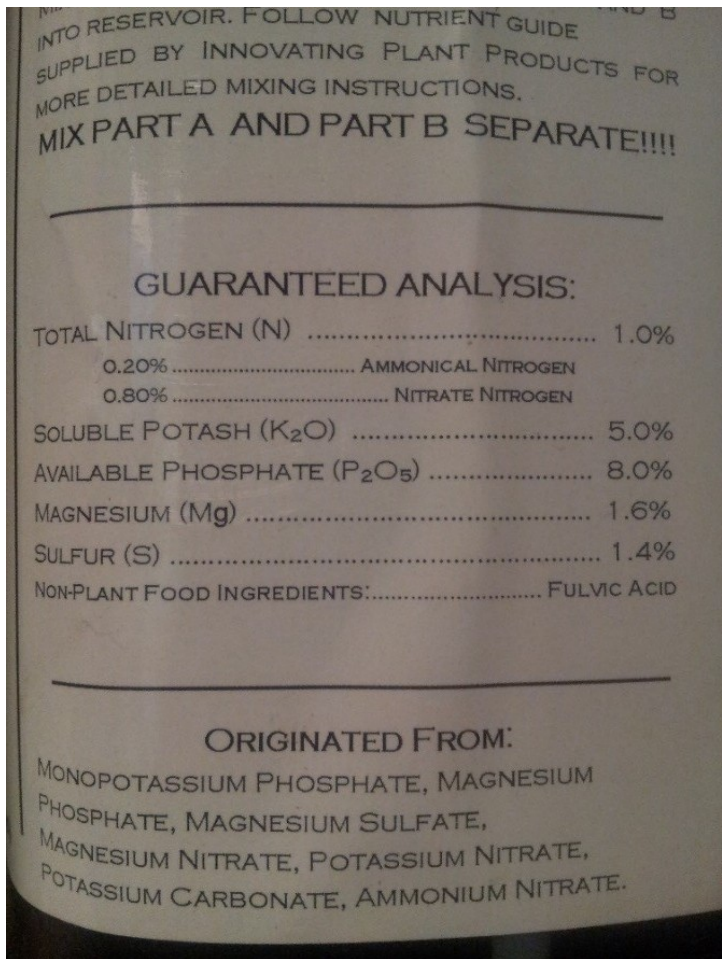


Figure A4. Ultimate Grow A composition



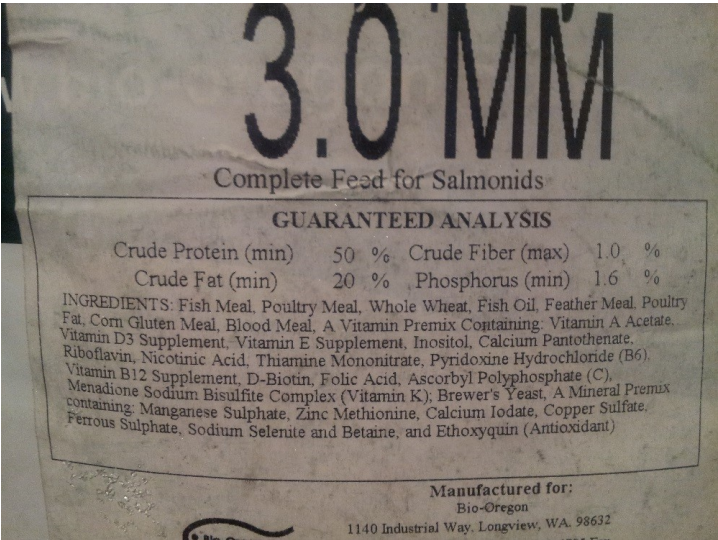


Figure A5. Ingredients for BioOlympic Fry 3.0mm.



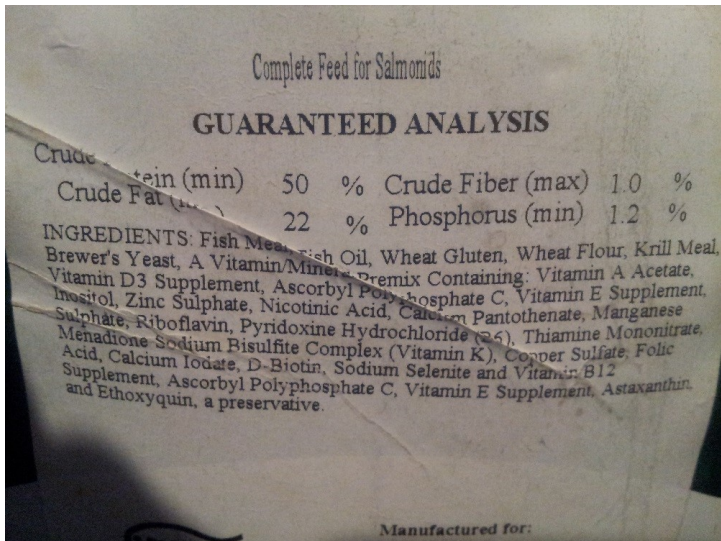


Figure A6. Ingredients for BioVita Fry 1.2 mm.

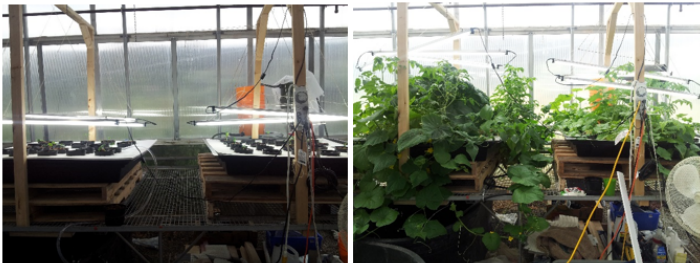


Figure A7. Beginning and end of hydroponics (left) and aquaponics (right) growth period.

## Synthesis of a Biphenyl Containing Different Tertiary Amide Directed Metalation Groups at the 4 and 4' Positions

Quinton Sirianni

### Chemistry

**Supervisor:** Dr. J. Norman Reed

**Co-Supervisor:** Dr. Bruno Cinel

**Abstract:** Directed ortho metalation (DOM) is a synthetic technique that allows for the relatively simple addition of an electrophile onto the ortho position of an aromatic ring. The technique requires a directed metalation group (DMG) to allow for deprotonation at the ortho site before electrophilic substitution occurs. While different DMGs have been studied in terms of their competitiveness towards one another, no study has compared the groups when they are both bonded to a biphenyl molecule. Thus, an attempt was made to synthesize a biphenyl molecule with two differing DMGs in order to use the molecule in future DOM competition studies. A commercial biphenyl (biphenyl-4,4'-dicarboxylic acid) was reacted with two different tertiary amines to form two differing tertiary amide DMGs on the biphenyl compound. The desired compound was then isolated and purified. Two different synthetic strategies to obtain the desired compound resulted in yields of 6.940% and 16.1% respectively. <sup>1</sup>H NMR spectra of the final products from both synthetic

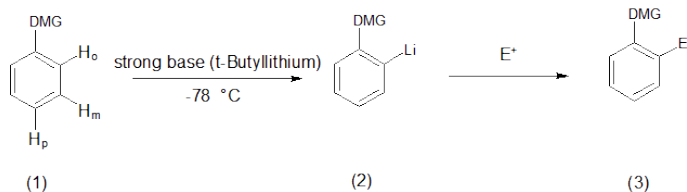
*strategies were used to confirm their identities as the desired compound. The desired compound was found to have a melting point at 206–209°C.*

## **Introduction:**

In the field of pharmacology, the search for new compounds that can be utilized as drugs is paramount to success. Ironically, the best way to search for new drugs is to look at the structures of well-known ones. Existing drugs are usually derived from natural products. They have common structures that are key to their effectiveness.<sup>1</sup>

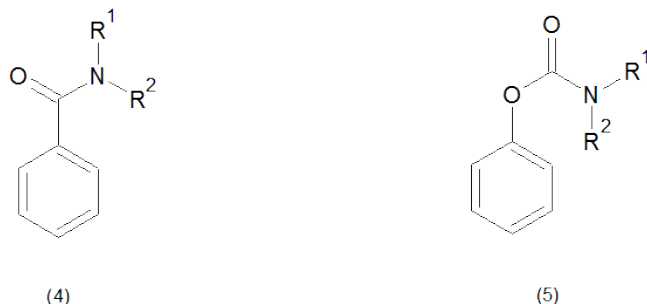
One common structure found in existing drugs is aromatic rings. These rings help to lock conformations of drug molecules so that they can match up with the steric requirements of their biological targets.<sup>1</sup> Thus, synthetic strategies that incorporate aromatic systems are of great interest to those trying to discover and synthesize new and exciting drugs.

Directed ortho metalation (DOM) is one synthetic strategy concerning aromatic systems. In general, the strategy involves the substitution of a metal cation (usually  $\text{Li}^+$ ) at the position ortho to the directed metalation group (DMG) by using a strong base (almost always an alkyllithium reagent).<sup>2</sup> The newly formed intermediate can then be exposed to an electrophile in order to perform a substitution at the ortho position (scheme 1). DOM is unique in that it allows a chemist to selectively target an electrophile to the ortho position of an aromatic ring. The reaction only requires a DMG and a strong base (such as t-butyl lithium). Other reactions that achieve a similar substitution pattern are more complicated and require steps such as using protecting groups.<sup>2</sup>



**Scheme 1:** General reaction pathway for a directed ortho metalation synthesis. The ortho hydrogen ( $H_o$ ) next to the DMG on compound 1 is removed under kinetic conditions using a strong base (usually an alkyllithium reagent). The intermediate compound 2 is then exposed to an electrophile. Electrophilic substitution at the ortho position yields compound 3.

One of the key aspects of DOM is the DMG that defines the ortho site on the aromatic ring. The DMG is a functional group that must coordinate the strong base into a complex which removes the ortho hydrogen and adds the metal cation.<sup>2</sup> In addition to this coordination ability, the DMG must also act as a poor electrophile with regards to the base used.<sup>2</sup> If the DMG is a good electrophile, the base will attack the DMG rather than deprotonate the ortho hydrogen as intended. Strategies used to reduce the electrophilicity of the DMG include increasing steric hindrance to prevent the strong base from contacting the electrophilic site. With these properties in mind, functional groups such as tertiary amides and tertiary carbamates present themselves as ideal candidates for DOM (figure 1).

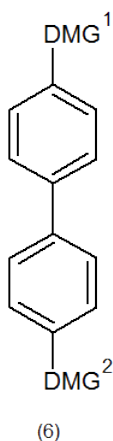


**Figure 1:** Example of the tertiary amide (compound 4) and tertiary carbamate (compound 5) DMGs. Note that the groups off of the nitrogen atom sterically hinder nucleophilic attack of the C=O electrophile.

Because there are only two main properties that define what functional groups can be used as DMGs, there are naturally many candidates. For example, variation of the R groups off of the tertiary amide functional group alone creates numerous possible DMGs based on a single common structure. In order to evaluate the effectiveness of these various different DMGs, competition studies have been performed.<sup>2</sup> One study in particular compared the intermolecular competitiveness of some common DMGs attached to benzene (secondary amides, tertiary amides, and benzyl alcohols).<sup>3</sup> The results show tertiary amides act as the strongest DMGs. In addition, there have been comparisons of DMG intramolecular competitiveness on single aromatic rings.<sup>2</sup>

Despite the competition studies mentioned above, there appears to be no reference in the literature regarding intramolecular DMG competition in compounds with more than one aromatic ring. In particular, there are no reported competition studies with two different DMGs attached to a biphenyl compound (figure 2). Such competition studies could reveal the extent of competition between two different DMGs with greater accuracy than the inter-

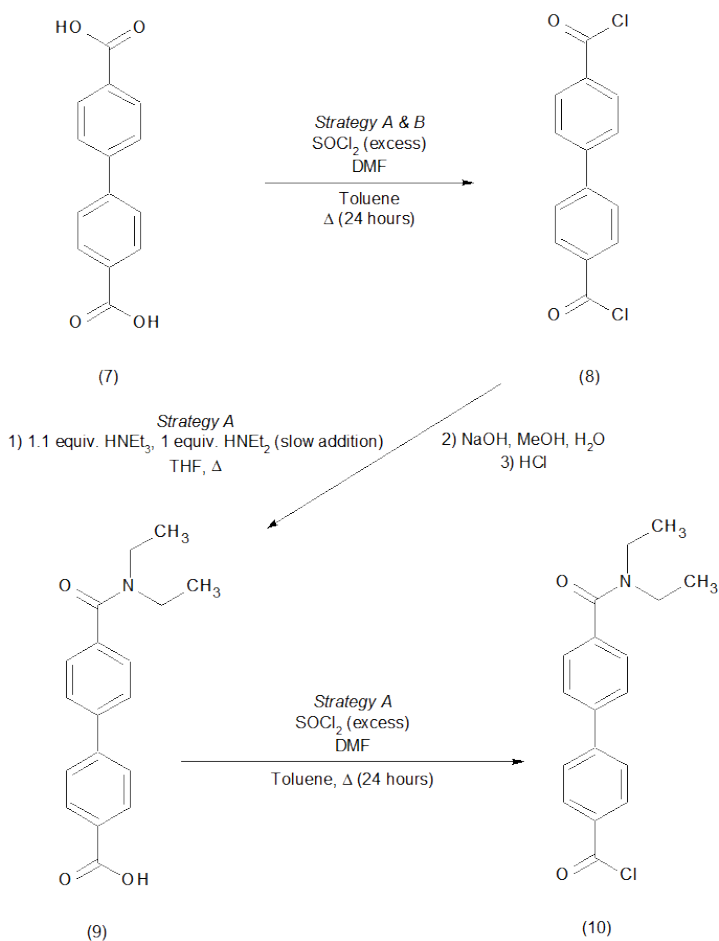
molecular study mentioned previously because the two DMGs are always near one another. Thus, both DMGs on the biphenyl are exposed to limited reagent at the same rate during the competition reactions. The intermolecular study, in comparison, may have revealed a particular DMG as the most competitive simply because it contacted and reacted with the limiting reagent before the competing DMG had a chance.

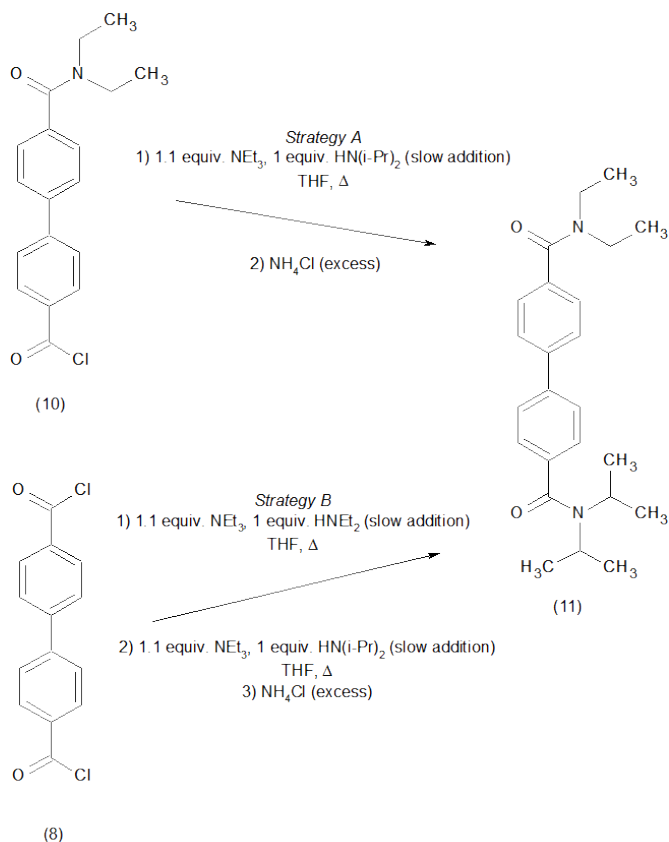


**Figure 2: A theoretical biphenyl compound that could be used to perform an intramolecular competition study between the two different DMGs attached.**

The goal of this project was to create a version of **6** that contained the well-known DMGs N,N'-diethylamide and N,N'-diisopropylamide. This new compound could then be used in an intramolecular DOM competition study. In order to create **6** with the selected DMGs, two different strategies were employed

(scheme 2). The desired compound **11** was isolated from each strategy with varying success and identified using  $^1\text{H}$  NMR.





**Scheme 2: Strategies for the synthesis of a biphenyl with differing DMGs (compound 11).** Strategy A was undertaken first and separates the by-products from the desired product via the intermediate formed (compound 9) Strategy B is a one-pot synthesis of compound 11. The desired product was purified from the by-products using column chromatography.



## Results & Discussion:

### *Strategy A*

Strategy A was the first synthetic strategy attempted in order to obtain **11** for competition studies. During the conversion of commercial compound **7** to **8**, 5.0064 g of the originally insoluble **7** became soluble in toluene during reflux. Removal of the toluene left a yellow-white residue that was assumed to be the crude product **8**. This crude residue was dissolved in THF and reacted with the first amine ( $\text{HNEt}_2$ ) to yield 3.212 g of a light-brown crude product **9**. This was recrystallized to give 0.9298 g of purified product.

Overall, these results give a yield of 15.13% and a percent recovery of 28.95%. The melting point of the purified product was determined to be 209-211 °C. A  $^1\text{H}$  NMR spectrum of the product was also obtained to confirm that the product was indeed **9** (figure 4).

Before proceeding, previously synthesized **9** was combined with the compound isolated thus far in an attempt to boost the yield of the final purified product. A combined mass of 1.2966 g of the tan-brown compound **9** was reacted with thionyl chloride to give a light brown solid (assumed to be **10**). This was then reacted with the second amine ( $\text{HN}(i\text{-Pr})_2$ ) and isolated to give crude brown crystals with a mass of 1.6495 g. The crude product (compound **11**) was purified using recrystallization to yield a mass of 0.7612 g.

The masses of the crude and purified products gave a yield of 45.87% and a percent recovery of 46.15%. Melting point determination gave a value of 206-209°C. Finally, a  $^1\text{H}$  NMR spec-

trum of the crude product was taken to confirm it was **11** (spectrum not shown).

All in all, strategy A was able to produce **11** successfully. However, the strategy had a very poor yield of the desired compound. Using the yields of the two different amine addition reactions, strategy A's overall yield was calculated to be only 6.940%. In addition, strategy A took a fair deal of time to perform and required more than one reaction flask to complete. The amount of final product yielded by this strategy (0.7612g of **11**) was not enough to perform any competition studies. Thus, the alternate strategy B was developed.

### *Strategy B*

Strategy B attempted to improve on strategy A's yield by containing the entire conversion process of **7** to **11** in one reaction flask. The use of only one reaction flask also reduced the time needed for the synthesis to be completed because there was no longer a need to isolate intermediate product **9** and react it with thionyl chloride. However, this strategy did necessitate the use of a chromatography purification step to separate and purify the final product **11**.

As with strategy A, a mass of compound **7** (10.3 g) was reacted with thionyl chloride to give a crude yellow-white product (assumed to be **8**). This product was then reacted with each amine in tandem without separating out the intermediate **9** to yield a dark-brown crude product **11** with a mass of 14.3 g. Compound **11** was separated and purified from the by-products of the reaction using normal phase column chromatography. A mass of 2.60 g of purified **11** was collected.

Looking at the masses of the crude and purified products, the yield was determined to be 16.1% whereas the percent recovery was determined to be 18.2%. A  $^1\text{H}$  NMR spectrum of the purified product was also obtained to confirm it was **11** (figure 5).

Overall, strategy B improved the synthesis by yielding more than twice the amount of desired product in less time and with less effort than strategy A. Improvements to strategy B should focus on the amine reactions in order to further reduce the by-products of those reactions. Regardless, enough **11** was produced by strategy B to be able to perform DOM competition experiments.

#### *Evaluation of compound 11*

As mentioned previously, both of the purified products from strategies A and B were evaluated by  $^1\text{H}$  NMR spectroscopy to confirm their structure as that of compound **11**. The  $^1\text{H}$  NMR spectra of **11** were then compared against the spectra of previously synthesized biphenyls containing either two N,N'-diethylamide DMGs or two N,N'-diisopropylamide DMGs (figure 6). It is readily apparent in this comparison that **11** is different from either of the other two compounds because **11**'s spectra has 4 aromatic doublet peaks; the other compounds only have 2 aromatic peaks due to the plane of symmetry that separates the two benzene rings. Noteworthy as well is the appearance of an aromatic doublet overlap in **11**'s spectra. This overlap is not present in the other spectra despite all of the compounds having a similar structure. This phenomenon was explored further.

To attempt to explain the overlap phenomenon, a higher concentration of **11** was analyzed using  $^1\text{H}$  NMR. The overlap

seemed to disappear and the peaks became more resolved when concentration of the compound was increased (figure 7). The same effect was also observed when the temperature of the NMR probe was increased. These results suggest that as the molecules of **11** come in closer contact with one another, they interact in a way that changes the chemical shifts on the NMR. Further study is needed.

### **Conclusion:**

In summary, two synthetic strategies were devised and implemented to successfully synthesize compound **11**. Strategy B was found to be the most promising due to its simple single-pot synthesis and minimal requirement of time. Furthermore, strategy B allows for the collection of all by-products of the synthesis during the column elution step if so desired. Hopefully strategy B can be refined to produce greater quantities of **11** in the future for DOM competition studies.

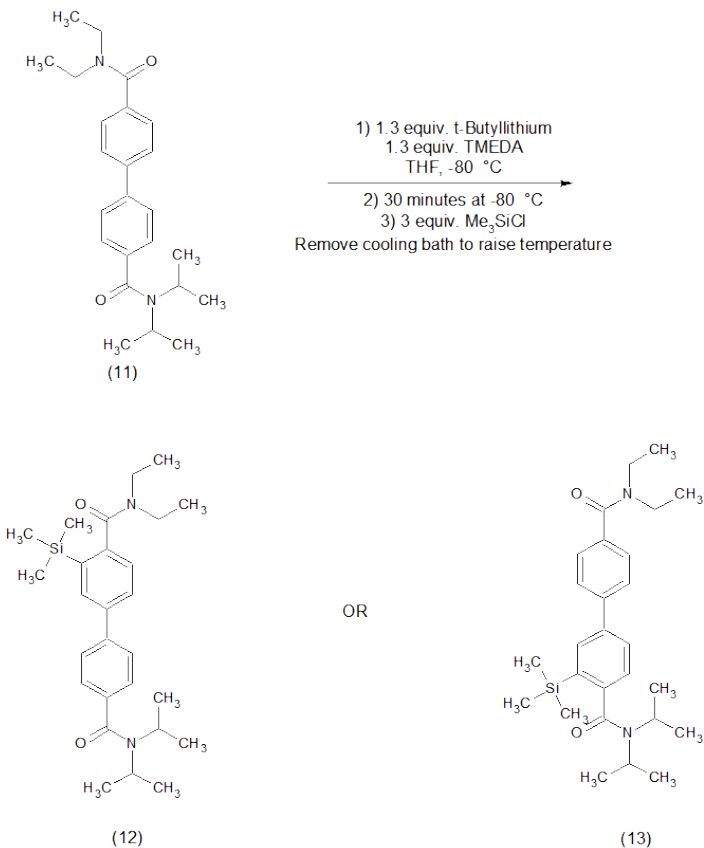
In addition to the development of strategy B, analysis of **11** by  $^1\text{H}$  NMR spectroscopy has revealed an aromatic peak-overlapping phenomenon that appears to be concentration and temperature dependent. Such a phenomenon is not seen in similar molecules and thus warrants further study.

### **Future Work:**

While this project was fairly simple and isolated in scope, it has spawned many ideas for future projects.

Firstly, competition studies of compound **11** are naturally the next step in investigating the compound and the competitiveness of its DMGs. A DOM reaction with a limited amount of base followed by an electrophile quench would reveal the nature

of the DMGs by the products produced. Such a reaction would be performed using the conditions established by Yiu and Reed (unpublished results). This reaction and its conditions are shown in scheme 3.



**Scheme 3: Theoretical competition reaction that could be performed on compound 11. The electrophile used can end up in one of two differing ortho positions depending on the strength of each DMG.**

Considering the two possible DOM products shown in scheme 3, it is speculated that compound 12 will be the major

product of the DOM reaction because the N,N'-diethylamide DMG is less sterically hindered than the other DMG. Once the reaction is completed, the major and minor products will have to be identified using  $^{13}\text{C}$  NMR spectra and possible NOESY spectra in order to establish which DMG the electrophile substituent is next to.

Secondly, experiments concerning the physical properties of **11** may reveal interesting results. Specifically, x-ray crystallography and serial dilution studies of the compound coupled with  $^1\text{H}$  NMR investigation may reveal exactly why the aromatic overlap in the  $^1\text{H}$  NMR spectra of this compound occurs. Furthermore, the synthesis and study of related compounds (figure 3) would reveal whether this overlap phenomenon is isolated to **11** or affects similar molecules as well.

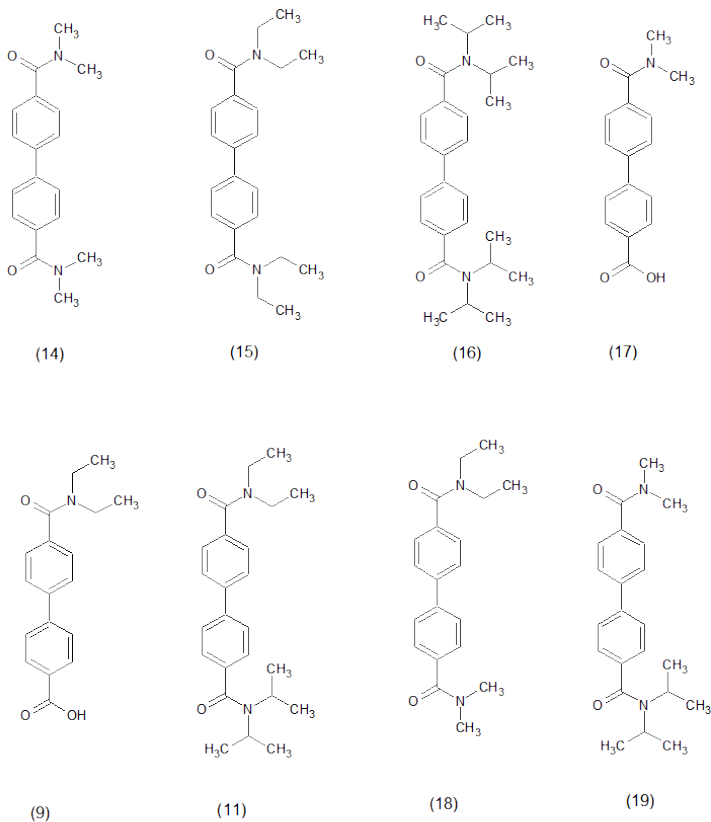


Figure 3: Structures of possible biphenyl compounds that could be synthesized and compared with compound 11 to see if the aromatic overlap phenomenon exists in similar molecules.

## Methods:

*Two different strategies were employed in the attempt to synthesize compound 11. The methods described in this section are thus annotated to*



*reflect whether they were employed in strategy A or strategy B (scheme 2).*

### **Conversion of biphenyl 7 to acid chloride 8**

#### *Strategy A*

A mass of 5.0064 g of commercial compound 7 was loaded into a 250-mL round bottom flask along with a magnetic stir bar. The compound was dissolved in 60.0 mL of toluene before 23.0 mL of thionyl chloride was added to the mixture. A small amount of DMF catalyst (1.5 mL) was added and the mixture was allowed to reflux for 24 hours. Reflux was performed with a  $\text{CaCl}_2$  drying tube to minimize water from the air contacting the reaction mixture.

Toluene was removed from the reaction mixture afterwards via vacuum distillation. More toluene was added and removed via vacuum distillation to ensure all unreacted thionyl chloride was removed from the reaction mixture. The resulting compound was then allowed to dry under vacuum until needed.

#### *Strategy B*

A mass of 10.03 g of commercial compound 7 was loaded into a 500-mL round bottom flask along with a magnetic stir bar. The compound was dissolved in 120.0 mL of toluene before 50.0 mL of thionyl chloride was added to the mixture. A small amount of DMF catalyst (3.0 mL) was added and the mixture was allowed to reflux for 24 hours. Reflux was performed with a  $\text{CaCl}_2$  drying tube to minimize water from the air contacting the reaction mixture.

Toluene was removed from the reaction mixture after-

wards via vacuum distillation. More toluene was added and removed via vacuum distillation to ensure all unreacted thionyl chloride was removed from the reaction mixture. The resulting compound was then allowed to dry under vacuum until needed.

### **Conversion of acid chloride **8** to compound **9** (*strategy A*)**

Compound **8** was dissolved in ~105 mL of THF and placed in a reflux apparatus with a CaCl<sub>2</sub> drying tube. Some heat was applied to ensure all of **8** had dissolved. A pressure-equalizing dropping funnel was used to introduce 3.2 mL of NEt<sub>3</sub> all at once into the reaction mixture. After rinsing the dropping funnel with more THF, 2.2 mL of HNet<sub>2</sub> was added to the reaction mixture dropwise in an effort to prevent a single molecule of **8** from reacting twice with the reagent. The dropping funnel was again rinsed with THF and the reaction was allowed to stir for 4 days. The mixture was then refluxed for an hour to ensure the reaction had completed.

To separate the desired product **9** from by-products and unreacted starting material, the reaction mixture was first exposed to vacuum filtration with Celite to remove the salt by-products. The filtrate was then vacuum-distilled to remove the THF. Methanol (~100 mL) and 0.5 M NaOH (~100 mL) were added to the filtrate and the filtrate was allowed to stir for 2 days. A short reflux of the reaction mixture (~4 hours) was then performed before stirring the reaction mixture for another 2 days. Methanol was removed from the reaction mixture using vacuum distillation. The residue from this distillation was washed into a separatory funnel using ~50 mL of 0.5 M NaOH. The residue was then rinsed using three aliquots of ~30 mL of CH<sub>2</sub>Cl<sub>2</sub> and the aqueous layer was collected. The aqueous layer was subjected to vacuum distillation to remove any traces of CH<sub>2</sub>Cl<sub>2</sub> and cooled in an ice bath

afterward. Finally, the desired product was precipitated from the aqueous layer using 6 M HCl and collected via vacuum filtration. The crude product was purified by a mixed solvent recrystallization (methanol/H<sub>2</sub>O).

The product **9** was characterized using both melting point temperature as well as by <sup>1</sup>H NMR spectroscopy.

### **Conversion of compound 9 to compound 10 (strategy A)**

Compound **9** was converted to compound **10** using the same reflux and vacuum distillation procedure that was used to convert **7** to **8**. In summary, 10.0 mL of thionyl chloride, 50.0 mL of toluene, and 1.0 mL of DMF were used. A total of 1.2966 g of **9** was used (collective amount from this experiment and a previous attempt to make **9**).

### **Formation of product 11 from compound 10 (strategy A)**

Compound **10** was dissolved in 50.0 mL of THF in a 250-mL round bottom flask. The flask was then placed in a reflux apparatus with a CaCl<sub>2</sub> drying tube. A pressure-equalizing dropping funnel was used to introduce 0.75 mL of NEt<sub>3</sub> to the reaction mixture. After rinsing the dropping funnel with more THF, 0.75 mL of HN(i-Pr)<sub>2</sub> was added to the reaction mixture. The dropping funnel was again rinsed with THF. The reaction was allowed to stir for 30 minutes before being refluxed for ~3 hours.

To isolate the final product, the reaction mixture was mixed with a saturated NH<sub>4</sub>Cl solution and the THF was removed using vacuum distillation. Once the THF was removed, the mixture remaining was added to a separatory funnel along with 50

mL of  $\text{CH}_2\text{Cl}_2$ . The organic layer of this separation was collected and the extraction was performed two more times with 50 mL aliquots of  $\text{CH}_2\text{Cl}_2$ . Saturated NaCl solution was added to the separated organic layer and another extraction was performed in order to remove more water from the organic layer. Finally, the organic layer was mixed with anhydrous  $\text{Na}_2\text{SO}_4$  until dry. Gravity filtration was used to collect the organic layer. The solvent was removed by rotovap in order to isolate the crude compound **11**. The crude product was then recrystallized using a mixed solvent (EtOAc/Hexane) and vacuum filtered to yield the final product.

This product was characterized with melting point temperature, thin layer chromatography (TLC), and  $^1\text{H}$  NMR spectroscopy.

### **One pot synthesis of compound 11 from compound 8 (*strategy B*)**

Compound **8** was dissolved in ~300 mL of THF and placed in a reflux apparatus with a  $\text{CaCl}_2$  drying tube attached. A pressure-equalizing dropping funnel was used to introduce 6.4 mL of  $\text{NEt}_3$  into the reaction mixture all at once. After rinsing the funnel with THF, 4.4 mL of  $\text{HNEt}_2$  was added dropwise into the reaction mixture. The funnel was rinsed again with THF. The mixture was then refluxed for an hour and was left stirring.

After a week's time, 6.4 mL of  $\text{NEt}_3$  was added to the reaction mixture using the dropping funnel. After rinsing the funnel with THF, 4.4 mL of  $\text{HN}(\text{i-Pr})_2$  was added dropwise to the reaction mixture while the mixture was refluxing. The flask was again rinsed with THF. The mixture was allowed to reflux for an hour.

The THF in the round bottom flask was removed via vacuum filtration and saturated  $\text{NH}_4\text{Cl}$  was added to the reaction mixture. A ~100 mL aliquot of  $\text{CH}_2\text{Cl}_2$  was used to perform a phase separation. The organic layer was collected and the extraction repeated two more times with ~100 mL aliquots of  $\text{CH}_2\text{Cl}_2$ . The organic layer was then washed with saturated  $\text{NaCl}$  solution and separated from the aqueous layer. Finally, the organic layer was gravity filtered through a layer of anhydrous  $\text{Na}_2\text{SO}_4$  to ensure dryness. The  $\text{CH}_2\text{Cl}_2$  solvent was removed by rotovap to give the crude product. This product was dried under high vacuum.

To purify **11** from the crude mixture, a normal phase silica gel column was set up with a 100% hexane solution. The crude compound was mixed with silica gel in a 2:1 ratio by mass and the resulting powder was added onto the top of the column. The column was run under air pressure in order to perform medium pressure liquid chromatography (MPLC). Aliquots of 300 mL of solvent were used for each run of the column and the eluent was collected in test tubes (aliquots listed in table 1). Eluents were checked using TLC to determine which test tubes contained **11**. The test tubes that contained **11** were pooled and evaporated using the rotovap to yield the product.

**Table 1: Solvents used to elute compound 11 from the MPLC column. An aliquot of 300 mL of each solvent was used in succession of one another. Compound 11 was collected during the 9<sup>th</sup> aliquot.**

Aliquot Number	Solvent Composition
1	10% EtOAc/90% Hexanes
2	20% EtOAc/80% Hexanes
3	25% EtOAc/75% Hexanes
4	30% EtOAc/70% Hexanes
5	40% EtOAc/60% Hexanes
6	50% EtOAc/50% Hexanes
7	60% EtOAc/40% Hexanes
8	70% EtOAc/30% Hexanes
9	80% EtOAc/20% Hexanes

### Melting point, TLC, and <sup>1</sup>H NMR

Melting points were determined using a MelTemp apparatus.

TLC was performed by spotting silica gel plates and using a solvent solution made up of 50:50 EtOAc/hexanes to develop the plates.

<sup>1</sup>H NMR was performed using a Bruker Avance III Ultra-shield 500 MHz NMR instrument. CDCl<sub>3</sub> with TMS standard was used as a solvent for **11** while deuterated DMSO was used for **9**. The spectra were collected at room temperature.

## Appendix of Spectra:

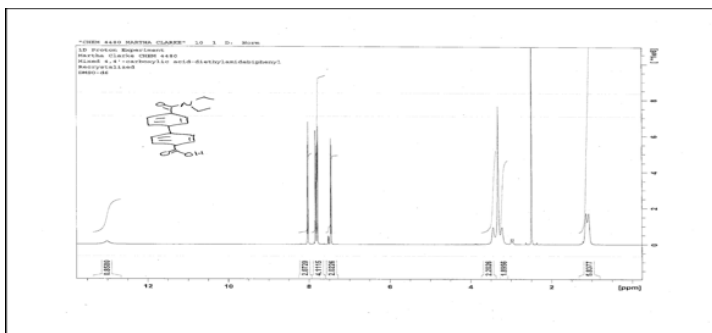


Figure 4: <sup>1</sup>H NMR (500 MHz in DMSO-d<sub>6</sub>) spectrum of compound 9. Note the 4 aromatic doublet peaks and the downfield broad alcohol OH peak characteristic of the compound.

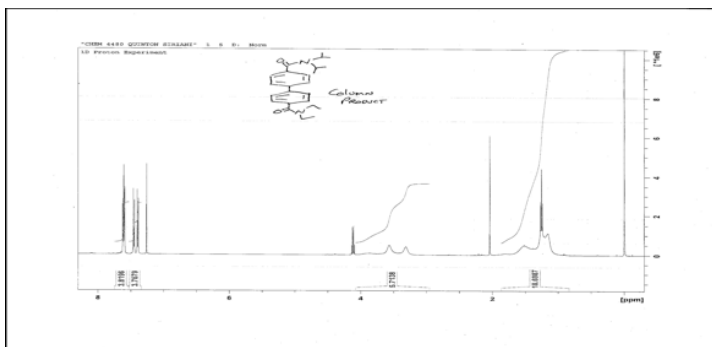


Figure 5: <sup>1</sup>H NMR (500 MHz in CDCl<sub>3</sub>) of the final product (compound 11 from synthetic strategy B). Note the significant doublet overlap between two of the aromatic hydrogens.

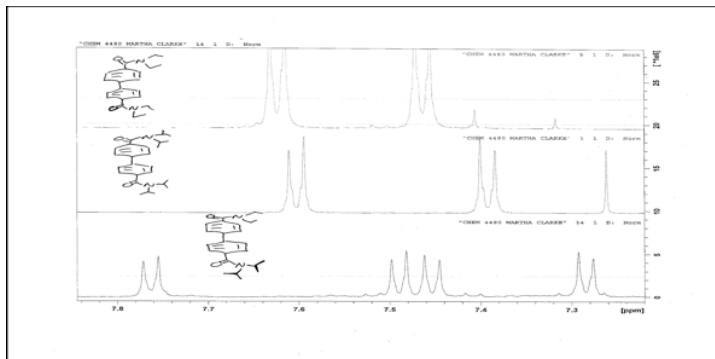


Figure 6: Comparison of the expanded <sup>1</sup>H NMR spectra (500 MHz in CDCl<sub>3</sub>), focusing on the aromatic hydrogens of compound 11 (bottom) with those of related biphenyls. It is quite easy to notice the overlap in the aromatic hydrogens in compound 11 that are absent from the other two related compounds. In addition, it is notable that the aromatic peaks are at such vastly different chemical shifts in compound 11 when compared to those in the other compounds despite the similarity in structure between all three species.

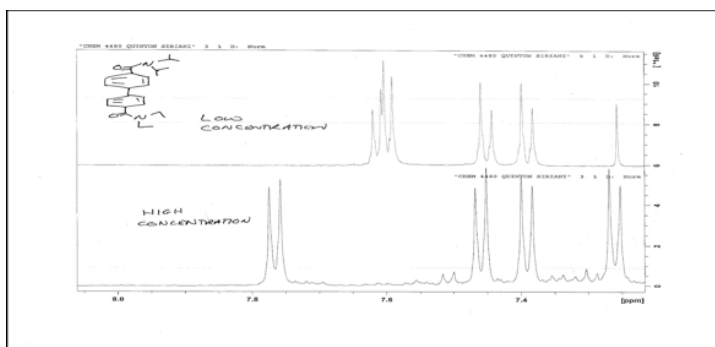


Figure 7: <sup>1</sup>H NMR spectra (500 MHz in CDCl<sub>3</sub>) of the aromatic peaks of compound 11 at high and low concentrations. Note the separation of the overlapped peaks when the concentration is increased, suggesting interactions between the compound molecules not seen in other related species.

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## “With the Dragon Wrapped Around Us”: Examining the Creation of an Online Discourse while Negotiating Fibromyalgia

Ashley Berard, BA & Meredith Burles, PhD

### Sociology

**Supervisor:** Meredith Burles

**Abstract:** *This presentation will be based on a small study of an online community that focuses on life with the chronic syndrome, Fibromyalgia. This research seeks to understand the creation of an online discourse by individuals negotiating daily life with the condition. Fibromyalgia is characterized by widespread pain, abnormal sleep, fatigue and cognitive dysfunction, as well as many related symptoms. In the medical field, the validity and source of the symptoms and condition have been questioned. The research focuses on how individuals with a diagnosis of fibromyalgia cope with this uncertainty by relying on online spaces where they can discuss and draw on supportive interactions and resources. A qualitative discourse analysis is being performed to examine the illness experiences and use of technology. The goal of the research is to understand the importance of individual experiences and social constructions in an area that is frequently studied through a medical model.*

## Introduction

Fibromyalgia affects 2 to 4% of the Canadian population (Fitzcharles & Yunus, 2011). The condition is mostly characterized by widespread pain, abnormal sleep, fatigue and cognitive dysfunction as well as many related symptoms. Fibromyalgia most often affects women and the general age range of a diagnosis is between 30 and 40 (Fitzcharles & Yunus, 2011 & Fitzcharles, Ste-Marie, & Pereira, 2013). Previous research on this condition is both medical and sociological in nature. In regards to a medical standpoint, the research makes clear that fibromyalgia is contested in regards to its cause, symptoms and even existence. However, the condition is still being diagnosed. Sociological research surrounding this condition has focused on the history of medical development and concepts surrounding the disorder, as well as the social meanings assigned to fibromyalgia.

Taking a sociological approach to studying chronic illness is important because it provides us with tools that allow us to see illness from a perspective other than the dominant medical construction. From a medical standpoint, while fibromyalgia is being diagnosed, it is not fully understood, so in regards to causes, symptomology or treatment, the information is not yet developed. This opens up an important area to study; if individuals are given a diagnosis that conveys a lack of information, what tension does this create for them? My study seeks to answer that question by examining a social space, an online support group, where individuals are able to speak freely about their illness and the challenges they face when living with a disease that is not well-understood.

This paper will discuss the findings of that qualitative study. First, a brief overview of sociological literature regarding fibromyalgia and chronic illness will be discussed. I will then describe the methods and design of the study. Key findings and

themes that emerged out of an analysis of the data will conclude the paper.

## **Literature Review**

Fibromyalgia syndrome (FMS) is a chronic and contested illness that primarily affects women. The main symptoms of the illness include widespread pain and fatigue, but a multitude of other symptoms are associated with FMS. The illness has high comorbid rates with other conditions like irritable bowel syndrome, depression, and anxiety (Fitzcharles & Yunus, 2011). A fibromyalgia diagnosis relies heavily on the patient's subjective experience due to a lack of concrete diagnostic criteria (Wolfe & Hauser, 2011), which leads the illness to be questioned in terms of its actual existence. Sociological research has focused on what the impact is for those living with a condition that is contested from a biomedical standpoint. In reviewing previous literature, a few key themes were identified. These include: the nature of the contested illness, the stigma around the illness, the impact on patient's identity, and the need for support.

### *The Contested Nature of Fibromyalgia*

From a biomedical perspective, fibromyalgia has been highly contested and questioned with respect to its cause or even its validity. The cause of fibromyalgia remains unclear, but "there is evidence for a genetic predisposition, abnormalities in the stress response system and possibly triggering events" (Fitzcharles et al., 2013, p 646). Many of the symptoms of the illness are viewed as subjective, leading to a diagnostic process that relies heavily on patients' interpretation or experiences. As well, criteria for diagnosis have varied over the past decade. Therefore, receiving a diagnosis can be a long and confusing process for those living with the illness. Many individuals with fibromyalgia have difficulty main-

taining the activities of daily life, such as work. However, disability or financial aid most often needs to be validated by a medical practitioner, which can raise challenges for both practitioners and patients when established criteria continue to change or remain highly subjective (Wolfe et al., 2011).

### *Receiving a Diagnosis*

The diagnosis plays a major role in the way individuals construct their illness experience. As Madden & Sim (2006) found in their study of individual experiences of diagnosis with fibromyalgia, “FMS appears to be an empty diagnosis; it conveys information, but little understanding” (p. 2966). The lack of meaning in a diagnosis impacts those who receive it in that some of the participants of this study had not even heard of the syndrome when they were diagnosed, and struggled to find information about it. Furthermore, because of the lack of understanding, participants tried to find their own lay understanding of the biomedical cause by trying to pinpoint their illness to an event in their life, like a car crash, that had occurred years earlier (Madden & Sim, 2006). In other studies, the diagnosis of fibromyalgia actually provided relief because patients were then able to give a name to their pain, which then validated their experiences. As Soderberg, Lundman & Norberg (1999) described, “It was a good thing that the illness was named, because according to the women, this [meant] that the illness exists” (p.580). Although the diagnosis can provide relief or validation, many previous studies found that women struggled in their encounters with health professionals to be heard, believed, or understood. In that same study, Soderberg et al. (1999) found that participants perceived a loss of credibility because they were not always believed or taken seriously when discussing their complaint of pain or illness, which lead to serious challenges.

### *The Role of Stigma*

Once patients received a diagnosis, living with the condition seemed to be physically difficult, and also emotionally challenging due to stigma around the condition. For example, Asbring and Narvanen (2002) argue that stigmatization is a major burden on women living with chronic illness and that “to be accused of lying can be more of a burden than the illness itself” (Asbring & Narvanen, 2002, p.152) because the illness is not commonly known, visible, or fully understood. A common theme in the literature was in regards to individuals negotiating their appearance and being careful about how they presented themselves, including whether to reveal their symptoms, and to whom. For example, Hallberg and Carlsson (2000) indicate that “some women did not show signals of pain during the interview and said that they never showed their family and friends that they were in pain: they tried to hold the pain within themselves” (p. 9). Some literature described how women had to conserve energy in order to attend certain social events or work, only to spend the rest of their time needing to recover their energy (Asbring et al., 2002 & Asbring, 2001). As such, individuals with FMS may seek to manage their appearance and behaviour as a way to minimize the stigma that they encounter.

### *Identity Disruption and Formation*

Another major theme in previous literature on fibromyalgia is that of the construction of an identity with illness. The onset of chronic illness caused a disruption in many women’s identities and negotiating this change seemed to be a struggle. Forming a new identity sometimes occurred, which came with its own set of challenges. As Soderberg et al. (1999) write, “living with [fibromyalgia] means having a life greatly influenced by illness...the women appeared to be involved in a struggle, and life

appeared to be heavy” (p.578). Many studies talked about a disruption in women’s lives or identities with the onset of fibromyalgia (Asbring, 2001; & Barker, 2002). Within this disruption, participants found that they were no longer able to do activities that used to be common in their daily lives, which led to a change in, or lessening of, identity understanding. Work appeared to play a major role and when women could not work, they had a more difficult time coming to terms with their altered abilities (Asbring, 2001). The way that women constructed their bodies in relation to illness was important as well. Bodily changes required women to shift their days, in terms of needing to conserve energy for certain events or daily activity like work (Asbring, 2001).

### *Online Support Groups*

Due to the contested nature of fibromyalgia, as well as the issues around stigma and identity, it is important to understand where individuals seek out support or help. One possible site of support is online support groups. Barker’s (2008) study analyzed an online support group website for users living with fibromyalgia. She believes that electronic support groups are becoming a major aspect of health and illness in terms of their role in generating lay understandings, and yet surprisingly there is little research done in this area. One important finding of her research is how “sufferers are steadfastly committed to framing their problems in strictly conventional biomedical terms” (Barker, 2008, p. 23). Drawing on their own experiences and understandings of their illness, users would engage in discussion using biomedical terminology or define their experiences in biomedical frameworks. This observation leads to Barker’s other conceptual finding, that of ‘physician compliance,’ rather than patient compliance (Barker, 2008). As she found, users would challenge the competence of the doctors they encountered, and were able to discuss and compare experiences on the website. As such, this online support group

provided an area where users could connect and form a community that centered on providing information about biomedical encounters, which provided a challenge to the typical doctor-patient relationship (Barker, 2008).

Despite the importance of this existing research, there remains limited understanding of how individuals living with FMS communicate about their experiences and make sense of having a contested and misunderstood chronic illness. As such, the aim of this research was to examine online support forums for individuals with FMS to identify how they construct their illness and negotiate biomedical conceptualizations of the illness with respect to their subjective experiences.

## **Methods**

### *Methodological Approach*

Qualitative research is beneficial when the subject requires an in-depth examination of how or why people do what they do, or how certain social issues are constructed. Using qualitative methods can help to gain insight that quantitative methods may not be able to provide, as qualitative approaches provide a greater depth and understanding of how something is experienced and made sense of. As Hesse-Bieber and Leavy (2011) state, “[Qualitative studies] seek out how individuals come to understand their world and privilege subjective forms of knowledge-building. The social reality is multiple and not unitary; there is no single truth that is sought” (p.33). Qualitative approaches therefore allow the researcher to gain an understanding of how individuals perceive their subjective situation and then to generate theory or knowledge based on these individual or group experiences.

In this research study, my goal was to understand the way



the biomedical conceptualization of fibromyalgia influences the experiences of those living with it. Studying the use of an online support group, my aim was to analyze how the use of such support groups, and of the internet, have begun to provide a space for those living with this condition to express their experiences and understandings of their illness, with a focus on the way they speak, or write, about their illness. Further, the research examined how individual interactions with medical professionals, peers, or other members of their social world influenced their illness experience and how they made sense of this condition. Because of these main research goals, a qualitative approach was best suited for the study, as subjective realities and social constructions are the main focus rather than large-scale trends.

#### *Population and Data Source*

For this small-scale research study, one online support group was examined that was specifically targeted to those living with fibromyalgia. The online support group was entirely public, so that no account was needed to access or post on the forum. While I did not participate in the forum, I was able to access the data because of its public nature. In this written report, the name of the online support group is changed to “Fibro Support” in order to protect privacy of the participants and the online source. Due to the high traffic of the website, postings of a one-week period were analyzed, which includes both original posts and preceding comments. The sample size was 27 participants, many of whom posted more than once. The online participants’ screen names were also changed in order to keep the participants and their screen names both confidential and anonymous. After accessing the original data, I immediately assigned each participant a number which corresponded to all of their posts, in order to protect identities and provide anonymity. Otherwise, the data stayed in its original form as it was collected through screen-shots. Although themes

from existing research were considered as possible themes that may arise, the analysis of data was inclusive to any themes that emerged.

### *Data Analysis*

The method of analysis that was employed was a discourse analysis technique. As Phillips and Hardy explain, “discourse analysis tries to explore how the socially produced ideas and objects that populate the world were created in the first place and how they were maintained” (2002, p.6). Further, these authors note that, “discourse analysis views discourse as constitutive of the social world—not a route to it—and assumes that the world cannot be known separately from discourse” (Phillips & Hardy, 2006, p.6). This method engages the idea that text represents social reality and that text is crucial in the way that it shapes reality (Hesse-Bieber & Leavy, 2011). The data analyzed was online posts from the support forums, where a topic was created by one user and a thread of conversation would follow, with all of these posts being analyzed. The text accessed from the online support community was read through multiple times in order to get a sense of the types of themes or ideas that emerged in the data. The data was then coded and further analyzed to establish solid themes and identify the discourses that the themes reflected. The goal of the analysis was to deconstruct the meanings behind the individual statements and group discussions in order to understand what general discursive formations were being produced through these support forum discussions. The focus was to identify individual experiences as a means for contributing to knowledge of fibromyalgia by providing first-hand accounts of living with the illness and the meanings attributed to them.

## Findings

While many different themes emerged from the data, the key ones identified as the most prominent and crucial from the text were: identity, doctor/patient relationships, and the concept of filling the diagnosis.

### *Identity*

A theme that consistently arose in the data was the impact of fibromyalgia on identity. Identity played a major role in how individuals dealt with the onset of fibromyalgia as well as daily life with the illness. A tension seemed to occur in that individuals could not complete or continue tasks due to illness, which then resulted in frustration. For example, one participant wrote when describing what she felt was her inability to deal with her workplace demands, “Truth of the matter is, I’m struggling...I have no energy to make it to the gym, to eat well, or to take care of myself. I have enough stamina to barely make it through the day” (P9). Here, it was clear that this participant wanted to continue in her role at work and perform to the highest ability, rather than placing her well-being as a priority. She further discussed that she did not feel comfortable talking with her supervisor, as she felt that her complaints would be frowned upon because she looked young, fit, and as though she should be able to keep up in the fast-paced environment.

This example, among others, highlights an interesting finding. It relates to the set group of roles that any individual may hold. Whether it is in their workplace or in the family, each status that an individual holds has a set group of roles, each with their own responsibilities. Chronic illness affects all of these roles, leaving one in a position where every aspect of their life must be shifted or altered in order to incorporate the implications of their

illness, over which they often have little control over. In this case, the participant's illness meant that s/he was only barely able to fulfill one role, that of work. As the participant later wrote, "I am trying to remain positive but I'll be honest...it's getting harder" (P9). All of the replies to the post made suggestions as to how this participant could make changes within the sphere of the workplace in order to adjust to the situation, and hopefully regain energy. Others suggested looking into other positions in an effort to reduce or alter workplace demands. As one participant replied, "Now you're seeing how this 'condition' will absolutely force you to modify your life. It sucks" (P4). The illness seemed to take hold of a 'master status' position, where all other roles fall underneath this main status (Charmaz, 1995), and there is no way to deny the illness its place in the individual's life. What this means is that all other responsibilities fall prey to symptoms and side effects of illness. This is not to say that individuals do not have autonomy over their illness experience, but that it creates difficulty in maintaining the identity that one previously held or possibly wishes to hold.

While the tension in one's identity due to fibromyalgia seemed to be highly diminishing, in some cases the onset of this illness created a more positive reaction. There were some individuals who expressed feelings of empowerment that went along with learning to live with FMS. For example, one participant wrote, "We call this a dragon [referring to fibromyalgia] and I will tell you that after fighting with him for 15 years I am starting to learn to dance with him a bit. It has NOT been easy, a lot of tears. I changed a lot in my life to accommodate this new friend" (P14). Participants learned to live with fibromyalgia, to put it first in their lives, but to not necessarily allow it to take full control. Charmaz (1995) points to the fact that those with chronic illness must repeatedly deal with the same struggle time and time again, which is the nature of fibromyalgia. It causes individuals to "dance with the dragon" (P14) and alter their lifestyles and identity.

### *Relationships with Doctors*

The online support forums had many conversations revolving around doctors' appointments and how these appointments went. A common term that came up in these discussions was finding a 'decent doctor.' The contested nature of fibromyalgia impacted this area greatly. Many participants felt that because fibromyalgia was not fully understood from a biomedical perspective, doctors could not grasp what they were feeling. One participant wrote,

Even your doctor may have a hard time understanding. After all, you're taking the meds that are supposed to help. What else do you expect from him? (Sorry but I've always got more respect from woman doctors). Either you're not taking the meds as directed or you're faking all that 'pain' right? Often, your doctor may not have read ALL the literature on the drugs he prescribes (P3).

This statement is similar to many that were on the forums. Participants felt that a doctor's appointment took work, and that doctors consistently did not believe that they were in the level of pain they described or that they were doing enough to try to heal. Therefore, finding a decent doctor became crucial. A decent doctor was a doctor that would listen, believe, and help to devise an ongoing treatment plan, and one that individuals could return to frequently for more tests and treatments without feeling like a burden. However, searching for a decent doctor appeared to be a major struggle for those with fibromyalgia and they often came to the forums to discuss how to find a doctor who would listen and even to recommend doctors within certain regions to each other if they were geographically close.

While it is clear that exercising consumer power was one

way to gain power in the doctor-patient relationship, similar to Barker's (2008) conceptualization of physician compliance, viewing their efforts as consumer power may oversimplify how these participants discussed their experience. Seeking out a "decent" doctor seemed more like a necessary survival task rather than one that amounted to increased power in the medical encounter. As one participant writes when describing the different appointments and test procedures, "I don't want more tests as this has been a while going on – and I'm sick of wasting \$ and time on tests. Very sick of it" (P2). The desire to find a decent doctor was thus a struggle in many ways. It forced these participants to take responsibility for their illness, rather than relying on the medical profession to provide a cure or treatment plan that would work and feel satisfying. To a degree, participants recognized that doctors could not cure them because fibromyalgia is not fully understood. However, it was clear that many participants had always engaged or believed in the linear process of going to a doctor and then healing. This belief reflects the biomedical perspective that is dominant in western culture (Lupton, 2012), which ultimately creates a reliance on doctors to cure those who are sick. However, when a doctor cannot heal a patient, this may require that resources, time, and financial means are expended. This, in turn, lessens an individual's consumer power and possibly raises stress levels, which many individuals linked to an exacerbation of symptoms. This led participants to see doctors as one of many resources, not as the ultimate power in determining their illness treatment plan.

Viewing doctors in this manner had consequences for the participants. In one way, it meant that they held a higher responsibility in understanding their illness and devising a treatment plan; but, it also meant needing to be careful of how they presented themselves in order to gain the information or resources (whether this be prescriptions, referrals or tests) they felt they needed from doctors. Being in charge of their health meant that the onus was on them to complete an appointment successfully.

Tips were exchanged on the forum that revolved around how to approach appointments with doctors. Tips included preparing a list of all their symptoms, bringing in printed research studies or books on fibromyalgia, or asking the doctor to run a specific test. For example, one participant wrote to another in regards to appointments,

My best advice is to prepare, prepare, prepare for your appointment. Take notes in. Psych yourself up beforehand. Be candid but try to not show a lot of emotion during the appointment. If you're in pain, let it show, but don't make a show of it, if that makes sense (P8).

This quote suggests that participants felt the need to present themselves in a certain way in order to achieve their goals in the doctor's appointments. This involved not looking too sick or showing too much pain, but also making sure that the doctor could understand what their level of pain actually was. This challenge amounted to creating another area for which the individual with FMS had to negotiate, manage, and hold responsibility. Although a diagnosis of FMS came from a doctor, doctors seemed to become just one of many resources that they drew upon after diagnosis, unless the participant had been able to find a "decent" doctor, which, however, seemed to be very rare.

### *Filling the Diagnosis*

Drawing on Madden and Sim (2006) and their idea of an "empty diagnosis," as the data was analyzed, it became clear that the majority of participants perceived their diagnosis as empty or void of information. Many described feeling confused and frustrated when they were told that they had this condition. In fact, participants engaged in this online support forum in order to seek out information from another resource. What this led to was

a process in which individuals tried to *fill* this empty diagnosis. They filled it through describing their experience with fibromyalgia and making connections to others who had similar experiences. In some cases, these experiences seemed to be medicalized and in others, they were centered on lay understandings. In order to fill the diagnosis, they developed their identity with the illness and its implications. One of the main aspects of this was describing physical symptoms to each other and identifying commonalities. A few examples of this include: "About 3pm or sooner some days I begin to get the fatigue" (P2), "Today I am beat. My neck is so tight I can't turn my head...I have a headache" (P14), "I know when I'm sick it's hard to think rationally. (That and I always worry about the one time there really is something wrong with me and I ignore it thinking it's just the fibro)" (P21), and "My fingers still don't work well with typing" (P19). Many conversations were either centered on physical symptoms or interlaced with descriptions of how the participants were feeling physically at that moment. This highlights the role of pain in participants' lives. It continued to be a constant in most conversations, although not always the main focus, possibly depicting the nature of fibromyalgia: daily life and the participants' realities always include pain, but cannot always center on pain.

Filling the diagnosis also included using medical terminology or the sharing of medical knowledge. This ranged from in-depth discussions of different medications (both prescription and over the counter) to using naturopathic treatment options or discussing new studies published on fibromyalgia. Other conversations would involve whether a participant was suffering from certain side effects of medication or if what they were experiencing was fibromyalgia pain. Medications were often suggested and further discussion of dosage and cost would occur. In the midst of one of these discussions, a participant stated, "Funny but I think we know our own bodies. And I think I have both issues" (P2),



referring to fibromyalgia pain as well as side effects of medication. These examples highlight how participants approached filling a fibromyalgia diagnosis. It was about having the confidence of knowing one's own body and translating that into understanding of what their illness is and how to treat it. Avoiding or ignoring their illness did not appear to be an option for most because it continued to play a major role in their life. Because of this, they had to actively engage with their illness and work towards creating a meaningful diagnosis. They did this by relying on one another for support, information, advice, and learning what fibromyalgia meant to others. For these participants, a fibromyalgia diagnosis is simultaneously empty and all-encompassing. This is not to say that the participants did not have their own agency or distance from their illness but, according to their posts, the illness entered into every area of their lives. This shift required them to take on a new role, not just as a person with chronic illness, but as an active participant engaging in a process of caring for oneself in a variety of ways.

### **Future Research**

Future research is needed in this area to understand how individuals cope with their daily realities and if these types of support forums provide much relief in their actual day to day lives. This could be done by linking this type of research to interviews or focus groups. There is the chance that because online forums allow participants to consider what they are typing and really think through these replies, the data could be more meaningful in regards to its internal thought value, but it may not give us a true understanding of how individuals act in their daily lives off-line. It would also be beneficial to examine what role these online forums play for doctors dealing with these patients and if this plays influences treatment planning or adherence.

## Conclusion

A participant wrote that “the body cannot continue at a fast pace with the dragon wrapped around us” (P1). This reference to fibromyalgia as a dragon came up a multiple times on the forums. Fibromyalgia is not well understood, and research on the condition is lacking, whether it be medical or sociological. However, from this study, as well as previous studies, it is clear that a fibromyalgia diagnosis provides little information and can be extremely stigmatizing for affected individuals. As such, this makes it very important to give voice to those who live with the condition and to try to understand the condition better. If participants describe this condition as feeling as though you have a dragon wrapped around you that will not let go, it gives the sense of a suffocating and challenging experience. Although little progress has been made in terms of the way in which fibromyalgia physically manifests, a lot of active work is being done by those living with the illness in attempt to understand the condition and how to live with it. As such, fibromyalgia provides an area of health and illness study that is fluid and open to new developments because there is no dominant, fixed understanding of what the illness is or means. Nonetheless, what is clear is that the diagnosis creates serious challenges in these participants’ lives, and further research in this field is not only important but necessary.

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## The Pharmaceutical Industry Has “Special” Interest in People’s Diseases

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### **English**

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**Abstract:** *The top 50 pharmaceutical companies, called Big Pharma, are making an enormous amount of profit from global pandemics. The causes of pandemics include the rapid spread of disease due to global travel, and the rise of “super bugs” which seem immune to traditional vaccines and treatments. Global media coverage and the growing numbers of pandemic fatalities, in turn, are creating a culture of fear and increasing the demand for anti-viral drugs. Big Pharma clearly profits from the sales of vaccinations and the medicines for viral treatment. What remains unclear are the ethical responsibilities of these pharmaceutical corporations. This paper will examine the low levels of treatment success, the wide range of drug side-effects, the global over-production of drugs and the related rise of immune “super bugs,” and the possibility of man-made viruses being created for profit.*

“Health is better than wealth:” people have been saying this since early times; today however, wealth has taken health’s place. Someone’s health has become a tool to get wealth. The 21st century started with worrying circumstances in the sense of peo-

ple's health. The list of threatening diseases of the 21st century started in 2002; the world got in a panic because of the rapidly spreading virus of atypical pneumonia, which afflicted thousands of people around the world (Westall, 2011, p. 401). Further, in the fall of 2005, the epidemic of "bird flu" epidemic took place (Westall, 2011, p. 401). Then, in April 2009, in Mexico, an outbreak of swine flu, also known as H1N1, became the first pandemic over the last 40 years; the disease covered 42 countries and 414, 945 people were affected (Westall, 2011, p. 401). Scientists are concerned by such tendencies in the 21st century since "the 2009 swine flu will not be the last and may not be the worst pandemic that we will face in the coming years" (Johnson, 2010, p. 459). A new disease may appear in any place on the planet at any time, but when and where, nobody knows. To the great fortune of humanity, contemporary medicine offers a huge variety of pills, treatments and vaccines to prevent and fight many diseases. It is exactly those drugs that have increased people's lifespans and maintained people's immune systems; due to these improvements, people who would have died 100 years ago are now able to survive. There is no doubt that the input of modern medical science is significant. Nevertheless, what is really happening in the drug industry? Does that industry bring wealth to nations, or profits to itself, ignoring ethical behavior? Despite the fact that modern medicine saves a lot of lives, the pharmaceutical industry is interested in getting profits from pandemics and vaccination, while their interest in cures and side-effects is doubtful.

The biggest profit to the drug industry comes from world-wide diseases called pandemics. In the past century, a pandemic was defined as "an infection which arises in a specific geographical area, spreads widely, and a high number of individuals are infected" (Laver, 2011, p. 1776). However, for unknown reasons, the World Health Organization (WHO) changed the definition of pandemic in May 2009, after the spread of the H1N1 virus (Heath, 2013, p. 550). The current definition of pandemic is "an

epidemic occurring worldwide, or over a very wide area, crossing international boundaries and usually affecting large numbers of people" (Heath, 2013, p. 550). Such a shift in definition, from one location to many, may reflect the changing interests of drug company shareholders, whose goal is to plant fear into people's consciousness. The number of people affected by the "swine flu" pandemic was actually much smaller than the number affected by the ordinary flu. By January 2010, scientists had established that 13,554 deaths were caused by swine flu, while 500,000 people die annually because of seasonal flu around the world (Trufanov 2013, p. 4). Continuous broadcasting and the use of terrifying statistics spreading through mass media, fill the public with fear. Fear is a main force driving people to save their lives, making them willing to buy anything for any price. In order to prevent bacterial diseases people take large amounts of antiviral drugs to keep their immune systems up. This is demonstrated by the annual report of one of the biggest drug companies, Pfizer, which shows that total sales of antiviral drugs had increased up to 30% by the end of 2003, when the global epidemic of atypical pneumonia took place (Milo-ry and Featherstone, 2012, p.12). Such a large increase in sales of antiviral medicines illustrates the public's interest in epidemic propaganda. Other evidence for the interest of drug companies in global diseases is the incredibly high price of treatment for infected patients. According to Andrey Trufanov, a member of the Italian research team that studied pandemics, the average cost to cure a patient infected by the swine flu virus in 2009 was \$150 (Trufanov, 2013, p. 37). Considering that the total number of infected people was over 400, 000, it is easy to compute that the estimated profit for leaders in the pharmaceutical industry would be up to \$60,000,000. Similarly, a 10-day course of treatment cost \$2000 for an individual affected by atypical pneumonia in 2002 (Bukata, 2005, p. 20). Such data, given in profit terms, leads one to think about the real interests of the pharmaceutical industry. Consequently, spreading fear about global epidemics and the importance

of treatments for them are some of the tools that bring the pharmaceutical industry billions of dollars.

The next area in which large profits are made from people's suffering is vaccination. Since the news of threatening diseases transmits everywhere, through all possible means of communication, it is not hard to sell a "miracle" protection to a terrified population. In Europe, more than 30 million people were vaccinated during 2009 (Samir 2011, p. 884). During the same period of time about 37 million people in the US and 80 million in China were vaccinated (Samir 2011, p. 884). Considering that the average price of one dose of vaccine for H1N1 was \$12 and more than 40 countries bought the vaccine for their populations, it is easy to imagine the incredible amount of revenue the leaders of the pharmaceutical industry received (Valdespino-Gomez, 2009, p. 697). As a result of production and sales of the vaccine for H1N1, the revenue of only one large drug company, Novartis AG, was \$12.1 million in 2009; sales of that vaccine alone increased their total revenue by up to 24.9% (Kresse and Rovini, 2009, p. 841). As a result, the price of Novartis' shares has been dramatically enhanced on the Global Market (Kresse and Rovini, 2009, p. 841). Data on the sale of so much vaccine makes one wonder whether those viruses have a natural origin or were created in a lab. There is a belief that pharmaceutical companies, with the assistance of the WHO, work on creating new bugs in laboratories so they can sell vaccines to the populations of developed countries. A professor of medicine at Virginia Commonwealth University, Link Kurt, uncovered credible evidence of such behaviour; he discovered that a vaccine company patented H1N1 vaccine on August 28th 2008, even before the pandemic started (Kurt, 2009, p. 45). Additional scientific evidence of the artificial creation of a virus was provided by Professor Fatimah Dowood, who conducted a series of chemical analysis on the swine flu virus and came to the conclusion that the virus was man-made (Dowood, et al. 2009, p. 2614). The circumstances above suggest that global viruses are related to well-



planned mass vaccination programs designed with for the purpose of getting profits.

Another point is the lack of interest displayed by the pharmaceutical industry in cures of chronic or ongoing diseases. According to information published by the WHO, 150-200 drugs would be enough to cure all known diseases (WHO 2010). The top 50 pharmaceutical companies, which together are often referred to as "Big Pharma," are responsible for a large proportion of the revenue generated by the industry. Each of these companies has about 100 drugs in production (Ferguson, 2011, p. 17). This means that there are tens of thousands of drugs in circulation in the world instead of the recommended 200. Furthermore, leaders of the pharmaceutical industry declare their interest in the eradication of people's illnesses in positive way. However, the reality does not correspond with that statement; the drug industry wants to keep illnesses around in order to extend the market for their services. According to a study done by Erica Check, by taking a medicine, the human body often gets used to certain of its components and next time the drugs will not help enough or at all, which leads to more consumption of these or different medicines (Check, 2006, p. 34). Apparently, the elimination of illnesses would lead to a drop in the multi-billion dollar profits of pharmaceutical companies. Also, most of the contemporary drugs do not solve the other problems that have been linked to taking them. An Australian medical doctor found out that most drugs have a 70% chance of side effects with only 30% chance of successful treatment (Smith, 2013, p. 13). Many side effects lead to other diseases. The high percentage of side effects explains the research findings that drug side effects are the 4th highest cause of mortality, after the cancer, strokes and heart attacks (Check, 2006, p. 36). Despite the fact that contemporary drugs cause many harmful side effects, their sales produce a lot of money for the industry.

Consequently, the pharmaceutical industry has great

interest in profiting from pandemics and vaccination and is not interested in cures. Annually, millions of people consume incredible numbers of pills, bringing hundreds of millions of dollars to their producers. Over the last 30 years the total revenue of Big Pharma has exceeded the revenues of all other industries by up to approximately 500% (Wieringa and Leeftang, 2010, p. 117). The industry takes 3rd place among the leading sectors of the Global Economy after Banking and Oil and Gas (Wieringa and Leeftang, 2010, p. 117). The fear of infection, the fear of not recovering, and the fear of getting inappropriate treatment, all drive people to be addicted to drugs. As people become more fearful, they become less critical in thinking about what might be the truth. People have to look deeply at the real purpose of the pharmaceutical industry, compare facts, think widely, and not blindly trust all of the information provided by mass media. These steps are necessary in order to get rid of conditions set up by the pharmaceutical industry, which exists not to cure people, but to make profit. People have to believe they are able to make change. It is everyone's responsibility to be aware of possible dishonesty among pharmaceutical producers. No matter where humanity is, health is still better than wealth.

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## A Liquid Chromatography/Mass Spectrometry Investigation of Vitreous Levels of Atorvastatin and Fenofibrate in Patients Diagnosed with Diabetes Mellitus

*Taran Main, Kingsley Donkor, Laiel Soliman, Colten Wendel, Kevin Ramsey*

### **Chemistry**

**Supervisor:** Dr. Kingsley Donkor

#### **1.0 Abstract**

*Statins are drugs that are consumed primarily for their anti-cholesterol properties. However, statins might also be beneficially used to reduce inflammation in several key areas that affect diabetic retinopathy (DR), which is blindness caused by diabetic mellitus (DM). In particular, atorvastatin (AT) and fenofibrate (FB) are statins that act to significantly reduce inflammatory agents and could thus potentially decrease DR. Therefore, both the anti-inflammatory and anti-atherogenic (reduction of cholesterol in blood vessels) effects of the drugs AT and FB are currently being studied in vivo. A local retinal surgeon (Dr. Kevin Ramsey) and third year medical student (Colten Wendel), have given the drug AT orally to patients who have been diagnosed with DM. The goal of this research was to examine the amounts of AT and FB that successfully reached the retina in order to determine if they were in large enough concentrations to act as an anti-inflammatory molecules and*

*thus decrease, or even prevent, DR. After the drug was administered by Dr. Ramsey, some of the vitreous humor was removed from the patients and analyzed at TRU to determine the concentration of AT and FB. The single biological sample that was analyzed contained ppb of AT, which is well above the 1 ppb amount required to have an anti-inflammatory effect. Future work includes examining the influence of AT and FB on DR and investigating whether these statins could be the first primary medication prescribed to prevent DR.*

## **2.0 Introduction**

Diabetes mellitus (DM) is an endocrine disorder caused by either insufficient secretion or insufficient action of the hormone insulin. DM affects the population on a global scale, and its occurrence is rising due to the increase in the number of people over the age of 65.<sup>1</sup> There are an estimated 10.2 million adults in the United States over the age of 40 known to have DM, and 40.2% of these display diabetic retinopathy (DR). In developed countries, DR is the leading cause of blindness in DM patients. It affects the microscopic blood vessels that are found in the retina. The first sign of DR is a lack of perfusion of retinal capillaries, which leads to the formation of balloon-like bulges (micro-aneurysms) in these blood vessels, as well as abnormal capillary permeability. The micro-aneurysms eventually cause the vessels to burst, leading to fluid leakage into the surrounding retinal tissue; this fluid accumulates in the macula and can threaten visual acuity. The production of new blood vessels then follows, as the body tries to increase blood flow to the affected areas. These new vessels are fragile and rupture easily, often flooding the retinal cavity, which can greatly impair vision. Swelling is also known to be an important factor in the development of DR.

Without treatment, 50% of patients diagnosed with DR

will become blind within 5 years.<sup>2</sup> It is estimated that over 90% of new patients diagnosed with DR could have their chance of blindness reduced with the use of a primary prevention. A proposed primary method of prevention involves using of anti-inflammatory drugs, particularly atorvastatin (AT) and fenofibrate (FB) (shown in Figures 1 and 2, respectively), to reduce inflammation in the eye.<sup>3</sup>

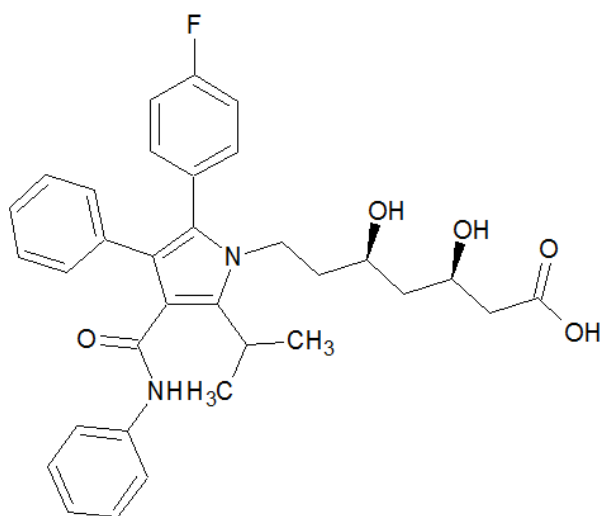


Figure 1: Structure of atorvastatin (AT)

AT is commonly used to inhibit HMG-CoA reductase, an enzyme found in liver tissue that is important in the production of cholesterol. Both AT and FB are also anti-inflammatory agents that significantly reduce the concentrations of several inflamma-

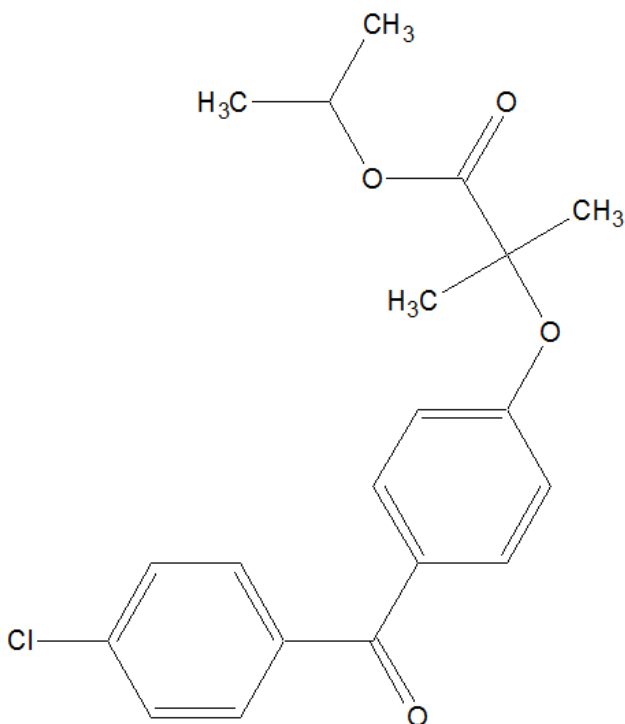


Figure 2: Structure of fenofibrate (FB)

tory markers. This study examines the concentrations of AT and FB in the retina (after administration of these drugs) to determine if they are adequate to have an anti-inflammatory effect, which might reduce or prevent the development and progression of DR. Both drugs are expected to reach the retina in quantifiable amounts if the daily intake is approximately 10 mg (of either drug). Vitreous fluid from the patients was extracted a minimum of 6 weeks after starting the medications. If the drugs reach the retina



in large enough amounts to have an effect, *in vitro*, we can confirm that AT and FB can be used for the reduction or prevention of DR in patients with DM.

The goal of this experiment was to separate and quantify the amount of AT and FB in samples taken from patients who took these drugs, using high-performance liquid chromatography coupled with mass spectrometry.

### 3.0 Experimental

#### 3.1 Apparatus

The analyses were done using an Agilent Technologies 1200 series high performance (HP) liquid chromatography (LC) system coupled to a 6530 accurate-mass quadrupole time of flight (Q-TOF) electrospray ionization mass spectrometer. Instrumental parameters are outlined below in Table 1.

<b>Injection Volume</b>	2.0 $\mu$ L
<b>Flow Rate</b>	0.3 mL/min
<b>Solvents</b>	A: 10% Water (formic acid) B: 90% ACN (0.1% formic acid)
<b>Run Time</b>	10 min
<b>Column Temp.</b>	40 Celsius
<b>Column Pressure</b>	70 bar
<b>Gas Temp.</b>	350 Celsius
<b>Drying Gas</b>	13 L/min
<b>Nebulizer</b>	30 psig
<b>Sheath Gas Temp.</b>	325 Celsius
<b>Sheath Gas Flow</b>	12 L/min
<b>Vcap</b>	3000 V

Table 1: Optimal experimental parameters used for data collection

### *3.2 Chemicals and Reagents*

Atorvastatin (AT) and fenofibrate (FB) standards were purchased from Sigma-Aldrich. Dihydrocarbomezapine (DHCM), used as an internal standard (IS), was also purchased from Sigma-Aldrich, as were HPLC-grade acetonitrile (ACN), H<sub>2</sub>O, and HP-LC grade methanol.

### *3.3 Preparation of Standard Solutions*

Stock solutions of AT and FB were prepared by dissolving 10.00 mg standards in methanol to a concentration of 1000 ppm. These stock solutions were stored at -20°C. Ammonium acetate buffer (pH 4.6, adjusted with acetic acid)<sup>1</sup>, was prepared daily using 18 MΩ water.

### *3.4 Preparation of Biological Samples*

The biological samples were obtained from patients who received 10 mg of AT orally. The vitreous fluid from the eye was stored at -80°C prior to extraction and analysis. Solid-phase extraction was performed. The vitreous fluid samples were diluted to 2.00 mL using ammonium acetate (0.1 M, pH 4.6) and a known concentration of DHCM (IS), and centrifuged at 13,200 rpm for 5 minutes. The supernatant was transferred to 100 mg Carbon-18 solid phase extraction (SPE) cartridges that were pre-conditioned with 2 mL of methanol followed by 2 mL of H<sub>2</sub>O. The cartridges were washed with 1 mL of water followed by 1 mL of methanol:H<sub>2</sub>O (5:95 v/v). The cartridges were air dried for 2 minutes. The analytes were eluted using 1 mL of methanol:ammonium acetate buffer (95:5, v/v, 0.1 M, pH 4.6) with positive pressure. The solutions were evaporated to residues using a Vacufuge. The

residues were reconstituted in 200  $\mu$ L of the mobile phase, ACN:H<sub>2</sub>O (90:10 v/v), and filtered using a 0.45  $\mu$ m nylon filter prior to injection into the LC/MS system.

## 4.0 Results and Discussion

### 4.1 Chromatography and Mass Spectrometry

The method developed (see Table 1) was found to be very effective using a C18 150 mm x 4.6 mm internal diameter (ID) column with the mobile phase ACN:H<sub>2</sub>O (90:10, 0.1% formic acid). The retention times for AT and the DHCM IS were found to be approximately 2.5 minutes, as shown in Figure 3. A small peak, found at 5 minutes in the AT section of Figure 3, was found to be below the limit of detection and was considered to represent an impurity. The m/z value for AT was determined to be 559.28, as shown in Figure 4.

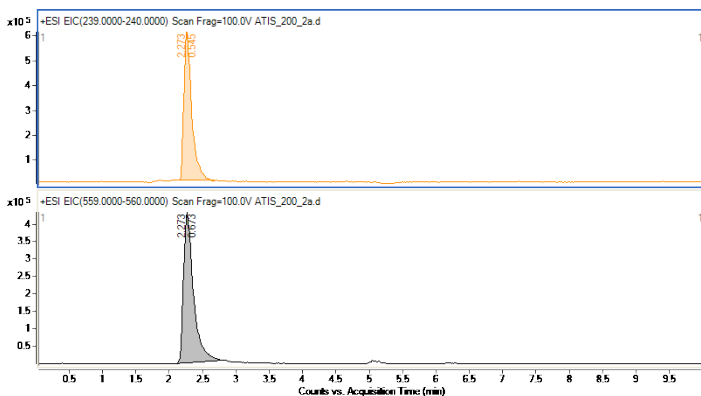


Figure 3: Chromatograms of AT and internal standard (IS) in standard solution of 200 ppb.

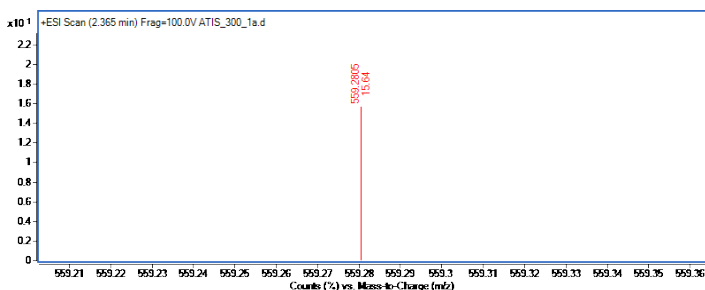


Figure 4: Electrospray ionization (ESI) scan to determine  $m/z$  value for AT

The run time for each sample was found to be only 10 mins. This allowed efficient elution of the analyte, reducing the consumption of mobile phase and run time on the column.

#### 4.2 Solid phase extraction (SPE) and analysis of AT and FB

Extraction of AT from the vitreous fluid, outlined in the experimental section, was determined to be successful. AT was detected using the proposed LC/MS method (Table 1). Once the column was replaced and properly conditioned prior to analysis, chromatograms became consistent with previous data, collected prior to contamination. Since all patients were receiving AT and no patients were receiving FB, analysis on FB was stopped so that all of the instrument time was available to analyze AT. FB analysis will continue when patients start receiving FB as the anti-inflammatory agent.

#### 4.3 Calibration Results

The neat calibration curves of AT and FB were completed successfully, as shown in Figures 5 and 6, respectively.

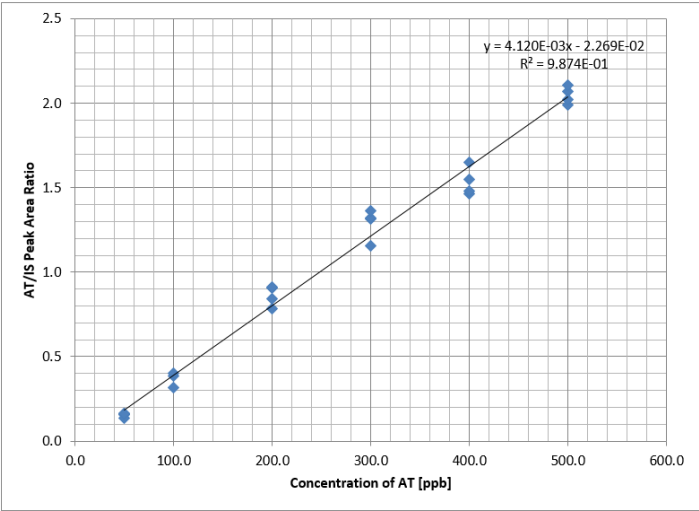


Figure 5: AT with IS calibration curve

The equation of the line in Figure 5 is:  $y = (4.120 \pm 3.919 \times 10^{-3} \text{ ppb}^{-1})x - (2.227 \pm 2.883 \times 10^{-2})$ . The  $R^2$  value was 0.9874, which confirms that the detection of AT, using LC/MS, was done accurately and precisely. The calculated limits of detection (LOD) and quantification (LOQ) for the neat AT calibration curve are shown in Table 2.

LOD	12.1 ppb
LOQ	40.6 ppb

Table 2: The calculated limit of detection (LOD) and limit of quantification (LOQ) for the calibration curve in figure 5.

Analyzing AT in methanol first, as an external calibration, was found to be ineffective when attempting to compare it to the biological samples. This was felt to be due to differences in

the solutions in which the AT was suspended. Standard addition would be a much more effective technique for detecting the AT levels in biological samples.

The concentration of AT in the one biological sample analysed was determined to be ppb using DHCM as the internal standard. This concentration was well above the proposed threshold of 1 ppb to have an anti-inflammatory effect. A continuation of this study could examine the amount of an anti-inflammatory effect AT has at various concentrations.

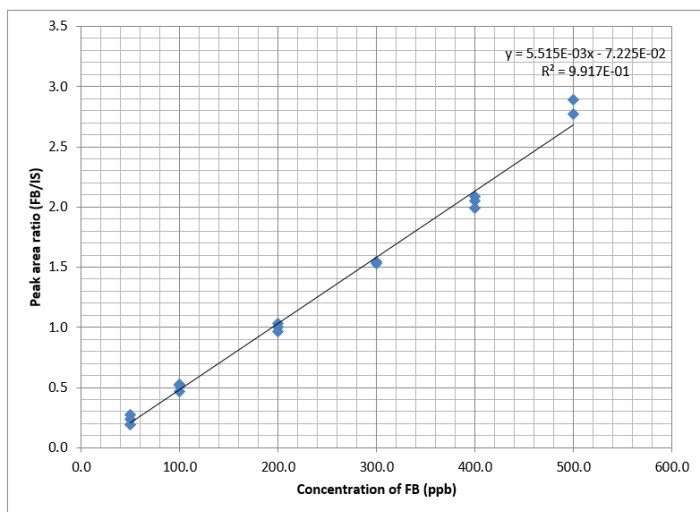


Figure 6: The peak area ratio of FB and IS.

The equation of the line for Figure 6 is:  $y = (5.515 \pm 0.134 \times 10^{-3} \text{ ppb}^{-1})x - (7.225 \pm 868 \times 10^{-2})$ . The external calibration curve for FB had an  $R^2$  value of 0.9917, which also confirms that the detection of FB in methanol was done with accuracy and precision across a range of concentrations. The LC/MS technique was

found to be effective at detecting AT and FB at the ppb level, but the peaks began to get depressed at higher concentrations (1 – 100 ppm) as the MS detector was getting saturated.

#### *4.4 Results with Respect to Prevention of DR*

This research was done to determine if AT enters the eye in amounts that would allow it have an anti-inflammatory effect, which would help prevent the development of DR in patients diagnosed with DM. If AT is determined to have such an effect, it would be the first primary prevention drug used against the development of DR. This could be an excellent discovery, since the drug could be provided on a global scale to prevent DR, which has afflicted millions of people diagnosed with DM.

### **5.0 Method Validation**

LC/MS is commonly used for the separation and detection of various compounds. The simplicity, efficiency and speed of this technique make it ideal for AT analysis. The neat calibration curves found in Figures 5 and 6 were validated by calculating the relative standard deviations of the samples run (i) on the same day at varying concentrations (intramolecular) and (ii) the same concentration on separate analysis days (intermolecular).

The acceptable intramolecular RSD% considered to indicate reliable data is below 20%, which is calculated using retention times in Tables 3.1 and 4.1 and the peak area ratio of AT and internal standard (IS) in Tables 3.2 and 4.2. The data confirms that the method developed to quantify AT was acceptable and could be used to plot a neat calibration curve of AT with reliable results.

concentration [ppb]	Retention Time AVG		Retention Time SD		Retention Time RSD%	
	AT	IS [100ppb]	AT	IS [100ppb]	AT	IS [100ppb]
50.0	2.348	2.331	0.04786	0.05125	2.039	2.198
100.0	2.388	2.383	0.03674	0.04344	1.539	1.823
200.0	2.262	2.257	0.1032	0.1100	4.560	4.873
300.0	2.276	2.292	0.04041	0.04020	1.775	1.754
400.0	2.292	2.287	0.03074	0.03027	1.341	1.324
500.0	2.295	2.295	0.04290	0.04290	1.869	1.869

Table 3.1: Intramolecular retention time relative standard deviation percent (RSD%) data for AT

concentration [ppb]	Pk A Ratio AVG	Pk A Ratio SD	Peak Area Ratio RSD%
	AT/IS	AT/IS	AT/IS
50.0	0.1597	0.0023	1.420
100.0	0.3688	0.0368	9.984
200.0	0.8678	0.0576	6.641
300.0	1.3323	0.0210	1.576
400.0	1.5305	0.0841	5.495
500.0	2.0663	0.0355	1.717

Table 3.2: Intramolecular peak area ratio (AT/IS) RSD% data for AT

concentration [ppb]	Retention Time		Retention Time AVG		Retention Time SD		Retention Time RSD%	
	AT	IS [100ppb]	AT	IS [100ppb]	AT	IS [100ppb]	AT	IS [100ppb]
50 (Jan 6)	2.348	2.331	2.651	2.642	0.3028	0.3110	11.43	11.77
50 (Jan 14)	2.953	2.953						
200 (Jan 6)	2.262	2.257	2.727	2.716	0.4647	0.4593	17.04	16.91
200 (Jan 14)	3.192	3.176						
300 (Jan 6)	2.276	2.292	2.791	2.794	0.5148	0.5013	18.45	17.95
300 (Jan 14)	3.306	3.295						
400 (Jan 6)	2.292	2.287	2.821	2.821	0.5290	0.5343	18.75	18.94
400 (Jan 14)	3.350	3.355						
500 (Jan 6)	2.295	2.295	2.992	2.992	0.6968	0.6968	23.29	23.29
500 (Jan 14)	3.689	3.689						

Table 4.1: Intermolecular retention time RSD% data for AT



concentration [ppb]	Peak Area Ratio AT/IS	Peak Area Ratio AVG AT/IS	Peak Area Ratio SD AT/IS	Peak Area Ratio RSD% AT/IS
50 (Jan 6)	0.1597	0.1569	0.0028	1.80
50 (Jan 14)	0.1540			
200 (Jan 6)	0.8678	0.7500	0.1178	15.71
200 (Jan 14)	0.6322			
300 (Jan 6)	1.3323	1.1860	0.1462	12.33
300 (Jan 14)	1.0398			
400 (Jan 6)	1.5305	1.4870	0.0435	2.92
400 (Jan 14)	1.4436			
500 (Jan 6)	2.0663	1.9754	0.0909	4.60
500 (Jan 14)	1.8846			

Table 4.2: Intermolecular peak area ratio (AT/IS) RSD% data for AT

The biological sample size was limited to only one because of the finite number of individuals diagnosed with DM and DR from whom samples could be extracted in the time frame allotted for this purpose. Despite the small sample size, one can conclude that LC/MS with optimized conditions can detect and quantify AT in biological samples; analysis of more such samples would re-affirm that the proposed conditions to detect AT in biological samples.

## 6.0 Future Work

This project is very promising and has the potential to discover a new, safe primary prevention method for DR. The work that has been done on the project is only just starting to scratch the surface. There are many ways to continue to improve the analysis and improve the extraction of AT from biological samples to further improve results.

The method could be improved so as to get better separation of AT from the IS. A lab technician more experienced with LC/MS could improve the parameters of the LC to increase separation of the analytes and thus obtain more accurate results. The parameters of the MS portion can also be improved further to bet-

ter detect the analytes; that is, to increase peak size and decrease background noise.

The solid phase extraction procedure first proposed in this report was found to effective, but could be improved in order to get better recovery of AT, which would result in more reliable data. A better understanding of the biological matrix would assist in determining the appropriate pH of the solutions as well as what compounds to use to remove as much of this matrix as possible. Changing the pH of the solutions used for extraction might improve the yield of AT, which ultimately increases the ability to detect it in the LC/MS. This research focused on the main form of AT, but it is known that AT breaks down and is converted to other metabolites; if these compounds were also quantified from the sample, a more complete representation of the amount of AT that is present in the vitreous fluid of the eye could be determined.<sup>4</sup>

The external calibration curves using a non-biological matrix proved to be successful, but the use of standard addition in the biological matrix would lead to the best results, minimizing the number of variables when determining the concentration of AT in the samples.

The biggest step now is to get more biological samples and continue the experiment. If a larger number of people diagnosed with DM were sampled, the evidence that AT and FB get into the vitreous fluid of the eye and have an anti-inflammatory effect would be more conclusive.

## **7.0 Conclusion**

A method was successfully developed to separate, detect and quantify AT in the vitreous fluid of the eye using LC/MS. A sample taken from one patient diagnosed with Type II diabetes

was analyzed and was found to contain ppb of AT. This is well above the limit of 1 ppb of AT required to have an anti-inflammatory effect in the retina. The method proposed was successful in determining that AT enters the eye in sufficient amounts to have an anti-inflammatory effect and thus could potentially be used as a primary prevention drug to prevent DR.

## 8.0 Acknowledgements

I would like to thank my supervisor, Dr. Kingsley Donkor, for giving me this opportunity to take part in an amazing directed studies project, and for guiding and supporting me through this adventure. I would also like to thank Laiel Soliman for her excellent mentoring skills, teaching me how to use the LC/MS as well as develop a solid phase extraction procedure. Thank you to Colten Wendel for proposing this research and choosing TRU and to Dr. Kevin Ramsey, retinal surgeon, for providing us with the biological samples. This research was supported by the Thompson Rivers University Department of Chemistry, Science Faculty.

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## Utilizing an Indigenous lens to inform how the Canadian Criminal Justice System approaches mental health and substance use issues among First Nation, Inuit and Métis individuals

Colleen Fines

### Social Work

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**Abstract:** *Over-representation of Indigenous people within the Canadian Criminal Justice System continues to be a growing issue, with undeniable intersections between criminal justice involvements and mental health and substance use concerns. Because mental health and substance use concerns are strongly correlated with recidivism rates, the therapeutic approach to these issues is paramount. The lack of culturally-safe programming during both incarceration and reintegration fails to acknowledge conflicted worldviews. Dissonance between cultural understandings of health and wellness acts as a serious impingement to working with Indigenous individuals. Applying an individualized approach to those who understand interdependency cannot result in a sense of holistic wellness. An approach based upon cultural safety allows for both understanding how intersections of oppression have created over-representation, while also addressing the issue of First Nation, Inuit and Métis over-representation. Cultural concepts of well-*

*ness and how wellness is achieved must be honored to ensure that individual needs are appropriately met. Holistic wellness is viewed as a non-static process. Connections with culture, family, community, and Nation must be made, and allowed to be maintained. Wellness is therefore possible through the use of traditional practices and a connection to one's culture. Incorporating culture into healing encourages balance; balance equates to wellness, and wellness equates to wholeness.*

### **Social Location of the Author**

As an Indigenous woman, I must begin by identifying myself. All that encompasses me involves so much more than simply stating that I am Métis, originating from the Red River in Manitoba. It must be stated that while my mother's familial contribution to my upbringing and cultural ideologies originated in the United Kingdom, and included cohesiveness and connection, this is only one piece of who I presently am. As a Métis woman, I have been directly impacted by the colonialist practices of the newcomers to Turtle Island. Today I experience internalized oppression as a result of the generations of shame-inducing tactics employed by the Canadian government. I have been directly impacted by the over-representation of First Nation, Inuit and Métis people within all systems of government: child welfare, criminal justice, and social welfare.

I did not learn of my Métis heritage until adolescence; my father had been taught well to feel shame. I learned that my father was raised by his mother and grandparents for his first four years. He listened to their traditional language but was not taught to speak it. Instead, he watched other children throw rocks and racial slurs at his Elders. Yes, he was taught well that his Indigenous heritage was not something to boast about. My father was a ward of the state from early childhood, until his pre-teens. An angry and hurt boy, his expressions of pain led him to involvements with the

criminal justice system. His intersecting experiences of shame, disconnection, abuse, and lost cultural identity led to self-medication and mental, emotional, and spiritual torment. Thus, these were my personal experiences of the generational impacts of colonization: internalized oppression, disconnection, and family violence and substance use.

Sadly, this cycle did not end with me; my own children have also been affected by these generational impacts. Today I choose to identify as Métis (although it is often an internal struggle) because of the disconnection I have experienced, and continue to feel, as a result of my father's removal from his family. It is because of my own experiences of shame for my Métis heritage, along with my own experiences of over-representation which compel me to use my voice – not only as a Métis woman but as a social worker. I believe that I have a responsibility to use my voice to try to effect social change. The countless First Nation, Inuit, and Métis individuals who have suffered (and continue to suffer) as a direct result of colonization deserve to have justice and to experience wellness not brokenness.

Over the last decade and a half, I have worked in various social service sectors. What I have noticed throughout my work is that there are undeniable intersections between criminal justice involvement, mental health concerns, and substance use, along with all the other social disadvantages marginalized people experience. Currently, my work with individuals who are reintegrating into the community following incarceration or forensic hospitalization has allowed me to become aware of the barriers intercepting reintegration. Unfortunately, I have witnessed high recidivism rates first-hand. As a result, I question what is lacking in available supports both 'inside' and out, as well as the systemic policies currently in place which continue to propagate this recidivism. These queries, along with my passion and personal location, have compelled me to undertake this current research.

## Introduction

The over-representation of First Nation, Inuit, and Métis people within the Canadian Criminal Justice System has received considerable attention from researchers, criminologists, and social workers alike. Despite this fact, the issue of over-representation continues to be present today, with the gap between Aboriginal and non-Aboriginal representation continuing to grow (Roberts & Melchers, 2003; Sapers, 2013). The literature argues that Canada's colonialist past has a direct relationship with over-representation (Adjin-Tettey, 2007; Belanger, 2010; Dell & Kilty, 2013; LaPrairie, 1997; Monture, 2006; Mullaly, 2007; O'Grady, 2011; Rudin, 2005; Sutherland, 2002; Williams, 2002). The generational impacts of colonization continue to affect First Nation, Inuit, and Métis people today; Indigenous people experience violence, substance use, poverty, and over-representation in all systems of social government. While there appear to have been genuine attempts at reversing these over-representations (Restorative Justice programs, Gladue Courts, and other approaches), current systemic policies continue to oppress and marginalize First Nation, Inuit, and Métis people (Dell & Kilty, 2013; Dickson-Gilmore & LaPrairie, 2005; Fitzgerald & Carrington; LaPrairie, 2002; Monture, 2006; Mullaly, 2007; O'Grady, 2011; Proulx, 2000; Proulx, 2003; Roberts & Doob, 1997; Rudin, 2005; Sutherland, 2002; Williams, 2002).

As a Métis woman who has been directly impacted by over-representation, I question the relationship between mental health and substance use among Aboriginal people represented within the criminal justice system, and how these issues contribute to over-representation. The lack of culturally-safe programming during both incarceration and the reintegration process fails to acknowledge conflicted worldviews, which then fails to adequately address over-representation. Therefore, I question how an



Indigenous worldview might better inform the approach of mental health and substance use programming during both incarceration and reintegration for First Nation, Inuit, and Métis individuals.

### **Over-representation**

Beginning shortly after 1492, the government of this land began to enact laws and utilize tactics to assimilate Indigenous people (Belanger, 2010; Smye & Browne, 2002). Using laws to criminalize practices which were viewed as savage, newcomers set out to make a population of *respectful* citizens. Indigenous people were forced to stop using their language, made to live on reserves (often far away from their ecological homes), forbade to practice spiritual ceremonies, forced to send their children to residential schools, and the list goes on. Laws were created to control Indigenous peoples' social, political, spiritual, economic, and cultural traditions, threatening and endangering their cultural existence (LaPrairie, 1997; Thira, n.d.; Williams, 2002). "The 'Department of Indian Affairs' was created to manage...and enforce the criminalization of traditional cultural practices. Totem poles, ceremonial objects such as masks, and regalia were destroyed or sold to collectors... the federal government prohibited Natives from organizing to discuss the Land Question and it became a crime to raise money to pursue Aboriginal title" (Thira, n.d., p.1). Five hundred and twenty-one years after contact, the consequences of colonization and cultural genocide can clearly be seen in the over-representation of First Nations, Inuit, and Métis people within all systems of social government, including the criminal justice system.

Statistics Canada reports that while Aboriginals make up approximately 3 percent of the Canadian population, they account for over 22 percent of criminal justice admissions (Perreault, 2009; Sapers, 2013). Documented trends over two decades indicate that

despite attention received from the Royal Commission on Aboriginal Peoples (RCAP, 1996), Indigenous people continue to be over-represented within the criminal justice system in comparison to non-Indigenous people (Roberts & Melchers, 2003; Sapers, 2013). In gathering data, Statistics Canada focuses on factors deemed attributable to the risk of offence or recidivism: age, education, employment, marital/family relationships, social interaction, substance abuse, community functioning, personal/emotional status, attitude, income, housing, and criminal justice processes (Perrault, 2009). Identifiers within Statistics Canada's data collection fail to acknowledge the generational impacts of colonization and cultural genocide, which in fact influence over-representation. Further, failing to record ethnic data allows a Euro-dominant bias to continue to inform data collection, and prohibits future changes to problematic policies (Millar & Owusu-Bempah, 2011; Roberts & Doob, 1997). Craig Proulx (2000) argues that "colonialism...the cultural devaluation, social and economic distortion it causes among Aboriginal peoples, is the major controlling condition [which leads] to over-representation [and the] created conditions of social, economic, intellectual and spiritual despair and disintegration among Aboriginal peoples" (p. 373). Although this information is well documented, these experiences of despair and disintegration continue. Howard Sapers (2013), the Correctional Investigator for Canada (CSC), states that "despite incorporation into CSC's policy framework, there is little evidence to suggest that *Gladue* principles [the Justice System must incorporate the history of colonization and it's generational impacts in sentencing] are routinely applied by CSC authorities or making a tangible difference in the lives of Aboriginal people under federal sentence" (Sec. IV). Thus, in the hopes of *civilizing a savage* people, the newcomers, with their colonialist laws, have merely succeeded in creating an unhealthy confusion of a once proud people.

In constructing laws to control and maintain Eurocentric

mores and the status quo, Indigenous people were removed from society, forming neighbourhoods of exclusion which resulted in oppression and symptoms of lateral violence. Public perceptions of acceptable behaviours informed policies and laws enacted to uphold mores and to punish those who did not fit within these norms, resulting in the proliferation of discriminatory and stereotypical social beliefs about Aboriginal people (Belanger, 2010; Dell & Kilty, 2013; Hagen, 1980; LaPrairie, 1997; Mullaly, 2007; O'Grady, 2011; Proulx, 2000; Rudin, 2005). Not only were laws created to control, but promises were made that would ensure health care, education, and other needs were met. First Nations, Inuit, and Métis people have developed a reliance upon the Canadian government for various needs, reinforced over the last five hundred and twenty-one years through reserve systems, the Indian Act, the welfare system, education, and other controlling measures (Belanger, 2010; LaPrairie, 1997). This dependence has diminished the cohesion of community, which was traditionally used to ensure that the needs of all members were met. The consequences of this dependence is especially dramatic in areas where poverty and crime are high; often urban Aboriginal people dwell in locations which are both economically disadvantaged and exhibit disproportionate rates of crime (LaPrairie, 1997). Thus, the current lived realities of First Nations, Inuit, and Métis people have been created through centuries of discriminatory policies and practices. These policies and practices have successfully removed Indigenous people from mainstream populations, creating stereotyped personas of a people who are unable to look after themselves, amplifying erroneous beliefs that Indigenous people are inherently delinquent and require the paternalistic guidance of the Canadian government.

### **Mental Health and Substance Use**

Mental health and substance use issues are a key factor

in criminal justice system involvements; these issues may be precursors to crime, or come as a result of involvement with the system (Blank-Wilson, Draine, Hadley, Metraux, & Evans, 2011; Gannon, Mihorean, Beattie, Taylor-Butts, & Kong, 2005; Phillips, 2010; Taylor, 2008). Nationally, “three out of four inmates” enter the criminal justice system with substance use concerns; “approximately half of federal offenders [have] a direct link between their substance use and criminal behaviour” (Public Safety Canada, 2013). Further, “38% of new admissions to the Correctional Service of Canada reported a history and current high levels of psychological dysfunction” (Bonta, Blais, & Wilson, 2013). Canada’s Correctional Investigator reports that “Correctional Service delivered at least one institutional mental health service to 48.3% of the total inmate population...47% of Aboriginal offenders...over 90% (or 4,065) of newly admitted offenders were comprehensively screened for potential mental health problems...nearly two-thirds were flagged for follow-up mental health interventions” (Sapers, 2013, Sec. I). These numbers indicate the severity of response required in meeting the needs of both the public and the individual. Blank-Wilson, Draine, Hadley, Metraux, and Evans (2011) posit that having a concurrent diagnosis greatly increases an individual’s risk to reoffend. As rates of recidivism rise with concurrent mental health and substance use issues, these issues must be addressed (Blank-Wilson, Draine, Hadley, Metraux, & Evans, 2011; Krieg, 2006; Mateyoke-Scriver, Webster, Hiller, Staton, & Leukefeld, 2003; Phillips, 2010; Taylor, 2008).

Historically, prison has been used as a means of removing *problematic* individuals from the rest of society (Hagen, 1980; Mateyoke-Scriver, Webster, Hiller, Staton, & Leukefeld, 2003). While this ‘answer’ to mental health and substance use issues may provide the general public with a sense of safety, it is both an extremely expensive and inappropriate response to health concerns. Sapers (2013) reports that over the past eight years “approx-

imately \$90M in new funds [have been spent] to strengthen primary institutional mental health care” (Sec.I). If 22 percent of admissions are First Nations, Inuit, and Métis individuals and 47 percent of these members are screened for possible mental health concerns, then it stands to reason that of the \$2.3 billion spent annually on Adult Correctional Services (22 percent, or \$506 million, involves Indigenous inmates), approximately \$238 million is spent on Aboriginal mental health concerns (Taylor-Butts, 2002; Thibault, 2012). Indeed, treating health concerns with a criminal justice response is both extremely expensive and inappropriate. “Criminal justice systems are increasingly serving as the chief health care source by providing diagnosis, assessment, and treatment for chronic drug users as prisons are often left to deal with the health consequences of prior drug abuse (as cited in Mateyoke-Scrivner, Webster, Hiller, Staton, & Leukefeld, 2003, p. 84). Sapers (2013), in his outlook for the upcoming year, has questioned the “appropriateness of managing significant mental illness in a prison setting”; he states that he expects correctional services will work towards making “real progress in finding more humane responses and appropriate alternatives to manage complex mental health needs” (Sec.VII).

Due to the fact that mental health and substance use concerns are a high occurrence within the criminal justice system and recidivism rates are correlated with these concerns, the manner in which these issues are addressed is paramount. Recidivism rates have been linked to barriers with reintegration, including substance use as an impingement to such (Blank-Wilson, Draine, Hadley, Metraux, & Evans, 2011; Krieg, 2006; Mateyoke-Scrivner, Webster, Hiller, Staton, & Leukefeld, 2003; Phillips, 2010; Taylor, 2008). While programming is available both while in custody and in most urban settings, the literature suggests that a focus of connecting these sources would strengthen the likelihood of successful reintegration (Blank-Wilson, Draine, Hadley, Metraux, & Evans, 2011; Krieg, 2006; Phillips, 2010; Rezansoff, Moniruzza-

man, & Somers, 2012; Taylor, 2008). While many researchers have indicated the importance of addressing mental health and substance use concerns during incarceration, release, and reintegration, it appears that a preventative rather than a reactive approach would be better.

### **Understandings and Approaches to Mental Health and Substance Use**

Currently, mental health and substance use issues are approached primarily through a medical model, which treats individuals according to deficits. A medical model approach to treatment often involves medication, therapy, and abstinence (Norcross, Hogan, & Koocher, 2008; Baker, & Velleman, 2007). Over the last century and a half, there have been great strides in the treatment of mental health and substance use issues; these have indeed brought healing and stability to the lives of many individuals who had previously been struggling. A great deal of effort has been directed towards addressing the issues of mental health and substance use as well as their impact on crime and safety (Federal-Provincial-Territorial Working Group in Mental Health, 2012; Livingston, 2009).

The correctional system of Canada has recently formulated a strategy to address mental health and substance use concerns, which seeks to ensure that:

Individuals in the correctional system experiencing mental health problems...will have timely access to essential services and supports to achieve their best possible mental health and well-being. A focus on continuity of care will enhance the effectiveness of services accessed prior to, during, and after being in the care and custody of a correctional system. This will improve individual health outcomes and ultimately con-

tribute to safe communities. (Federal-Provincial-Territorial Working Group in Mental Health, 2012)

This vision acknowledges the importance of meeting the needs of individuals who are indeed experiencing health-related concerns but find themselves being treated within the correctional system. Once again, the Correctional Investigator speaks to this issue:

The Office does not question the integrity, commitment or professionalism of CSC's efforts. However, we should not be relying on facilities that were never designed to accommodate or care for individuals with serious mental health issues...I am increasingly of the opinion that modest and incremental reform of a system that is fundamentally flawed is not in the public interest. Some mentally ill individuals in federal penitentiaries do not belong there and should be transferred to outside treatment facilities as a matter of priority...segregation, pepper spray and restraints are not treatment for mentally ill individuals. (Sapers, 2013, Sec. I)

So while there are evidence-based approaches which have proven successful in reducing the negative consequences of mental health and substance use concerns, the criminal justice system has unfortunately been used as a centre of 'treatment'. Of additional importance is the fact that 47 percent of the individuals being treated for mental health and/or substance use issues within correctional facilities are of First Nation, Inuit, and Métis heritage, and therefore, are being treated with methodology which does not align with traditional practices or cultural worldviews.

The significant difference between a mainstream approach and an Indigenous approach is that for Indigenous people, health is viewed holistically. Wellness cannot be separated; physical, emotional, mental, and spiritual wellness are all connected, and further, they are intertwined with one's family, commu-

nity, Nation, and the nature which surrounds all things (Dickson-Gilmore, & LaPrairie, 2005; Hart, 2002; Martin-Hill, 2009; Proulx, 2003). For Indigenous people, to be well means that one is balanced with all things; if an area is out of balance, then one is not well. If one is not well, then one requires healing. "Healing is a concept that is difficult to articulate...there is no need to articulate it...healing is work, it is ongoing and requires dedication...it requires commitment...no one can heal you or make you heal" (Waldrum, 2008). Wellness is not static, it requires self-awareness and willingness. Wellness requires that one is balanced with their physical, mental, emotional and spiritual self, as well as with their family, their community, their Nation, and nature. Wellness is wholeness, and wholeness is balance.

Individualizing the mental health and substance use issues experienced by First Nation, Inuit, and Métis people does not align with their worldview. In contrast, a holistic approach includes the history of colonization, discrimination, marginalization, the continued oppression of this population, and the intersecting determinants of health. A holistic approach allows for an understanding of how socio-economic and socio-demographic locations have impacted lifestyles (Dickson-Gilmore & LaPrairie, 2005; Fitzgerald & Carrington, 2008; LaPrairie, 1997; LaPrairie, 2002; LaPrairie & Stenning, 2003). Whereas, approaching behaviours through an individualized lens results in a failure to recognize and include social intersections that amplify 'anti-social' behaviours (Proulx, 2000; Taylor, 2008). It has been reported that the gap between criminal justice representations of Aboriginal and non-Aboriginal people continues to grow despite the attention it has received (Roberts & Melchers, 2003; Sapers, 2013). While some offender management systems have proven to reduce recidivism rates for non-Indigenous individuals (Rezansoff, Moniruzzaman, & Somers, 2012), one must question whether an Indigenous approach would show similar results for First Nation, Inuit, and



Métis individuals as the mainstream approach appears to have shown with non-Aboriginal people.

There have been numerous programs across Canada which included traditional cultural ideologies and practices, such as the *Aboriginal Ganootamaage Justice Services of Winnipeg* (AGJSW) (Mallett, Bent and Josephson, 2000). This program has reported to have measured a recidivism rate of less than 10 percent (Mallett, Bent, & Josephson, 2000). The AGJSW “provides a forum to foster reconciliation, restitution and restoration of peace and harmony” (Mallett, Bent and Josephson, 2000, p.60). Following the holistic medicine wheel, the AGJSW employs the use of Elders, healthy role-models, healing circles, and various traditional ceremonies in seeking wellness and balance (Mallett, Bent and Josephson, 2000). Once again, holistic approaches allow the understanding of how colonization and social location have affected current populations (Dickson-Gilmore & LaPrairie, 2005; Fitzgerald & Carrington, 2008; LaPrairie, 1997; LaPrairie, 2002; LaPrairie & Stenning, 2003).

Dickson-Gilmore and LaPrairie (2005) emphasize that while both mainstream and Indigenous groups are seeking safety and restitution, the approaches are diametrically different. While First Nations, Inuit, and Métis communities incorporate a holistic, healing approach, it cannot be translated as cushy or passive. Rather, the means towards the end are sought through traditional methods. The authors further say that Indigenous communities have often lamented that the criminal justice system is not punitive enough; traditional approaches to wellness (including individual, community, and Nation) involve measures such as segregation and shame in seeking the restoration of relationships (Dickson-Gilmore & LaPrairie, 2005). Thus, ‘treatment’, and the process of seeking wellness and balance are presented through conflicting

approaches: the mainstream medical approach and the holistic Indigenous approach.

### **De-colonizing Approach to Mental Health and Substance Use**

Decolonization can be understood as a reversal of the assimilating policies and practices which have resulted in the generational devastation of First Nations, Inuit, and Métis people. Marlene Atleo (2008) warns that this is “an arduous process both for Aboriginal and non-Aboriginal people alike – arduous because it requires a mutual self-consciousness...a cooperative destruction...and a creation of institutional forms that are more appropriate and mutually beneficial” (p. 31). Patricia Monture (2006) argues that change must come from members who hold power. Because the criminal justice system was created to control and exclude, applying Indigenous ideologies to a mainstream system would simply perpetuate over-representation. Failing to address structural policies that encourage marginalization would essentially be neglecting to address the real underlying cause of over-representation. A decolonizing approach allows for the understanding of how colonization, oppression, and continued socio-economic poverty impacts Aboriginal people holistically (Dickson-Gilmore & LaPrairie, 2005; Fitzgerald & Carrington, 2008; LaPrairie, 1997; LaPrairie, 2002; LaPrairie & Stenning, 2003). In focusing specifically on mental health and substance use, through a decolonizing lens, I will refer simply to wellness, as my value system does not separate the two – wellness is wholeness.

Bill Mussell (n.d.) expresses that Aboriginal health “is about wellness, not illness” (p. 3). Wellness includes all aspects of self: “relationships with family, community, ancestors, and the natural environment; individual wellbeing is strongly connected to family and community wellness” (Mussell, n.d., p. 1). The connection between individual, family, and community cannot be over-

emphasized. The interdependence that Indigenous people have with one another provides the very context to wellness. Disconnection has resulted in detrimental experiences for First Nation, Inuit, and Métis people (LaPrairie, 1997). Therefore, it is apparent that mediating connection would be the first step in addressing wellness for those who have been removed from their families, communities, and Nations.

Wellness “is achievable only by building and maintaining community systems to meet basic needs that manifest cultural beliefs and values” (Mussell, n.d.). Individuals within the criminal justice system must have connections to their family, their community, their Nation, and their territory in order to be well. But what of the communities that are struggling with wellness themselves? How does the over-representation of First Nation, Inuit, and Métis people cease if current and future generations are living in conditions of extreme poverty, and continued systemic oppression? How does the social learning theory explain what will happen if children experience role-modelling by those who are unwell, or grow up in communities that are unwell? Wellness is holistic; it must exist in an individual, in their family, in their community, and in their Nation simultaneously.

In addressing First Nation, Inuit, and Métis criminal justice over-representation, some changes have already been implemented (Restorative Justice, Gladue courts, AGJSW, and other measures), but it is clear that more are required. Sapers (2013) suggested the following in his annual report:

I recommend that CSC establish an Ethnicity Liaison Officer position at each institution responsible for building and maintaining linkages with culturally diverse community groups and organizations, ensuring the needs of visible minority inmates are met and facilitating culturally appropriate program development and delivery at the site level. I

recommend that the Correctional Service of Canada audit the use of *Gladue* principles in correctional decision making affecting significant life and liberty interests of Aboriginal offenders, to include penitentiary placements, security classification, segregation, use of force, health care and conditional release. (Sec.VII)

As Indigenous worldviews approach wellness holistically, criminal justice involvements must be addressed at all levels.

Culturally-specific and culturally-safe methods of ‘treatment’ and programming for incarcerated individuals must take place. This includes the employment of Elders; Elders are the gatekeepers of a Nation’s knowledge, and the keepers of tradition. Further, the umbrella terms ‘Indigenous’ and ‘Aboriginal’ do not do diversity justice; each Nation possesses traditional beliefs and cultural practices, and taking the practices and beliefs from one group and applying them to all other groups fails to honour the existing diversity of First Nations, Inuit, and Métis people. Therefore, it is imperative that should the criminal justice system employ “*Ethnicity Liaison Officers*” (*Sapers, 2013, Sec. VII*), these officers must be themselves from diverse populations. Utilizing the sage knowledge of Indigenous Elders must also include those who are from diverse populations in order to honour the existing diversity of incarcerated individuals. To reiterate: wellness “is achievable only by building and maintaining community systems to meet basic needs that manifest cultural beliefs and values” (Mussell, n.d.).

### **Implications for Social Work**

It has been repeatedly stated that current experiences of over-representation are a direct result of colonization and the social devastations that exist because of continued oppression. The Social Work Code of Ethics (2005) outlines our responsibilities as social workers: dignity for all, integrity, confidentiality,

professional competence, striving for social change, seeking the elimination of marginalization, enacting true equality, working for the elimination of poverty, and other anti-oppressive practice approaches. As a profession, social work is committed to affecting social change. As professionals, social workers are entrusted with the responsibility of ensuring that we meet the code of ethics, that we honour each person we work with, that we acknowledge our own social location and our own biases, and that we continue to question the status quo as it contributes to the propagation of the oppression and marginalization of countless individuals. Awareness of personal social locations allows social workers to honour diversity while affecting social change.

Practicing as allies alongside those who are oppressed and marginalized allows social workers to practice with cultural 'safety': "the recognition of the social, economic and political position of certain groups within society" (Smye & Browne, 2002, p. 46). As social workers we recognize structural inequalities and advocate for change, we honour diversity, and we challenge notions of knowing and understanding that align with only one value system. "Cultural safety prompts us to ask a series of questions to unmask the ways in which current...policies, research and practices may be perpetuating neocolonial approaches" (Smye & Browne, 2002, p. 47). To be sensitive to cultural diversity and to practice in ways which emit safety and sensitivity requires social workers to avoid amalgamating groups. 'Aboriginal' does not adequately convey the diversity of First Nations, Inuit, and Métis people, just as 'Asian' does not adequately convey the diversity of Indian, Chinese, Japanese, Cambodian, and Malaysian people. Fusing individual groups into one does not honour or recognize the diversity that exists among each separate group. As social workers, we must honour diversity, practice with safety and sensitivity, and advocate for change.

In honouring diversity, we must recognize that cultural

ideologies inform concepts of wellness and how wellness is achieved. In advocating for change, we must use our social locations and our voices to ensure that individual needs are being met in ways which align with distinct cultures. In working with First Nation, Inuit, and Métis individuals who are either incarcerated or reintegrating, it is imperative that culture and diversity is honoured. Further, it is imperative that holistic wellness is interpreted as a non-static process. To this end, connections with family, community, and Nation must be made and allowed to be maintained. Wellness is possible through the use of traditional practices and connection to one's culture; holistic wellness requires continuity, willingness, and dedication.

## **Conclusion**

Although the over-representation of First Nation, Inuit, and Métis people within the Canadian Criminal Justice System has received considerable attention, it continues to be a growing issue. The colonialist past of this country has a direct relationship with the over-representation of Aboriginal people in all systems of government. The impacts of colonization continue to affect current and new generations of First Nation, Inuit, and Métis people today. These impacts can be seen as symptoms of violence, substance use, and poverty, which devastate countless individuals. The dissonance between cultural understandings of health and wellness acts as a serious impingement to working with Indigenous individuals; applying an individualized medical approach to those who understand interdependency cannot result in a sense of holistic balance and connection. An approach which is based upon cultural safety allows for the understanding of how intersections of oppression have created the issue of over-representation. Incorporating diverse helpers (Elders, role-models, liaison officers, and other culturally appropriate measures) allows for a connection to be made with one's unique culture and community. Allowing for

distinct cultural practices (smudging, talking circles, healing circles, sweats, prayers, dances, and other cultural practices) enables individuals to practice medicine which aligns with their originating community's approach to wellness. Incorporating culture into healing encourages balance; balance equates to wellness, and wellness equates to wholeness.

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## Barriers to Community and Social Reintegration for Criminal Offenders

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**Abstract:** *Social and community reintegration for offenders is a pressing issue in today's society, and as social workers we are often expected to solve these issues at a very late stage in the process. In particular, areas of accessing housing, gaining employment, and maintaining family relationships seem to be three major aspects in having more successful reintegration; however, in many instances our overarching ideologies and limited services inhibit offenders reaching these goals.*

*Therefore, when developing a question to guide my research, I wanted to go beyond 'what' the barriers of social reintegration are and move towards 'why' the barriers exist and 'how' social workers can address them. Hence, my research question is to look at why do the barriers of accessing housing, gaining employment, and maintaining social relationships hinder the social reintegration into community for offenders, and what can social workers do to lessen these barriers. My research was completed through a directed studies course and is supported by an extensive literature review that has been supervised by Jennifer Murphy who completed her doctoral work on a similar topic. I have completed a*

*research paper that focuses on the barriers listed above, the theories that support/hinder these issues, and the role of social work in this field.*

### **Why Focus on Offender Reintegration?**

In the diverse sphere of social work, practitioners not only work in a multitude of fields, but they also participate in research that encompasses social work's relevance in these areas. My experience as a social work student, supplemented by my current research on offender reintegration, has caused me to notice that topics surrounding the criminal justice system are often ignored in social work education and research, specifically in a Canadian context. This disregard of criminal justice in social work may be attributed a view that the criminal justice system is the responsibility of those in more authoritarian roles, such as police officers, correctional officers, or court officials, and to the declining number of adults under correctional supervision in Canada (Dauvergne, 2012; Goff, 2004).

However, it is a drastic drop in community supervision that has driven this decline rate, and the number of adults in custody has actually risen in Canada (Dauvergne, 2012). Likewise, recidivism or offender reentry into the correctional system is still a major issue in Canada, as 75% of convicted offenders have had multiple prior offenses. Social barriers, such as accessing housing and employment opportunities, and maintaining social relationships are chief aspects of this recidivism (Baldry, McDonnell, Maplestone, & Peeters, 2006; Griffiths, Dandurand, & Murdoch, 2007; Sapers, 2013). Therefore, one could say that the issues for offenders have not lessened in Canada; instead, they have increased, and been shifted to a community level. The factors that are issues for offenders—community integration, equal access to employment and housing, and maintaining healthy relationships—are areas that in which social workers typically have some insight.

Thus, the criminal justice system is something that is relevant to the field of social work and social workers will need to better understand the barriers faced by offenders reentering the community since they will have to address these issues in their practice. If social workers continue to play a minimal role in the area of offender reintegration they will be ignoring a very large subsector of marginalized individuals in Canada. Until social workers begin advocating for offenders and becoming more involved in the correctional system, they will actually be contributing to the marginalization of these individuals, rather than upholding the basic social work ethic of advocating for change for the overall benefit of society (BC Association of Social Workers, 2011).

### **The Importance of Addressing Barriers**

In my experience as a housing outreach worker for a local community agency in Kamloops, I have become enlightened about reoccurring trends in the barriers faced by offenders who are newly out of prison. The most persistent barriers relate to accessing and maintaining housing, finding employment, and maintaining healthy relationships. Furthermore, I have begun to understand that these barriers are the reason for a large number of these offenders reentering prison in a very short period of time. Once I began embarking on research in this field, I found a substantial literature on the many research studies supporting my practice-based claims. I feel that addressing these barriers to the reintegration of criminals not only provides social workers with insights promoting better practice, but it also assists in looking at what systemic and structural issues reinforce these barriers. Before critically examining barriers, we first must have a comprehensive understanding of what the barriers for offenders actually look like.



### *Accessing and Maintaining Housing*

One of the most pressing concerns for an individual leaving prison is accessing safe and affordable housing (Geller & Curtis, 2011; Maidment, 2006). In fact, having secure housing is recognized as important for the economic, physical, and emotional health of individuals, regardless of their vulnerability and social class in society (Geller & Curtis). Not having stable housing has been proven to lead to social exclusion and oppression (Geller & Curtis; Dyb, 2009). Yet, despite the necessity of having housing in our society, homelessness among just released offenders is an ongoing problem, which can increase the likelihood of reoffending by 20% (Baldry et al., 2006; Brown, et al. , 2008; Harding & Harding, 2006). The limited amount of transitional and low income housing for offenders post-release practically sets them up for failure. (Baldry et al.; Brown et al.; Dyb; Geller & Curtis). Market-based housing is unattainable in many circumstances, since many offenders coming out of prison have no source of income; yet, they often cannot receive income support services because they don't have an address (Maidment). This puts offenders in a paradoxical position: they have limited low-income housing options, but even if they were to seek out other non-supported housing options, they are not given the financial support to do so.

If an offender does obtain housing, maintaining it is equally important to community integration. A study based on Australian offenders found that among ex-prisoners who have had to move more than once, 66% went back to prison, whereas prisoners who did not have to relocate had a return rate of only 25% (Baldry et al., 2006). Unfortunately, offenders are often forced to live in temporary accommodations like hotels or rooming houses, have difficulty paying rent, are forced into shared accommodations, and live in overcrowded situations, all of which are considered precursors for housing instability (Geller & Curtis, 2011;

Maidment, 2006). Again, this emphasizes the importance of not just having housing, but having accommodation that is suitable and safe.

Additionally, lack of understanding and stigmatization of offenders by landlords and the rest of the community contribute to the problem of accessing housing (Harding & Harding, 2006). Landlords often fall into the trap of NIMBYism (Not in My Backyard Syndrome), which makes them unwilling to provide housing for offenders based on the fear that they may be a threat to community safety or that their presence may diminish property values (Harding & Harding; Murphy, 2002). Landlords essentially discriminate against offenders and are more likely to rent to someone without a criminal record, which reinforces the idea that offenders are 'undeserving' and should continue to be punished, despite the fact that they have already served the sentence for their crime. (Harding & Harding).

Not being able to access housing ultimately inhibits community reintegration and consequently results in many offenders reentering prisons. Not having secure housing gives many offenders a sense of hopelessness, which causes them to reoffend or otherwise get involved in criminal behavior (Brown et al., 2008). In addition, the majority of housing available to offenders is located in areas with higher criminal activity, which offers even more temptation to reoffend (Dyb, 2009; Geller & Curtis, 2011; Graffam & Shinkfield, 2007; Harding & Harding, 2006). Thus, our society continues to punish offenders by not providing them with the support needed to access and maintain housing; offenders continue to have higher rates of homelessness, poorer housing conditions, and growing rates of recidivism, which all of which reinforce other barriers to social and community reintegration.

### *Finding Meaningful Employment*

Finding meaningful employment for offenders post-release is an equally important barrier. Employment is closely linked with the barrier of maintaining housing, since an individual cannot maintain one without the other (Geller & Curtis, 2011). Similar to homelessness rates, it is not surprising that offenders have higher unemployment rates than the general public (Geller & Curtis; Maidment, 2006). Again in an Australian context, it was found that 8% of offenders who had employment upon release went back to prison, whereas 54% of offenders who were unemployed returned to jail (Baldry et al., 2006). Clearly, being employed is an aspect of re-integrating into the community; it reduces recidivism.

Although there is an understanding that not all individuals in society may be able to fully participate in employment, having financial stability is a means of achieving control in our capitalist society: it has been socially constructed as a necessary requirement for success (Garland, 2001). Yet, the fact is that offenders are substantially unsupported in accessing meaningful employment (Maidment, 2006). Incarceration is stigmatizing and many employers see offenders as a last-resort hire; they are more likely to hire those with little or even no experience over someone with a criminal record (as cited in Petersilia, 2001). Likewise, most employers still require criminal record checks, and achieving a pardon or 'record suspension' is a very lengthy and difficult process (Parole Board of Canada, 2012; Ruddell & Winfree, 2006). Even though we know that many employers require criminal record checks, there is still a lack of programming to support offenders coming out of prison, such as a transitional employment programs or even skills-based training that could address this barrier (Griffiths et al., 2007; Sapers, 2013). Again, it appears that soci-

ety is suggesting that once offenders commit crimes, they basically have to live with these crimes for the rest of their lives.

Lack of financial stability or employment for offenders is often a precursor for them to get re-involved in criminal behavior (Graffam & Shinkfield, 2012). Even if they do find employment it is usually minimum wage work, which results in many of them living in poor conditions and often in circumstances in which they cannot pay for their necessities, such as housing (Geller & Curtis, 2011; Maidment, 2006). Moreover, many of the jobs offenders end up with involve casual employment that often does not provide benefit programs or job security (Graffam & Shinkfield). The barrier of employment involves more than just finding a job: it involves finding work that is meaningful and that will actually allow offenders to reintegrate into the community on both a social and financial level (Maidment). Overall, there is an expectation for offenders to be contributing members in our society; yet, there is little or no support helping them achieve these far-reaching goals.

### *Upholding Healthy Family Relationships*

The context of an offender's relationship with his or her family can also be a detrimental factor in successful reintegration into the community and these relationships are closely linked to other barriers discussed earlier (Evans, 2001). Overall, offenders who have strong family networks have an invaluable support throughout all stages of their criminalization, particularly when trying to reintegrate (Maidment, 2006). Having positive family relationships can be a factor in reduced recidivism, particularly with regard to housing and accessing other social supports (Carlisle, 1997; Rocque et al. , 2010; Shinkfield & Graffman, 2007). For example, it was found that among Australian offenders living with family, only 23% returned to prison, whereas 52% of offenders not living with family returned to prison (Baldry et al., 2006).

Maintaining a positive family relationship is something that many released offenders, particularly Aboriginal offenders, seek over other needs, (Brown et al., 2008; Maidment). Therefore, from a client-centered perspective, encouraging family relationships is not only positive because it reduces recidivism, but also because it values the actual desires of the offender.

On the other hand, if an offender has a negative family relationship, it can be a predictor of a higher chance of returning to prison (Shinkfield & Graffman, 2007). Due to a lack of housing and support for offenders, many are pushed into living with family members with whom they may not necessarily have a positive relationship (Geller & Curtis, 2011; Petersilia, 2001). This forced relationship often backfires for offenders, causing worse family breakdowns, evictions, and overall, a revolving door in which offenders get stuck (Geller & Curtis). Furthermore, offenders' family relationships are often plagued with battles over other issues beyond housing, such as marriage and divorce battles, employment problems, welfare access, and parenting rights (Rocque et al., 2010). These stressors can be triggers for offenders, who often resort to criminal behavior in these stressful instances, perhaps because they are unaware of other avenues for support (Rocque et al.; Shinkfield & Graffman). If an offender has negative family relationships, their strongest relationships often become friends and peers who may be involved in criminal activity, which again can result in a higher chance of recidivism (Goff, 2004). Thus, society's overtly conservative underpinnings, which assume that family can support a relative during vulnerable periods, may not always be aid in the reintegration of offenders.

It is important to note that many familial relationships are not always negative to begin with for offenders; however, the stigma attached with incarceration and limits on visitation may contribute to the breakdown of relationships between offenders and their families (Rocque et al., 2010). Because many prisoners

spend extended periods of time incarcerated, their bonds shift from family members to fellow inmates, which may not always be the best bonds to have post-release (Goff, 2004; Rocque et al.). The emphasis on staying positively connected with family is practically non-existent while in prison, yet, the expectation is that post-release, offenders will still have relationships with family members who they may have not contacted in years (Carlisle, 1997; Rocque et al.; Sapers, 2013). Although it has been recommended that offenders have more contact with family and community while incarcerated, through community outings and monitored Internet access, this request has been consistently denied by governing correctional bodies (Sapers). Instead, we continue to see rising recidivism rates in Canada, which could be reduced if the continuum from incarceration to community better addressed the barriers offenders face: accessing housing, obtaining employment, and maintaining positive family relationships. (Goff et al., 2006; Petersilia, 2001).

### **Why Do Reintegration Barriers Exist for Offenders?**

Although understanding the social barriers that offenders face while trying to reintegrate into community is relevant, social workers cannot simply stop at identifying the issues. Instead, they need to understand why these issues exist in the first place by using a more critical and structural lens. There are many ideas stigmatizing attitudes, and ideological issues that both reinforce barriers for offenders and help to explain why barriers exist in our society. Although many of these overlap, they can be generally organized into overarching stigmatizing ideas and attitudes, society's values in regard to the overall role one should play in reintegration, and narrower views that look at reintegration as something the offender controls on an individual level. Social workers should also utilize theories and values that are commonly understood in their profession to better approach offender reintegration.

tion; these social work theories and values will be explored further when discussing social work's specific role in addressing offender reintegration. However, it is still important to understand other overarching theories, attitudes and issues before social workers can develop plans that address these barriers; otherwise, social workers may only scratch the surface of the problems at hand.

### *Stigmatizing Theories and Attitudes*

Having a negative view of offenders, or any group for that matter, is not something that is inherent in society; rather, it is something learnt through powerful structures and institutions that impose stigmatizing perspectives (Garland, 2001). Many overarching ideas in our society focus on the need for social order and public safety; although these may be relevant for ensuring that the general public feels secure, they do a disservice to those who have ever strayed away from this order, even if they have lived up to the consequences of their crime (Garland; Turnbull & Hannah-Moffatt, 2009). A surveillance and security oriented society creates a sense of punitive segregation that focuses on protecting the community from offenders, many of whom have already served their time, rather than trying to reintegrate them (Garland; Turnbull & Hannah-Moffatt). For example, many offenders immediately enter halfway houses upon release; these houses often impose strict guidelines, rules, and supervision, which continue to segregate offenders—the houses are practically second stage institutions (Bahr, Harris, Fisher, & Armstrong, 2009; Turnbull & Hannah-Moffatt). These halfway houses are often promoted as positive for offenders reentering the community since they provide housing. However, many of the strict guidelines inhibit other important aspects of reintegration such as employment and reunification with family (Canadian Association of Elizabeth Fry Societies, 2012; Turnbull & Hannah-Moffatt).

Furthermore, this overarching sense of control and need for public safety leads to stigmatization of offenders, as ins NIMBYism (as cited in Murphy, 2002; Winston, 2010). NIMBYism, often used to describe community resistance to economic or infrastructural changes, poses specific problems for offenders trying to obtain housing (Murphy; Winston). Having low-income housing within general neighborhoods can be a positive integration strategy for offenders, as this places them within communities rather than segregated into halfway houses or 'poorer' areas (Winston). Unfortunately, NIMBYism and a professed need for safety are often reasons why the creation of low-income housing projects faces resistance in some neighborhoods; many feel that bringing in those who are of lower income will increase crime and bring down property values (Turnbull & Hannah-Moffat, 2009; Winston). Furthermore, NIMBYism often promotes the idea that someone's position is their own fault; as a result, strategies that would help those who are labeled as 'lesser than,' such as offenders, are not promoted (Stein, 1996).

This idea of individual blame can also be linked with cognitive transformation theory, which focuses on individuals' making their own choices and proposes that they have the means within themselves to change (Bahr et al., 2009; Tripodi et al., 2010). Cognitive transformation theory can also be seen as a reinforcing our social order ethos in society, as it labels deviation from the normative social order as the making of poor 'personal choices' (Bahr et al.; Garland, 2001; Tripodi et al.). This theory can have many negative implications for offenders trying to reintegrate, as it suggests that there is little need for supportive programs to be put in place for offenders, as the choice to 'be good' is simply an individual one (Bahr et al.). Additionally, it reinforces our overarching societal viewpoint of offenders as deviants rather than focusing on what societal barriers exist (Garland). In terms of reintegration, these stigmas only create larger barriers, as each time someone reenters prison they are labeled as being never able to



change, and the focus of looking at social barriers becomes lost (Garland).

### *Societal and Structural Theories and Values*

Not all values reinforce the barriers for offenders trying to reintegrate; some do indeed shift away from offenders being labeled as deviant and instead look at more structural explanations for why offenders have difficulty reintegrating. In contrast to social order theories, humanistic approaches define every individual as human and on an equal playing field, regardless of their social location (Plummer, 2001). This approach essentially ignores the label of 'offender,' and can thus be an instrumental strategy for integration (Plummer). If this label disappeared, through elimination of things like criminal record checks for employment and credit checks for housing, jobs and accommodation would be much more accessible for offenders, which in turn could help familial relationships (Ruddell & Winfree, 2006; Tripodi et al., 2010). Therefore, theories such as social bond theory and life course theory, which have humanistic undertones, move away from the criminality of the offender and are approaches that could positively reinforce offender reintegration (Bahr et al., 2009; Bales & Mears, 2008).

Social bond theory focuses on the social setting an individual is placed in and how this environment influences positive or negative bonds that could induce change (Bales & Mears, 2008). With regard to offender reintegration, this theory would suggest that an offender living in a hostile and overcrowded family home and having no employment, would more likely have negative bonds with their family members and other individuals in their social circle and this, in turn, would be unlikely to lead to positive change (Bales & Mears; Rocque et al., 2010). On the other hand, if an offender were living in a suitable environment, financially

providing for their family, they would have positive bonds, which could encourage positive change (Bales & Mears; Rocque et al.). Thinking based on this theory is positive for offenders trying to socially reintegrate, as it shifts away from an offender's past or criminal tendencies and instead bases success on the social setting of the offender. Furthermore, it reinforces the importance of having housing, employment, and very specifically, it highlights the importance for offenders of having positive relationships (Bales & Mears).

In regard to life course theory and offenders, the focus is on the importance of having a structured social environment, which is seen as a means of inhibiting criminal activity (Bahr et al., 2009). Under this theory, structure does not necessarily involve stringent rules and regulations, as these could trigger rebellious tendencies, but rather factors like having employment (Bahr et al., 2009). Life course theory can also be linked with social bond theory, since creating positive social bonds can be viewed as a necessary component for maintaining a structured environment (Bahr et al., 2009; Bales & Mears, 2008). Generally, this theory moves beyond looking at the deficits of an offender and instead looks at what structures are needed for success and reinforces the importance of meeting social needs, rather than enforcing surveillance and control. Overall, theories and values that focus on the societal and structural needs of offenders are important for reintegration, as they counter the idea that offenders are 'lesser than' and instead reinforce the notion that offenders are human and their needs are as important as those of any one else in society (Plummer, 2001).

### *Role Accumulation Theories*

Theories that examine how offenders view themselves are also important perspectives to analyze, since this can play a very important role in their ability to reintegrate (Martinez,

2010; Maruna, 2001). Having a positive social role in society can give offenders the motivation needed to develop a commitment to change (Martinez; Tripodi et al., 2010). The theory of Generativity reinforces this idea of having a positive social role, as it speaks to the importance of having a role that is fulfilling, whether this involves having meaningful employment, being a mentor to someone, or simply attempting to reach personal goals; feeling needed in society is imperative to success (Maruna). In relation to reintegration, even if an offender has employment, housing, and positive relationships with family, if they do not find their role in society meaningful, then they may still feel the urge to reengage in criminal activity (Martinez; Tripodi et al.).

Unfortunately, as discussed previously, society categorizes offenders into roles that are usually negative (Garland, 2001; Maruna, 2001). They are not likely to be very motivated living in a society that continues to tell them that they are less than others, by not renting housing to them, not employing them, or not wanting to build positive relationships with them (Evans, 2001; Harding & Harding, 2006; Tripodi et al., 2010). The constant stigma and negativity surrounding an offender post-release can also make them more apt to reoffend and conform to their 'criminal role' (Martinez, 2010). Until offenders no longer view themselves as criminals, they will be unable to fully reintegrate into society.

However, moving beyond a criminal label in society is very difficult when offenders are constantly evaluated on how much of a risk they pose and how much of a danger they may be to a community (Garland, 2001; Goff, 2004). This is especially difficult when offenders are either in halfway houses, low-income neighborhoods, or hostile family situations, as the individuals they associate with in these situations will most likely also have similar negative roles (Dyb, 2009; Martinez, 2010; Rocque et al., 2010; Tripodi et al., 2010). As social learning theory states, motivations are learnt from those one associates with; therefore, if the indi-

vidual offenders are forced to surround themselves with others who have low self-efficacy, they themselves are more likely to also have a lower-sense of self-worth (Bahr et al., 2010). This low self-worth will only reinforce criminal roles and ultimately increase the likelihood that an offender will return to prison (Martinez). Hence, our criminal justice system creates a revolving door for offenders. The existing difficulties posed by obtaining housing, accessing employment, and maintaining relationships are combined with offenders being forced into situations that can only lessen their motivation to overcome these barriers and instead reinforce conforming to roles that will heighten the chances of reoffending (Martinez, 2010; Tripodi et al., 2010). Offenders are thus required to overcome both societal limitations and personal barriers in order to attain full reintegration into community. This has become a very difficult task, as the overarching ideologies in society that reinforce surveillance, control, and public safety confine offenders into negative environments that reinforce their criminality (Garland, 2001; Turnbull & Hannah-Moffatt, 2009). Overall, this contradictory system is what causes rising recidivism rates (Goff, 2004).

### **Social Work's Role in Offender Reintegration**

Social workers are often given a 'Band-Aid' role when working with offenders; they are expected to pick up the pieces, trying to help with housing, employment, and familial relationships after the offender has had little success with these goals. However, analyzing the current barriers, as well as the theoretical underpinnings that both explain and also limit reintegration, it is clear that in general, social workers need to be more involved when working with offenders, and at a much earlier stage. In particular, social work is needed to both address structural issues and also practical limitations in the continuum from institution to community. Yet, it is difficult to create change by starting from

scratch; therefore, when formalizing plans to address the barriers to reintegration, social workers should start by assessing current strategies and then consider the gaps that exist in order to create better plans for implementation. Social workers should also remember to consistently self-reflect with respect to which theories and values they are working from, as these can strongly influence the way they approach offender reintegration.

### *Gaps in Current Programming*

Current correctional programs either focus on within-prison goals or within-community goals; there is a lack of programming that focuses on the actual transition from institution to community (Brown et al., 2008; Harding & Harding, 2006; Peterilia, 2001). Existing programs within institutions are unable to address social needs and since they tend to end within institutions. For example, many focus on either work that fulfills the needs of the institution, such as cooking and cleaning, or on personal issues like mental health and addictions; these programs tend to not bridge, since they are lacking in follow-up once an offender is released into the community (Griffiths et al., 2007; Sapers, 2012). On the outside, community programs focus on risk assessment and are still institution and surveillance based, which again does not address the social needs of offenders (Goff, 2004; Griffiths et al., 2007). Even if offenders are linked to programs that address mental health concerns or addictions once they are in the community, the follow-up is largely driven by the medical model, involving medication management and detox programs (Bahr et al., 2009; Goff; Griffiths et al.). Although these programs can be important for reintegration, rather than working in conjunction with other social programs, they tend to actually override supports focused on housing, employment, and familial relations (Goff; Graffam & Shinkfield, 2007; Griffiths et al.). The types of programs that would assist in offender reintegration, such as coun-

selling services and literacy training, are only accessed by 12.5% of offenders, while 35% remain on waitlists (Sapers, 2012). As explained previously, these gaps in current services ultimately result in many inmates being ill prepared when trying to access housing, obtain employment, and maintain relationships (Baldry et al., 2006; Graffam & Shinkfield; Sapers, 2012).

### *How Can We Better Address Offender Reintegration?*

It is apparent that the largest gap in offender reintegration is the lack of proactive programming within institutions (Sapers, 2012). Many correctional officers may not have the training, skills, or even positive attitude toward inmates that would help offenders fulfill their goals for reintegration (Gunnison & Helfgott, 2010). Thus, one way that social workers could better address reintegration barriers could be to actually practice more within prisons. Rather than trying to pick up the pieces once an offender is blindly released into the community, social workers could work in a multitude of areas including proactively linking offenders to potential housing options, liaising with employment services, and providing access to counseling on both individual and family levels (Carlisle, 1997; Sapers; Spencer, 2006). Social workers could facilitate community outings before an offender is released, such as job interviews or house viewings, so that the inmate might have certain things already in place when he or she is released (Sapers).

Social workers could also undertake the role of advocate and educator. It is clear that offenders have to withstand numerous stigmatizing attitudes especially from landlords and employers; part of social work's role should be to create partnerships with landlords and employers that would address some of these attitude issues (Geller & Curtis, 2011; Graffam & Shinkfield, 2012; Tripodi et al., 2010). In fact, social workers could not only create

these partnerships, but they could also offer support to employers and landlords, connecting them with agencies that could help with their needs as well, such as life skills workers and outreach workers (Brown et al., 2008; Geller & Curtis). Having outreach staff who continue to work with offenders in the community is very important, as these workers could help with the continuum from incarceration to community by providing counselling and other supports, rather than having this programming end once an offender leaves an institution (Griffiths et al., 2007).

Social workers could also work towards building better relationships with already existing community supports, such as police officers and community correction officers (Axford & Ruddell, 2010; Evans, 2004; Rezansoff, Moniruzzaman, & Somers, 2012). Offenders often view police and community correction officers as punitive forces; the strict guidelines and restrictions they impose can cause released inmates to reoffend (Axford & Ruddell). Social workers could take on the responsibility of building more positive relationships with these the authorities. For example, in a pilot project in British Columbia, when intensive supervision was replaced by a more collaborative and integrated team approach to working with prolific offenders; the rate of recidivism was reduced by 40% (Rezansoff et al., 2012). Having integrated teams working with offenders can allow for individual needs to be addressed in multiple contexts (Rezansoff et al., 2012). It is also important to build positive relationships with the community (Evans, 2004). Facilitating community forums that allow transparency for community members, and providing education, are very effective tools that can help with reintegration for offenders (Evans, 2004). It is important, however, that these forums should provide an opportunity for the voices of offenders as well as community members to be heard; many of the present programs do not include the offenders (Evans).

In addition to the numerous practical actions social

workers can take to address offender reintegration, they should also be cognizant of the theories and practice models that influence their work; otherwise they may begin to work from perspectives that actually hinder offender reintegration, some of which were discussed previously. Some relevant theories for social workers working towards better offender reintegration include systems theories, particularly ecological systems theory (Healy, 2005). Ecological systems theory looks at an individual's relationship with the environment and views each individual's environment as unique. Social workers who work from an ecological systems theory will be able to better understand where an offender is 'at' with respect to cultural, historical, communal, and societal contexts (Friedman & Allen, 2011; Healy). A social worker using this approach would look at an offender from the perspective of his or her own internal system at the individual level (e.g., examining substance abuse or mental health issues), as well as the family level, and the overall community level—all of which contribute to how well an offender can succeed in his or her environment (Friedman & Allen). Taking all of this into account would allow a social worker to better understand an offender's life stress, coping abilities, power relations, etc.; shifting away from a linear approach, the social worker could work from a more circular or holistic perspective (Healy). Indeed, if a social worker does not work from a systems theory approach, they may miss a very important aspect in an offender's environment, which could ultimately set the offender up for failure when trying to reintegrate into the community.

Another important perspective social workers should consider when working with offenders trying to reintegrate is that of "strengths" (Healy, 2005). The strengths perspective can be described as a work practice that focuses on strengths, abilities and potential rather than problems, deficits and pathologies (Saleeb, 1997). Many offenders may have a very low sense of worth and be full of shame once finishing their sentence; a social worker who does not incorporate a strengths perspective into their prac-



tice may not be able to help offenders feel worthy or motivated to accomplish their goals (Martinez, 2010). A social worker using a strengths perspective should be “oriented towards the exploration of future possibilities rather than an excavation of the past” (Healy, p.156), which is very important when trying to assist offenders reintegrate. Offenders are typically coming from an environment that often highlights their weaknesses (Martinez). Failure to focus on the offender’s inherent strengths could not only create a barrier to reintegration, but also prevent social workers from building a therapeutic rapport with the offenders they are working with, as the offenders may see them as reinforcing their perceived weaknesses (Maidment, 2006).

Lastly, another important practice approach and theory for social workers is critical theory (Healy, 2005). Critical social work can be broadly described as promoting social justice through practice and policy. A social worker using critical theory would recognize large-scale social structures associated with the oppression of certain groups based on their class, race, gender, age, sexual orientation, (dis)ability, and their overall ‘position’ in society (Healy). A social worker practicing with critical theory would work with oppressed populations to promote and achieve social change and transformation (Healy; Mullaly, 2007). Within the context of offender reintegration, it is extremely important for social workers to understand how offenders are oppressed in society, not only due to their label as an offender, but also as a result of other aspects of their social location. For example, a female offender may have different barriers and challenges than an offender with a mental illness or a developmental disability. Therefore, social workers need to be self-reflexive in their practice and be critical when examining how current structures and policies prevent offenders from reintegrating into society (Healy). If a social worker fails to utilize a critical lens in their practice, they may fail to address the systemic barriers that oppress offenders and may end up only be tackling surface and short-term issues that will not

contribute to longer-term change for offenders trying to reintegrate (Healy).

In summary, there are numerous theories, perspectives, and practice approaches that social workers can be guided by in their work with offenders, and pieces of each may be incorporated in situation. There is, in fact, no one ideal theory best suited to work in this challenging field and each theory its limits. The key is for social workers to be aware of the theories they work from and how theory impacts the individuals they work with. Overall, social workers have an important role to play in ensuring better offender reintegration and in building positive and productive relationships in which everyone is working towards the same goal: to empower and support offenders.

## **Conclusions**

Social and community reintegration for offenders is a pressing issue in society, and social workers are often expected to solve problems at a very late stage in the process. In particular, accessing housing, gaining employment, and maintaining family relationships are vital for successful reintegration; however, in many instances society's overarching ideologies and limited services inhibit offenders from reaching these goals. Social workers can help address these issues at both practical and structural levels, by challenging and modifying the current systems as well as by advocating for new programs that better address this growing need. Individuals need to remember that offenders who have been released from institutions have served their time, and society should not continue to punish them. Instead, environments should be established that allow for offenders to feel that they are needed within communities. This will ultimately create the safety our society strives for.

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## In 'Ley'mans Terms: Exploring David Ley's Contributions to Urban Geography

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### Geography

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**Abstract:** *The 1970's represented a period of rapid change in urban geography, during which philosophical pluralism led to numerous approaches to the field. David Ley was a major contributor whose work had an impact on the discourse during this period. In this paper, Ley's major contributions of Humanistic Geography, the Cultural Turn, and Gentrification are all explored, and the impacts of these contributions are examined.*

*"This City is what it is because our citizens are what they are."-Plato*

### Introduction

*"It is not easy to construct by mere scientific synthesis of a foolproof system..." (Erickson, 1950)*

In his work on building a better system, Erik Erikson talked about "interplay." Urban geography is a field that has been



defined by the “interplay” of ideology and discipline. Over 75 years, the field has been subjected to numerous ideologies: Regional, Spatial, Behavioural, Marxist, Humanist, and Feminist. These ideologies have also been drawn from a variety of disciplines; for example, urban geography has become more of an interdisciplinary field of study, comprised of sociology, economics and geography. However, all these conflicting ideologies do not weaken the field. Basset and Short (1989) outline how the contending actors create healthy debate, “exposing deficiencies and challenging orthodoxies” (p. 189). This is important, as it has integrated urban geography into the mainstream of social science (Basset & Short, 1989)

This paper will examine one of the key writers in urban geography: Dr. David Ley. Ley’s resume includes an impressive list of publications and he is noted as being a major contributor to the ideology of Humanism. He is also known for his work bringing cultural importance into cities, and examining the phenomena of inner city revitalization (otherwise known as gentrification, a process of moving back to the city centre). He was one of the scholars that contributed to the “interplay” that now marks the field of urban geography.

His contributions are the focal point of this paper. A brief examination of the history of Urban Geography and the need for new thinking will set the stage for Ley’s introduction. His key works will then be discussed, and his major contributions explained. Each contribution will be discussed separately. These are interconnected themes that developed over time, each achieving prominence during different periods. That is to say, gentrification was an interest touched on early in Ley’s writing, but it was not fully realized until much later, after the discourse within geography had developed. Since these themes interact, this discussion will be dedicated to addressing them and their evolution and interaction over time.

## *History*

To understand where Ley fits into the urban discourse, it is important to understand the tone of urban geography at the time. The late 1950's witnessed a "quantitative revolution" that carried on through the 1960's (Adams 2001, p. 530). The 1960's saw the Chicago School of Geography become the dominant force in Urban Geography, adding a greater sense of professionalism to the field (Yeates, 2001, p. 515). The Chicago School also put an emphasis on process over form. While Physical Geography embraced the quantitative revolution, by 1970, Human Geography turned its focus more towards perception and phenomenology (the study of structures of consciousness experienced from the first-person point of view) (Adams, 2001, p. 536). This isn't to say that the quantitative methods previously employed were lost. Harvey's *Explanation in Geography* (1969) detailed the benefits of adopting the scientific ideology and how it up-graded the standards of argument (Harvey 2002, p. 39).

Spatial analysis, the dominant school of thought in the 1950's through to the 1970's, had focused on quantification and examining the form of the city in mathematical language. Around the early 1960's, the Chicago School started pushing for a focus on process. Facilitating this different approach required new ways of thinking. This created a sub-division of spatial analysis known as Behavioural Geography. At its peak, Behavioural Geography caused widespread change within the geography community, expressed here by Gunnar Olsson (1974): "Although this intellectual offspring never really developed, its conception and birth had important epistemological consequences. (p. 52)." Among those consequences was the realization that using mathematical thinking and logic confined the thinker to a prison in which ambiguity and fuzziness could not be addressed (Olsson, 1974).

What can be kept from the quantitative revolution and the Chicago school? An underlying theme from Adams (2001), Harvey (2002), and Yeates (2001) was the need for, and development of, consistent thought, or “norms of logical argument” (Harvey, 2002, p. 39). This ‘logical positivism’ (practice of good science), and increased professionalism, ushered in a new era of Urban Geography.

### *Philosophical Pluralism*

This new era of philosophical pluralism can be identified by the rapid growth in schools of thought and ideologies in the 1970's and early 1980's. To this point, the field had, and still does have, strong ties to Spatial Analysis and its Behavioural Geography component. However, new criticisms of spatial analysis were flourishing (Paterson, 2014), and a tense political atmosphere led new scholars away from established norms and towards radical new thoughts, the most popular at the time being Marxist theory (Blaut, 1979).

Whereas Spatial Analysis focused on form, and Behavioural Geography focused on process, Marxist Geography focused on material/structural relationships and the distribution of power (Ley, 1978). While both of these ideologies were influential in the examination of the social city, they both lacked a means of addressing human agency.

The radical movement that allowed for dissension from the Chicago School also allowed for new approaches to be more accepted (to an extent). Despite the popularity of Marxist theory, there was concern that it was overly focused on capitalist theories and left out pre-capitalist thought, essentially the cultural element

(Blaut, 1979). The considerable gap in literature was not left undressed for long, marking the beginning of Ley's influence.

## **David Ley**

Dr. Ley first made his mark in 1974. Taking advantage of the radical tradition, he produced work that used behavioural thought, but led towards subjective, humanist tones. Since then, Ley has become prominent in the study of changing cities, particularly Pacific-rim cities. Ley received his training at Oxford and the University of Pennsylvania. He has received numerous accolades, including being made a Fellow of Royal Society of Canada, holding a Canada Research Chair, and receiving a Lifetime Achievement Award from the Association of American Geographers, and he has served as the head of the UBC Geography Department. Although his contributions are ongoing, he has already left his mark on Urban Geography, particularly in the areas of Humanistic Geography, the Cultural Turn, and Gentrification.

### *Literature Review*

After graduating from the University of Pennsylvania, Ley published his thesis as *The Black inner city as a frontier outpost: Images and behavior of a Philadelphia neighborhood* (1974a) (or *The Black inner city*, for simplicity). This was a major work for two reasons: it focused on a contemporary urban issue and it utilized a modern methodology (Jackson et al., 1998). This book marked the beginning of the early part of Ley's career, during which he examined the inner city in great detail, utilizing humanism, emphasizing cultural perceptions, and describing the changes to the inner city that would eventually be manifested as gentrification. Important literature on each aspect will be individually presented in the following section.

The development of humanism is the most important, as it naturally leads to a greater need for the use of cultural geography theory in explanations, which in turn gives a more comprehensive idea of gentrification. Before continuing, a working definition of Humanism is needed. Simply put, Humanism is a philosophical tradition that emphasizes human faculty as the centre of human action. Humanist geography is an approach that attempts to put humans at the centre of geography, and views other methods as unsatisfactory for understanding human behaviour because they view humans as 'materialistically motivated robots' (Gregory et al., 2009, pp. 356-357). Ley's key works on Humanist Geography include: *The Black inner city* (1974a), "The City and Good and Evil: Reflections on Christian and Marxist Interpretations" (here after referred to as "The City"), (1974b), *Humanistic Geography* (1978), *Geography without Man: A Humanistic Critique* (1980), and *Cultural/Humanistic Geography* (1981).

The two 1974 publications put an emphasis on human agency, calling for a need to focus on "the strategies of the actors on the gaming table" (Ley, 1974a, p. 9; Ley, 1974b, p. 71). While *The Black inner city* followed a behavioural methodology, there was a clear attempt to draw attention to the specifics of spatial form, i.e., "...the antecedent decisions and behaviours which arrange phenomena in space" (Ley, 1974a, p. 9). In "The City," Ley also drew attention to the recent criticisms of social science models, and the lack of "satisfactory models of man" (Ley, 1974b, p. 71). *The Black inner city* (1974a) made subtle suggestions that the built form was less responsible for shaping the inner city community of Monroe than the people themselves and their actions.

In 1978, Ley edited *Humanistic Geography*, which lays the foundations for the new approach. The introduction explains that the goal of the text is to create an integral cross section of humanist thinking (Ley & Samuel, 1978). The book is organized into

parts that examine the epistemological orientation, methodological implications, and research directions of humanism (Ley & Samuel, 1978). In Ley's own chapter, he discusses a reformulation of humanism, with less focus on idealism and more focus on anthropocentrism, inherent human nature, and inter-subjectivity (Ley, 1978). This book marked the starting point of humanism in the scientific world (Ley & Samuel, 1978); it particularly addressed early concerns that it was too focused on the concept and experience of the existential man (pp. 51), while offering a critique to improve the ideology as an acceptable social science. This was achieved by adopting better epistemological and methodological stances (Ley & Samuel, p. 9).

The final humanist paper discussed here is a review of the field, tracking its path to a wider mainstream audience. "Cultural/humanistic Geography" (Ley, 1981) begins by tracking the field's ties to the Sauerian cultural geography tradition, with its focus on culture as "superorganic" (Ley, 1981, p. 250). This superorganic model of human-culture relations became heavily criticized, as it described humans as being subjected to culture, not shaping it; ironically, this made cultural geography a geography without an active view of man (Ley, 1980; Ley, 1981, p. 250). The paper discusses both the dehumanizing aspects of spatial analysis and humanism's preoccupation with perception and meaning, which results in a failure to ground itself in social or historical context (Ley, 1981). The concluding section states that Humanistic Geography is a "theoretical perspective" (Ley, 1981, p. 253), rather than an empirical sub-field. Ley further suggests that the objective is to marry the humanities to the social sciences, combining social theory, historical context, and scientific philosophy (Ley, 1981, p. 254).

As the humanist discourse intensified, connections between cultural and humanist Geography became apparent. Ley was selected to produce three progress reports on cultural/

humanistic geography, for the journal *Progress in Human Geography* (1981, 1983a, and 1985). The 1981 paper made clear connections to Sauer's influence, and the new focus on contemporary studies of urbanizing society (including identification of key actors, specification of lines of communication, and the development of subcultures (Ley, 1981, p. 250). Lastly, in 1983 Ley published the textbook, *A social geography of the city*, within which he addresses urban geography's philosophical issues. By 1983, humanism was an accepted philosophy, thus the book put emphasis on anthropocentrism and man as a "culture builder" (Ley, 1983b, p. 8).

Ley's 1983 progress paper examined theory, methodology, and a growing stream of empirical work that focused on the cultural landscape (Ley, 1983a, p. 267). The aim was to identify a more credible model of humanity (p. 267). Methodological advances that combined intellectual rigour and contextual sensitivity (p. 269) were the solution for addressing culture and place. The last section of the paper suggested that this was accomplished by a commitment of new cultural geographers to combining detailed local knowledge with broader societal contexts (p. 271). This wasn't a demand that all study needed specific context; it just suggested that "careful comparative studies may generate generalizations and theoretical propositions" (p. 272).

The final progress report praised cultural and humanistic geography for strides in innovation and continuity (Ley, 1985, p. 415). It discussed the interpretive turn, an active view of culture, the culture of consumption, and landscapes as text. A growing discussion in inter-disciplinary approaches was happening, and social geography began moving away from analyzing spatial patterns towards interpretive accounts of constructing place (p. 416). The next sections discussed culture as an event (p. 417), and dominant culture as part of a matrix that shaped a plurality of subcul-

tures and oppositional forces (p. 418). This led to a view of culture that was dynamic and interactive (p. 418). Finally, by addressing the landscape as being a text to be read—part of a new cultural geography where hermeneutics (method or principle of interpretation) affect how the work may be integrated (p. 419).

The last theme to be discussed is gentrification. Inner city revitalization, or gentrification, became prominent in the 1970's, and a large body of literature was produced (Ley, 1986, p. 521). Ley's 1986 paper was an attempt to develop an integrated model that addressed more than just one city, or more commonly, just one neighbourhood. "Alternative explanations for inner city gentrification: a Canadian assessment" (1986) outlined the common thoughts and themes of gentrification. Lees (2000) used another of Ley's texts in her reappraisal of gentrification studies: *The new middle class and the remaking of the central city* (Ley, 1996). Lees acknowledges the influence that Ley has had in the study of gentrification. Finally, Ley's 2003 study, "Artists, aestheticisations and the field of gentrification," tied cultural capital and cultural production to gentrification.

In 1986, Ley discussed the popular explanations of gentrification. These included demographic change, housing market dynamics, the value of urban amenity, and economic base. The report examined these concepts within a multi-city Canadian context. There was also a major focus on the effect of the Baby Boom generation on housing trends. Overall, the findings were that the urban amenity bundle had the highest correlation to causing gentrification (Ley, 1986, p. 532). However, the main objective of the report wasn't to define what caused gentrification: it was focused instead on providing a system-wide framework from which particular cities could then be explored (Ley, p. 533).

This idea of working within a framework is well repre-



sented within Loretta Lees' work regarding gentrification (2000). She acknowledges a new concept of the middle class, which has been developed by Ley (1996) and Butler (1997), and especially complements Ley's work for embracing specific contextualities where other authors simply generalize (Lees, 2000, p. 396). Lees further references the importance of Ley's work on gentrification when she talks about two recognized traditions of gentrification, one of which is Ley's demand-side explanation, which focuses on how gentrification occurs (Lees, p. 401).

The last point addressed by Lees was Ley's focus on ethnicity and race questions over gender and class. An example of this is the building of 'monster' houses in Vancouver, Canada, which could be viewed as Chinese gentrification (p. 400); the Chinese argue that Vancouver is a city subject to rapid change and innovation, thus they should be allowed to impose their change as an expression of innovation. Much of Ley's 1995 paper discusses the demographic change in the Kerrisdale neighbourhood of Vancouver, and how Chinese cultural change was a lot like the original Anglo cultural change (Ley, 1995, p. 203), which saw the English impose their culture onto a new landscape. Ironically, now the Chinese are doing the same thing, much to the Anglo community's dismay. This ethnic focus was also seen in previous work (Ley 1974b).

In 2003, Ley published another paper on gentrification that examined the class process. "Artists, aestheticisation and the field of geography" examined a new cause behind gentrification, this one focusing on artists as the renovators of neighbourhoods (Ley, 2003). There was a progression of city inhabitants who would live in a gentrified area. Artists rejuvenated an area, only to be infringed upon by social and cultural professionals, then higher income professionals, with the final stage of takeover completed by business people and capitalists (Ley, 2003, p. 2540). Simplified, the process involved a flow of artists to low income areas where

there would develop a high cultural capital, which then fell victim to commodification resulting in a quick community change away from cultural capital to economic capital. The whole act is a teeter-totter of cultural capital across socio-economic spaces.

## **Discussion**

Ley's work often added depth to the subject he was studying. A further examination of his contributions will strive to show how he impacted urban geography. Then his ideas will be examined to see how they interacted with each other, and how these interactions were beneficial to the study of the city, particularly to the development of urban geography.

## **Contributions**

Ley has had significant influence with respect to the *interplay* of thought that has shaped urban geography. His contributions will be explained chronologically (humanistic geography, cultural turn, gentrification), from the first work on, as the theories overlapped and led into the next contribution. They will be explained separately, utilizing the previously discussed literature. One of the more important aspects of Ley's contributions has been his attempt to marry scientific philosophy with the social sciences to create better models of man (ones less obsessed with quantification and more interested in humans as unique subjects).

## **Humanism**

Ley has been influential in improving humanistic geography. Two of his 1974 works had it as a theme: explicitly in "The City" and implicitly in *The Black inner city*. An excellent quote from "The City," stated that the city was a construct of man, therefore it is a situation where "man oppresses man." Attempts to fix

this evil without a focus on man would be futile and only serve to create more problems (Ley, 1974b, p. 71). The identification of man oppressing man as a key process is a call to understand why our built environment is constructed in an oppressive manner and to understand why people act like they do within the constructed environment. It is illustrated in *The Black inner city* when a park, built along two warring gang territories, goes unused. These works contributed to a growing radical dialogue that was also being pushed by Olsson (1974). The positivist methodology that Ley used in *The Black inner city* showed that Ley was grounded in an approach that was acceptable (i.e., the behaviourist approach). This allowed Ley some leeway moving forward with humanistic geography.

His 1978 book was an influential series of essays that addressed the major deficiencies of humanist methodology and philosophy, and helped create a strong foundation for the future direction of the field, in order to allow: "...reconciliation of social science and man, to accommodate understanding and wisdom, objectivity and subjectivity, and materialism and idealism" (Ley & Samuel, 1978, p. 9). This contributed to pushing humanistic geography into the mainstream of study. He didn't argue for it as an entire stand-alone field, but rather as a perspective from which social sciences could be connected with positivist science (Ley & Samuel, 1978, p. 9).

In 1981, he began defending humanism by addressing the major criticisms made against it, and making suggestions for its improvement. The research directions he suggested became a key aspect of the 1981 progress paper. He stated the need for more penetrating cultural analysis, particularly of consumption culture (Ley 1981, p. 254), which was underrepresented in research, compared to production which was overrepresented. New approaches also included looking at the landscape and its interaction between

place, identity and social context, and the role of institutional decision makers from a humanist perspective (Ley, p. 254).

### Cultural Turn

The development of humanism continued after 1981, but it put a greater emphasis on cultural understanding. This was the beginning of a cultural turn that was striving toward incorporating the empirical and literary strengths of Sauer's Berkley tradition (Ley, p. 254).

Ley's next progress paper (1983a), tracked the direction of humanist geography as culture began transforming the perspective. It built from the 1981 paper, and examined three studies by Daniels (1982), Cosgrove (1982) and Western (1981), which were all embarking on a new style of cultural geography, which married commitment to local details with broader contexts, thus overall strengthening models of man. This new cultural geography looked at both culture and landscapes as being active (Ley, 1983, p. 271). There was also a growing emphasis on the idea that humans were not culture carriers, but rather its builders (Ley, 1983b, p8). This focus on culture and landscape had started a revival of research on culture that viewed landscape as a setting for a wider focus of works to be integrated (Ley, 1985, P419).

### Gentrification

Developments in examining landscapes (Ley 1983, 1985), advances in combining local knowledge to broader context (Ley, 1983), and better methods (Ley, 1981), made for a much better system of examining neighbourhoods. This began a look at the city, particularly at the how and why of inner city revitalization.

Ley published a Canadian assessment of 22 Census Metropolitan Areas (CMAs) that examined the top four explanations

of inner city revitalization. He was endeavoring to provide a broad framework for understanding why this phenomenon was happening. He was adamant that findings from the United States not be “uncritically” transferred to Canada, as there were differences in externalities, middle class populations, and built environments (i.e., fewer ghettos) (Ley, 1986, p. 522).

Ley stood out for being interested in the demand for gentrification rather than the supply of areas to be gentrified. It fits in with his humanistic foundation as it shows a concern with why people are picking these areas rather than why they are forced there (supply creates an image of a scenario where the consumer is absolved of responsibility or control, whereas Ley always insists on human control (Lees, 2000, p. 399). Ley's work on the new emerging middle class also suggested that gentrification, which was being generalized as a North American phenomenon, was actually a “geography of gentrification” (Lees, p. 396; Ley, 1986), subject to much change over geographic area.

The 2003 paper “Artists, Aestheticisation and the field of Gentrification” was a specific study of Vancouver. It focused on the gentrification occurring within one city, accounting for the general contexts he had found in his 1986 study, where amenities had proven to be important (Ley, 1986, p. 532). His 2003 study examined the cultural capital, and the ability of artists to develop low income areas into more desirable locations. Their presence attracted other professionals in more creative fields (e.g., engineers, teachers) and slowly the cultural-economic capitals swapped from high cultural value to high economic capital (Ley, 2003, p. 2540).

### *Theory Interaction*

The interactions between these contributions are inter-

esting in that they enhance each other. The interaction among them over time has made each stronger. Ley's first book focused on the neighbourhood of Monroe, Philadelphia. He was limited in his approach as humanism wasn't accepted at the time; based on the study's weaknesses (and his perceived weaknesses of behavioural geography), he suggested new directions with which to approach the study of urban systems. The desire to better understand neighbourhoods created a demand for new philosophical approaches to social theory. This approach questioned current norms in the field and was questioned in turn, for being trivial and idealist. In response, the cultural turn pushed for better integration of cultural and historical contexts and the adoption of better scientific philosophy and methodology. Overall, the development of humanism led to a larger grasp of social consciousness. This comes full circle back to David Ley's examination of city neighbourhoods. His first work was concerned with neighborhoods; he left that interest to pursue ideological debate, and once the humanist approach matured, he returned to his study of cities, and neighbourhoods, utilizing an approach he had helped to develop and was satisfied with.

It can be seen that urban geography has benefited from an interdisciplinary approach that has instilled much debate. Baset and Short (1989) pointed out that the voices of geographers became united with those of economists, sociologists, and political scientists (p.176) during a period of intense debate over the inadequate understanding of social systems. By challenging the norms of spatial analysis, Marxists and humanists created much debate, which forced in-depth examination of the philosophy and methodology of the different approaches (1989, p.190). This debate and plurality of approaches was noted as both a strength and weakness of urban geography; it pointed out deficiencies and challenged orthodoxies (1989, p.189).

When looking back to the interaction of ideas in Ley's

work, it can be seen that the debate among views did indeed help. For example, Humanism never would have been accepted if it hadn't grounded itself in positivist logic. Marxists would have lost followers if they hadn't listened to the calls for better social understanding during the race riots and Vietnam War. The cultural turn would not have been needed had Marxists and spatial analysts not called into question the validity of humanist studies. While Basset and Short (1989) referred to this interplay as a double edged sword that could be detrimental to urban geography, it seems clear that this interaction in fact created an environment that promoted the field's development from top to bottom.

### *Field Development*

To examine the overall impact of Ley's development of urban geography, Gauthier and Taaffe's (2002) method will be utilized. Their paper examined the revolutions of urban geography; the third wave is where social theory became highly desired. They approached ranking the revolutionary impacts by using six characteristics: 1) type of change, 2) pace of change, 3) intensity of debate, 4) operational characteristics of change, 5) impact of change, and 6) disciplinary and societal context (Gauthier and Taaffe 2002, pp. 503). By utilizing these same characteristics, Ley's impact can be measured during the third wave of revolution.

To begin, what was the type of change that Ley instigated? He argued against the dehumanization of man, (Ley, 1974a; 1974b), which was a societal issue. Furthermore, he wanted a fix for the philosophy and methodological approaches of humanist geography, which became apparent in his seminal book *Humanistic Geography: Prospects and Problems* (Ley & Samuel, 1978). These were types of change that began an inevitable shift to greater social understanding.

The second characteristic, pace of change, is decidedly rapid. Debate was already exploding about a number of social issues that were not addressed by spatial analysis and Ley was one of many (e.g., Golledge, Gould, Gregory, Harvey, Tuan [Gauthier and Taaffe, 2002, p. 517]) who helped stoke the debate of counter theory. This radical movement in geography instituted rapid change away from the established norm of spatial analysis. Two of Ley's works in particular are noted as being key during this period of debate: *Humanistic geography* (1978), and *A social geography of the city* (1983) (cited in Gauthier and Taaffe, 2002, p. 517).

This leads to the intensity of debate experienced. Gauthier and Taaffe describe, to some extent, the social and political context (pp. 517-520). The era was tense; race riots, McCarthyism, nuclear proliferation, the OPEC oil crisis, and the Vietnam War were coupled with rising levels of university education and widespread activism within the population. This made for intense levels of debate, especially when individual beliefs (such as Marxism, socialism, appearing to be communist) could result in prison time. The counter theories also had to go up against a well-established school of thought that had made great strides in the 1960's in gaining professional credibility. It has also been established that the period was not a debate between two schools of thought, but rather a debate among a number of competing ideals (Marxism, behavioural geography, humanism, spatial analysis, and structuralism). This period was intense, and took on a number of operational characteristics.

During this time, the debates were shifting quickly. Ley's 1978 book was the first defense of humanistic geography, and set the fundamental basis of further study and methodology. The focus here was the methods and philosophy behind humanism. The operational characteristics changed in 1981, however, when focus began switching to incorporating Carl Sauer's cultural geog-



raphy (Ley, 1981, p. 250), and soon after it changed again to the interpretation of landscapes (Ley, 1985, p. 419). Ley is represented by his literature in a number of operational changes to the field.

The final two characteristics are the impact of change, and disciplinary and societal contexts. They are represented together here because Ley's biggest impact has been the push for more emphasis on context. He has developed and defended humanistic geography, which over time has spawned more emphasis on culture and landscapes. These emphases have resulted in a greater understanding of cities and society as a whole. His efforts in promoting context are now demonstrated by Gauthier and Taaffe, as they had a major characteristic based on an idea that has been championed by Ley.

## Conclusion

From all of this, what has been Ley's greatest impact on geography? He has aided in the *interplay* that helped shape the debate during the radical movement. This radical movement has had serious implications, as it has caused a break from spatial analysis and created an era of geography that approaches social issues in a much more holistic, interconnected, way. This interconnection has been apparent during the radical movement, the importance of which has been previously stated by Basset and Short (1989). Ley has pushed this interconnectedness most substantially with the cultural movement of the 1980's. *A social geography of the city* is one of the works that completely reoriented geographers' ideas of space, from being a subject of analysis to a context in which geographers can understand people's relationship to space (Ley, 1983b; Gauthier H, Taaffe E, 2002, p519). This relationship is well represented in his examination of artists in Vancouver, where he explores the landscape, its historical con-

texts, and how a person's economic and cultural capital affects their place of residence (Ley, 2003).

Ley's major literary impacts have been *The Black inner city as a frontier outpost: Images and behavior of a Philadelphia neighborhood* (1974a), *Humanistic Geography: Prospects and problems* (1978), and *A social geography of the city* (1983b). They represent three major periods of humanistic geography. However, do not limit his impact to urban geography to these three texts. His numerous papers, which contributed to the defense of humanistic geography, contributed to a major period of debate that utilized numerous philosophies and methodologies to strengthen the humanistic stance. Looking past his numerous appointments and the accolades he has garnered over the years, it is clear that he has contributed greatly to the field of urban geography. His specific contributions from the early papers are still relevant today and have been key building blocks in improving the social science of examining the city. His contemporary focuses on ethnic communities, transnational migrant workers, and community development in Pacific-rim cities are all extensions of the framework he helped build during the second half of the twentieth century.

#### *Acknowledgements/Notes*

Some papers used were obtained through another source. *The new middle class and the remaking of the central city* and *Geography without man: A humanistic critique*, are both papers that I got a feel for through use of different source; I felt they contributed toward my understanding of Ley's impact as a whole. I used the page number from the paper I actually read, to make up for the actual sources not being used; they just weren't readily available.

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## The East Gable Room: The Theme of Compromise, not Conformity in *Anne of Green Gables*

Ariel Little

### English

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**Abstract:** *Anne of Green Gables* by Lucy Maud Montgomery is one of the most well-known novels in Canadian children's literature. The story of Anne is a fairly typical example of an "orphan tale" in which an individual joins a community and then finds her place in the new society. Although it is broadly assumed that Anne transforms the society of Avonlea with her imagination, it is a point of scholarly contention whether or not Anne conforms to Avonlea. Some critics suggest that in *Anne of Green Gables* a compromise between the individual and society occurs and that neither dominates the other. Support for this theory can be found by examining Anne's personal space, the east gable room. The physical alteration of Anne's bedroom over the course of the novel shows how it is transformed by Anne's presence, implying that Anne does alter Avonlea, yet her bedroom is not decorated like a royal chamber as Anne once imagined. While Anne's adoption of Avonlea's taste may at first appear to create a mixed message, seeing it as a compromise reconciles potentially conflicting messages. The theory that *Anne of Green Gables* portrays compromise between the individual and society is verified by

*the transformation of Anne's bedroom and suggests the mutually beneficial adjustment it reflects between Anne and Avonlea. This presentation will explore the transformation of Anne's personal space and her relationship to it in order to advance the argument for Anne of Green Gables being a novel about compromise, and not conformity.*

Although Lucy Maud Montgomery's *Anne of Green Gables* is one of the most well-known Canadian children's novel, few readers bother to analyze its content closely. In part, this lack of attention is because Anne is the epitome of the "tradition of ...orphan tales" where a new individual is introduced to a society and the novel follows the finding of his or her place in that society (Drain 15). While most readers assume Anne transforms Avonlea's society using her imagination, it has long been a point of scholarly contention whether or not it is *actually* Anne who conforms to Avonlea. In "Community and the Individual in *Anne of Green Gables*: The Meaning of Belonging," Susan Drain provides an alternative perspective: "The process of belonging is a mutual one, in which both the stranger and the community are changed by their contact with the other" (15). Drain suggests that a compromise between the individual and society occurs and that neither dominates the other. Anne's personal space, the east gable room, provides additional support for Drain's theory. Anne's bedroom serves as a microcosm for Avonlea, as Anne's relationship with her bedroom is similar to her relationship with society. In the same way as Anne moves from being out of place in her bedroom to her bedroom being her home, she moves from existing in tension with Avonlea to a place of mutual acceptance and affection. The physical alteration of Anne's bedroom shows how it is impacted by Anne's presence, implying that Anne does alter Avonlea, even though her bedroom's overall structure does not change throughout the novel. Viewing Anne's relationship with Avonlea as a compromise reconciles any potentially conflicting messages.

The transformation of Anne's bedroom and the mutually beneficial adjustment it reflects between Anne and Avonlea further verifies Drain's theory.

The initial description of Anne's bedroom mirrors the community of Avonlea as "[t]he immediate impression" of both "is a strong sense of order" (Drain 16). In Avonlea, the "headlong brook" becomes a "quiet, well-conducted little stream" and all the houses in Avonlea, except for Green Gables, are "sociably situated" on "the main road" (1,5). This orderliness extends to Green Gables, where "[n]ot a stray stick or stone was to be seen," for, as the reader is told, either would have been readily noticed, suggesting that any disorder would stand out in Avonlea (5). The narrator's description of the "six by eight mirror" is an excellent example of how Anne's bedroom is an extension of Avonlea's emphasis on order. The exact measurement of an object is atypical of the narrator's method of description, which focuses on colours and the overall artistic impression given. This description implies that the room is in perfect order, like Avonlea prior to Anne's arrival. Anne's bedroom is further linked to Avonlea by the room's "high, old fashioned" bed (28). Avonlea is similarly a very traditional, "old-fashioned" community that is not fond of modernity or innovation. We see this attitude, for example, in the disapproval of Miss Stacey's modern teaching methods, including "field afternoons" and "physical culture exercises" (179-80). Like Avonlea, the east gable room appears to be "of a rigidity not to be described in words" (28). Moreover, as they are linked in appearance and nature, the bedroom, and Anne's response to it, further mirrors the tension between Anne and Avonlea.

Although bedrooms normally stimulate feelings of comfort and peace, Anne's initial emotion to her room is hardly comfort. Anne finds that "the walls were so painfully bare and staring that she thought they must ache over their own bareness" (28). Anne finds displeasure with her room because, like Avonlea, it



lacks imagination and Anne finds the focus on order in Avonlea and her bedroom unnatural. In comparison to the natural world where Anne finds much comfort, her room is almost completely devoid of colour, having “whitewashed walls” and curtains with an “icy white frill” (28). The room’s only source of colour is the “prim yellow chair” (28). Considering yellow’s traditional association with sickness, this description implies that there is something fundamentally wrong with the room, and therefore with Avonlea as well. The room’s unimaginative orderliness even “[sends] a shiver to the very marrow of Anne’s bones” (28), which sets up the tension between creative Anne and orderly Avonlea.

Anne’s response, however, may be warranted, as her bedroom contains “a fat red, velvet pin cushion hard enough to turn the point of even the most adventurous pin” (28). Montgomery uses this seemingly ordinary household to symbolize the novel’s two female characters, who govern social conformity and impose order on society (Clement 53). The pincushion’s “fat” quality parallels the description of Mrs. Rachel Lynde as a “fat woman” (65). Rachel Lynde “promotes orderliness” (Drain 16) in Avonlea by “keeping a sharp eye on everything that move[s] from brooks and *children up*” (Montgomery 1, emphasis added). Readers often consider Mrs. Lynde to be Avonlea’s spokesperson because she first introduces Avonlea to readers (Drain 16). The implication of the pincushion mirroring Mrs. Lynde is that it represents Avonlea’s society. The pincushion is also reminiscent of Marilla, the adult in charge of “bringing up” Anne, particularly in the description of Marilla’s hair being “a hard little knot...with two wire hairpins stuck aggressively through it” (47, 6). In a sense, pins are the residents of pincushions and the “adventurous pin” clearly represents Anne, a force of potential change in Avonlea (28). The pincushion’s “hard enough” quality indicates Avonlea’s ability to make Anne conform. Mrs. Lynde is shown to be capable of conforming free things as “not even a brook could run past Mrs. Rachel Lynde’s

door without showing due respect for decency and decorum" (1). Marilla also successfully and "aggressively" controls the pins in her hair, which suggests she can do the same to Anne (6). Anne rebels against this possibility by throwing her clothes on the ground, thus running the room's perfect sense of order (28). The disparity between Anne and society is apparent from Anne's initial response to her bedroom, and it foreshadows Anne's difficulties in finding her place in Avonlea.

By the end of *Anne of Green Gables*, Anne is fully integrated in Avonlea's society and even brings pride for Avonlea. The contention over whether Anne's incorporation into society is due to the conforming of Anne or of Avonlea can be resolved by closely examining Anne's bedroom's transformation. At the beginning of the second description of Anne's bedroom, it is apparent that something has changed, as the narrator says that "[t]he east gable was a very different place from what it had been on that night four years before" (246). This difference could potentially be in Anne's perception, but the narrator confirms that Anne has indeed altered the room, and, by implication, Avonlea, by saying, "[c]hanges *had* crept in" (246, emphasis added). Now, "white lilies faintly [perfume] the [bedroom]" (247). Rachel Lynde associates white lilies with Anne and her acceptance into society. When they first meet, the logical Mrs. Lynde and the imaginative Anne differ over their perception of Anne's person, leading to Anne insulting and yelling at Mrs. Lynde, which shows the initial disparity between these two characters (Clement 55-6). Anne, however, apologizes to Mrs. Lynde who accepts the apology by giving her white lilies, which marks Anne's initial acceptance into Avonlea and the potential for compromise (72). Then, near the end of the novel, Mrs. Lynde compares Anne's beauty to "them white June lilies she calls Narcissus," illustrating Anne's place as part of Avonlea (231). The presence of the white lilies scent, therefore, shows Anne's influence over Avonlea and illustrates the addition of a new sensory experi-

ence, which suggests Anne's presence has enriched Avonlea. Furthermore, the curtains are no longer "white," but instead are "pale green art muslin" that "fluttered in the vagrant breezes" (246). Green is the colour of Anne's eyes, which further indicates Anne's alteration of Avonlea. In addition, the description of the "vagrant breezes" (246) creates a connection between the room and nature, implying that Anne has opened Avonlea up to the realm of imagination, because nature and Anne's imagination are inextricably linked.

Unfortunately, however, not everything goes Anne's way. We are also told that in Anne's room, "[t]he velvet carpet with the pink roses and the pink silk curtains of Anne's early visions certainly never materializ[es]" (246). The bedroom has been transformed, but it has not achieved the high level that Anne desired. It is safe to say that Avonlea has not morphed into a "modern" Camelot as Anne would have preferred. The use of the word "certainly" (246) suggests a limit, albeit a reasonable one, on the ability of the individual to transform society (Gray 186). This practical assessment of the individual's power over society is in part what makes *Anne of Green Gables* more credible than another famous children's novel, *A Little Princess*, where luxurious furnishings suddenly appear as a result of the protagonist Sara's positive thinking (231-5). Furthermore, Montgomery shows that when Anne tries to force reality to alter to the desires of her imagination the consequences are negative, such as when Anne accidentally dyes her hair green. These poor outcomes indicate that a capitulation of Avonlea to Anne's desires would be equally adverse (Gray 186). Even though Anne has not completely succeeded in revolutionizing Avonlea, the compromise still works in her favour, as seen in details such as the walls being "hung not with gold and silver brocade tapestry, but with a dainty apple-blossom paper" (246-47). Anne's room may not be a princess's bower, but "apple-blossom paper" is considerably more beautiful, imaginative, and simply

more “Anne-like” than plain “white walls” (28). “[G]old and silver brocade tapestry” would be not only out of place in Avonlea, but also extravagant bedroom décor for a young girl (246). In “Mobilizing the Power of the Unseen: Imagining Self/Imagining Others in L. M. Montgomery’s *Anne of Green Gables*,” Lesley Clement views Anne’s adoption of compromise as a key sign of Anne’s maturation; Anne’s compromise symbolizes her gaining of a less self-centered, and more communal, perspective (61). The narrator confirms Anne’s compromise with society as part of Anne’s maturation, informing the reader that Anne’s “dreams had kept pace with her growth, and it is not probable that she lamented them” (246). The narrator’s remark indicates that Anne’s perspective has broadened to enable conforming to Avonlea, while remaining a dreamer.

Drain asserts that “interconnectedness must be acknowledged...rather than accepted passively as the way things are” (19). Further aspects of Anne’s bedroom suggest that Anne and Avonlea are indeed aware of their “interconnectedness” and have struck out a pleasing compromise. Two examples of this compromise are “the white painted bookcase filled with books” and the “gilt-framed mirror with chubby pink cupids and purple grapes” (247). The bookcase is white, reflecting the orderliness of Avonlea, yet it is filled with books, the food of the imagination. The mirror is simply “gilt-framed” not “mahogany” as Anne originally wished, but its design is very romantic and has a fantastical connotation from the cupids (247). The most significant example of this pleasing compromise is Anne and Marilla’s mutually beneficial relationship. Anne “mellows” Marilla and has made it so that “crispness was no longer Marilla’s distinguishing characteristic,” while Marilla provides a steadying influence for Anne in addition to the love Anne’s always craved (282, 285). Overall, Anne’s bedroom has become “as sweet and as dainty a nest as a young girl could desire,”

implying that the compromise between Anne's imagination and the reality of Avonlea has produced a positive result.

Throughout the course of *Anne of Green Gables*, Anne and Avonlea take turns in shaping each other. Due to this mutual exchange of influence, compromise is the only way to reconcile *Anne of Green Gables* to any unifying theme about the reciprocal impact of the individual and society on each other. As Drain astutely observes, "the very title of the book suggests how important belonging is" (16). Drain further argues that belonging is not "subordination, possession, or conformity, but ... interdependence and tension" (16). As Anne herself states, she has "pruned down and branched out," showing her recognition of her continued growth and Avonlea's impact on her (256). Some readers may argue that any compromise on the part of the individual is amiss, yet the idea that is at the core of *Anne of Green Gables*, even more than transformation through imagination or conformity, is belonging and the desire for it. For Anne's east gable room to truly be hers, she must alter the room to suit her personality. Conversely, for Anne to belong to her bedroom she must accept that it will never be a palace, which ultimately suggests that compromise must take place between the individual and society for any sense of belonging to occur.

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