

Natural Selections

A NEWSLETTER OF THE ROCKEFELLER UNIVERSITY COMMUNITY

Musings on a Ph.D.

SARAH BAKER

A few weeks ago, I earned the opportunity to defend my thesis, the terminal task in receiving my Ph.D. While everyone's path is different, the journey for me has been a rollercoaster of both academic and emotional development, and I'd like to reflect on what the process has taught me.

It's okay to feel lost at times.

I started my graduate school journey knowing that I wanted to study neuroscience, but I had very little experience in the field. Most of my research as an undergraduate was done in a physical inorganic chemistry lab, so I lacked the basic textbook knowledge of the neuroscience field. Getting up-to-speed was daunting, and it felt like many of my colleagues came into graduate school with a much better understanding of these fundamental concepts than I had. I spent my evenings those first couple of months reading textbooks and watching videos online. I wish I had known that what I would learn in the lab in the process of doing research was going to be more valuable than any chapter of a textbook that I had read.

Graduate school can feel lonely, but you are not alone.

Moving to a new city and starting at a new institution where you don't know anyone can feel overwhelming. You lose the camaraderie that naturally develops in high school and college when your whole

class is studying for the same test and seeing each other regularly. The pressures of graduate school can add another dimension to feelings of isolation. While you interact with lab members and collaborators, the process of working on a Ph.D. is largely supposed to be your own—your own project, your own body of work. Everyone feels imposter syndrome at one time or another (or maybe even constantly). Once I realized that everyone else was also going through their own unique challenges, or maybe even many of the same ones I was, I stopped thinking of graduate school as a solitary pursuit. I began to reach out to others. Daily coffee breaks with friends and colleagues to talk about our highs and lows became crucial to building a sense of community.

Self-care is important.

Graduate school is full of pressure, either self-imposed or loaded on by mentors, competitors, and colleagues. For some, this may develop into feelings of having to constantly be in the lab to be productive. But as I have seen both with myself and classmates, this oftentimes leads to burnout. The rest of life does not stop just because you are now a graduate student. Make time to cook yourself a good meal and spend time with your friends and significant other. And don't be afraid to make time for yourself. For me, I was most productive in the lab around the time that I became involved in more

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JIM KELLER | NATURAL SELECTIONS



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groups on campus and began training for a triathlon. My busier schedule meant that everything I did each day in the lab was more structured, as I needed to make the time for the things I enjoyed outside of the lab. Growth in graduate school is not limited to cognitive and academic growth, but can expand to other aspects of your life, as well. During the course of my Ph.D., some of my new experiences included travelling to three new countries, learning how to play volleyball better than I ever had in high school, teaching myself how to knit, and rekindling my love of reading and writing. I would encourage any other student to expand on an old hobby or something they have always wanted to do simultaneously with progressing on their thesis project.

Thank your people.


Getting good grades in high school and college largely comes from your own study habits and hard work. In graduate school, success not only comes from effort, but also from the insights and advice of colleagues and the support system that gets you through those hard days. Thank the people who help you along the way.

And ask for help when you need it. Although no one in my family is in science, they have remained steadfast in their support of all my pursuits. My friends, both at Rockefeller and outside of the university, are the people who lift me up just by being there. Small gestures can show your support system that you are grateful.

You will find a new way to see the world.

It is impossible to complete a Ph.D. without learning something along the way. I have a new appreciation for the complexity of the dysregulation of immune processes that happen in Alzheimer's disease, the topic of my thesis project. I learned new methodologies and improved my ability to critically evaluate both my own experiments and those published in the scientific literature. But more than that, I have a newfound admiration for the process of science—this deeper understanding could only happen by being a part of the process myself.

I came into my Ph.D. having no career plan in mind, but came out the other end realizing the strengths I could pull together to have a successful career in medical communications. I recognized that my favorite parts of the Ph.D. were the times



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when I was writing and critically evaluating data—developing my thesis research proposal, working on grants, and authoring papers. I feel lucky that these experiences prepared me for an internship and new career at a medical education company.

Beyond my professional growth, the process of graduate school has made me more confident in speaking up, fighting for what I care about, and being resilient when things do not go as planned. Despite beginning my Ph.D. with so much uncertainty and doubt, I have only become increasingly happy that I followed through with this pursuit. To any new graduate students out there, hang in there. The path is certainly a winding one with many peaks and valleys along the way. But try to savor the journey and keep moving forward. The trek will set you up to better face challenges for the rest of your life. ■



Francois, the sourdough starter

Why COVID-19 Is Causing You to Eat Your Feelings

ANNA AMELIANCHIK

In the past few weeks, as the world has been struggling to curtail the coronavirus pandemic, social distancing requirements and the fear and anxiety brought on by the disease has changed our relationship with food. Shortly after Governor Cuomo issued a stay-at-home order for New York State, New Yorkers crowded grocery stores to stock up on pantry items like beans and pasta, swapped takeout for home-cooked meals, and went on baking frenzies worthy of their own Netflix show. In addition, stress and anxiety induced changes in our eating habits, leading some people to overeat and others to decrease their food intake. If you have recently found yourself snacking more than usual and gorging on calorie-dense foods, you are not alone.

High-intensity, acute emotional states that promote the fight-or-flight response (e.g.

extreme fear) suppress appetite and food intake. This neat evolutionary perk ensured the survival of our species. However, in the case of moderate stress, about 40% of people actually respond by increasing their food intake. This behavior, often referred to as “emotional eating,” also causes some of us to reach for energy-dense and highly palatable foods, such as chocolate, sweet and savory pastries, pizza, burgers, French fries, and sausages. Emotional eating is understood to be a coping strategy that provides short-term relief from stress and negative emotions. However, a temporary improvement in mood can be followed by other negative emotions, such as feelings of guilt. In addition, emotional eating can lead to weight gain. If you identify as an emotional eater, there might be several reasons why you respond to stress by increasing the consumption of sugary and fatty foods:

Serial dieting. Our bodies are unable to distinguish between self-imposed food restriction and real food shortages. Therefore, the body responds to dieting the same way it would respond to starvation: by slowing down the metabolic rate and increasing hunger and appetite. This often causes dieters to abandon their restrictions, particularly under stress. Therefore, dieting is considered to be a risk factor for the development of emotional eating.

Poor interoceptive awareness. Some people are prone to confusing stress-related physiological responses with hunger—a phenomenon known as poor interoceptive awareness. This can be the result of inadequate emotion regulation strategies (e.g. suppression of emotions or avoidance of stress by distraction) and can lead to emotional eating. Interestingly, poor interoceptive awareness can develop as a result of damaging parental practices, such as neglectful, overly protective, manipulative, or hostile behaviors.

Inadequate sleep. While not everyone changes their eating behaviors in stressful situations, almost everyone will attest to the fact that stress can interfere with sleep. In turn, poor sleep can lead to emotional eating by interfering with neurobiological, behavioral, and cognitive processes that regulate emotional responses. Moreover, emotional eating can lead to increased weight gain in short sleepers, i.e. people who habitually sleep less six hours a night, compared to long sleepers.

History of trauma. Post-traumatic stress disorder (PTSD) as well as childhood and adult trauma exposure are associated with emotional eating. One possible mechanism underlying emotional eating in individuals with a history of trauma is the hypoactivation of the hypothalamic pituitary adrenal (HPA) axis. Under stressful conditions, the HPA axis coordinates a neuroendocrine response that is thought to promote survival. However, a history of trauma might decrease HPA axis responses to stress and as a result, erase the typical post-stress reduction in hunger.

Genetic susceptibility. The prevalence of emotional eating among children is very low, as emotional eating most commonly emerges in the transition between adolescence and adulthood. Additionally, both genetic and environmental factors play an important role in the development of emotional eating. For example, one study reported that a mutation in the dopamine D2

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receptor (*DRD2*) gene predicted emotional eating in adolescents, but only if they also experienced inadequate parenting, such as high psychological control (e.g. “My father (mother) makes me feel guilty when I fail at school.”). In addition, a mutation in the serotonin transporter (*5-HTT*) gene can lead to emotional eating in adolescents, but only if the mutation co-occurs with depressive feelings. Both studies highlight the importance of genetics in the regulation of eating behaviors under stress, but indicate that it’s both nature and nurture that lead some people to turn to food in an attempt to self-medicate.

Depression. Depression is typically characterized by a loss of appetite and weight loss. However, a significant 15-29% of depressed patients suffer from so-called “atypical depression,” which causes increased appetite and subsequent weight gain. These symptoms of atypical depression have a stronger association with emotional eating than other individual depression symptoms, linking depression to obesity.

If you are worried about the long-term consequences of emotional eating, consider talking to a healthcare professional who can recommend strategies to minimize it. Studies show that such strategies might involve any of the following:

- Incorporating moderate intensity unstructured exercise (e.g. long walks) and/or high-intensity structured exercise (e.g. running or interval training)
- Meditating
- Finding social support
- Implementing cognitive behavioral therapy (CBT)
- Establishing healthy, balanced dietary choices early on in the day
- Using mindful eating habits (e.g. paying attention to hunger and satiety cues while eating)
- Avoiding trigger foods (e.g. not buying foods you are likely to consume in response to stress) ■



Beckett and Cleo

Photo courtesy of GRETCHEN M. MICHELFELD

Adam Collier and Zelda



Photo courtesy of ADAM COLLIER

Joyce Ng and Yogi

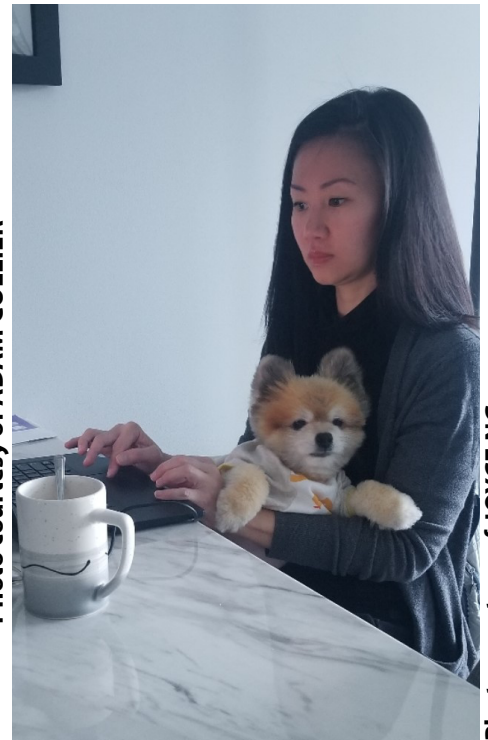


Photo courtesy of JOYCE NG

Working from Home with Pets

GRETCHEN M. MICHELFELD

With some adorable exceptions, most of us do not bring our pets to work. We were used to coming home at the end of a long day to a cat clamoring to be fed or a dog dancing ecstatically at our return. The sudden change in work culture throughout the Tri-Institutional community has served to expand the work environment through videoconferencing (I just discovered that one of my bosses loves Monet and another likes

antique cameras). At the same time, it’s hard to be trapped inside all day. We go a little stir crazy. And now we spend the whole day with our crazy pets, as well!

I interviewed members of the community to see just how working at home with pets is impacting their daily working lives:

“Yogi has definitely made it easier for me,” said Joyce Ng of the Office of Spon-

sored Programs Administration. “He is my emotional support pup in these uncertain times.” Yogi is Ng’s twelve year old Pomeranian, who is very happy to have her home with him all day. However, “He has definitely become more attached and needy.”

According to Adam Collier of the Leibowitz Lab, Yogi would appear to be the op-

posite of his cat Zelda.

“Zelda is an independent lady, so I always appreciate it when she lets me pet her,” Collier explained. “I think she is difficult to impress, but my talk of zebrafish piques her interest. At first, she seemed pretty confused with me being home all day and wondered why I’m in her house so much, but I think she has slowly gotten used to the idea of sharing her space with me.”

My own cat, Cleo, starts driving me crazy in the late afternoon.

Something about the way the late-day sun creates shadows right above my desk makes her bounce off the walls, and she insists on having her supper much earlier than she would normally get it when I’m out of the apartment all day. Collier says Zelda has never really been motivated by food or treats—just catnip. Cleo definitely does not need catnip! But in these difficult times, there is nothing like a purring little furball in my lap to calm my frayed nerves. Cleo is usually excellent company.

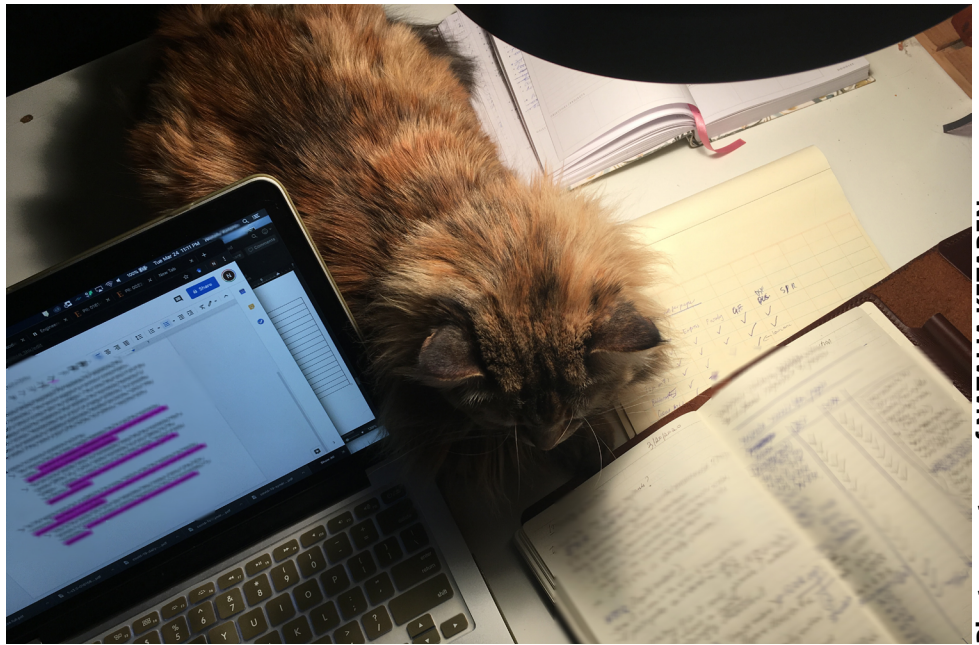
Anna Amelianchik of the Strickland Lab feels the same way about her cat, Mila.

“Mila has been in our family for nearly eleven years,” Amelianchik explained to me over email. “Last year, I brought her with me from Russia, and despite the many challenges of caring for a pet, she has been a source of great comfort because she is the only family I have around. She is not exactly needy or cuddly like other cats, but when I am visibly upset or very ill, she sits next to me looking all concerned. And in trying times like these, what else do you need other than knowing that someone cares for your well-being?”

Unlike Cleo, Mila makes Amelianchik’s apartment a peaceful place to work.

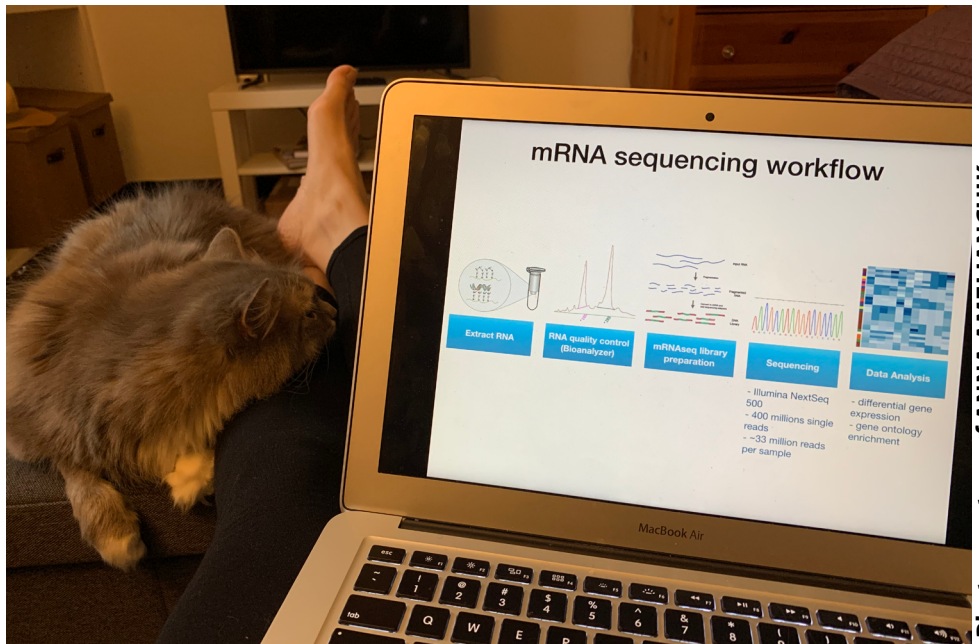
“Mila makes it much easier to be isolated alone in a tiny studio apartment. She doesn’t tend to disturb me much when I work, but a few times a day she wakes up from a nap and comes to me asking for pets. It always makes me smile, but also gives me a chance to unpeel my eyes from the screen and let them rest before returning to work.”

Isolating alone can be very lonely, but quarantining with other people presents a whole other set of challenges. The first few days that I was trying to both work from home and help my eleven year old son, Beckett with online schooling, we both got very frustrated. But by the end of the first week, Cleo helped him calm down and focus. Now it’s comforting to see him casu-



Little Kitty

Photo courtesy of NATALIA KETAREN



Mila

Photo courtesy of ANNA AMELIANCHIK

ally snuggling with her while he logs onto Google Classroom or reads a novel for his English Language Arts class. It’s good for both of our stress levels, and I get a lot more work done.

The Rout Lab’s Natalia Ketaren finds her cat, Little Kitty, to be a stress reliever as well, but her home sometimes has the same challenges that ours does!

“Little Kitty is definitely a stress reliever,” said Ketaren. “Pets are a calming presence and ours makes us laugh. She breaks up the workday. However, at times she goes completely wild and does circuits around the apartment. You have to put away your cups of tea or coffee to protect the electronics!”

What does Little Kitty think of Ketaren’s work?

“She sees my notebooks and papers as a bed. My laptop is both a bed and a chin scratcher. My pens are her toys. She often likes to be the center of attention. However, she will self-isolate somewhere where we can’t reach her to get some uninterrupted nap time.”

I think all of us working from home are pretty jealous of Little Kitty’s opportunities for uninterrupted nap time! We’ll just have to keep plugging away and make the best of a very strange situation. The thing is, our animals know nothing of this scary pandemic. They remind us of life’s simpler concerns and rewards. ■

Culture Corner

A War of the Worlds for the Age of Pandemic

BERNIE LANGS

Spoilers below!

There have been two excellent film adaptations of the ahead of its time 1898 science fiction novel by H.G. Wells, *The War of the Worlds*. Gene Barry starred in the 1953 movie that would find repeated airtime in the late 1960s on local New York television, where I first viewed it as a boy. The most memorable moment (and sole remembrance for me) is towards the end of the story, when the terrified humans not yet slaughtered by the invading armies of aliens, take refuge in a bombed church. In 2005, Steven Spielberg directed a fantastic take on the notion of a merciless killing machine of invaders, with Tom Cruise as the hero (Ray Ferrier) who is forced to take fast and imaginative action to survive. The movie focuses on Ferrier's desperate attempt to stay ahead of the alien starships as they pillage and destroy not only human life but turn the very earth itself into a blood-soaked wasteland. Spielberg effectively transforms Cruise's character of a divorced and out-of-touch father of a young girl (the superlative Dakota Fanning) and teenage son (well-played by Justin Chatwin) into a selfless defender willing to take all measures to protect his family. In the last scene, as the aliens are dying off and crashing their vessels into sections of Boston, a tongue-in-cheek surprise occurs when Ferrier reaches his ex-wife's home to safely deliver his daughter. He is greeted not only by his ex-wife and their son (who had been thought dead due to an earlier attack), but also by his former father-in-law, portrayed by none other than the star of the 1953 *War of the Worlds*, Gene Barry.

In both movies, the aliens easily repel the greatest efforts of mankind's weaponry, only to die off naturally soon after their invasion. They succumb to the worlds' ecosystem and atmosphere and are unable to defend themselves from microbes and bacterial disease. Although they are technologically superior and advanced, these monsters still die from invisible and natural attackers. The dread and fear that Spielberg evokes not only comes from the monstrous appearance of those steering the alien forces, but from the sounds their ships make announcing their approach. In one touching

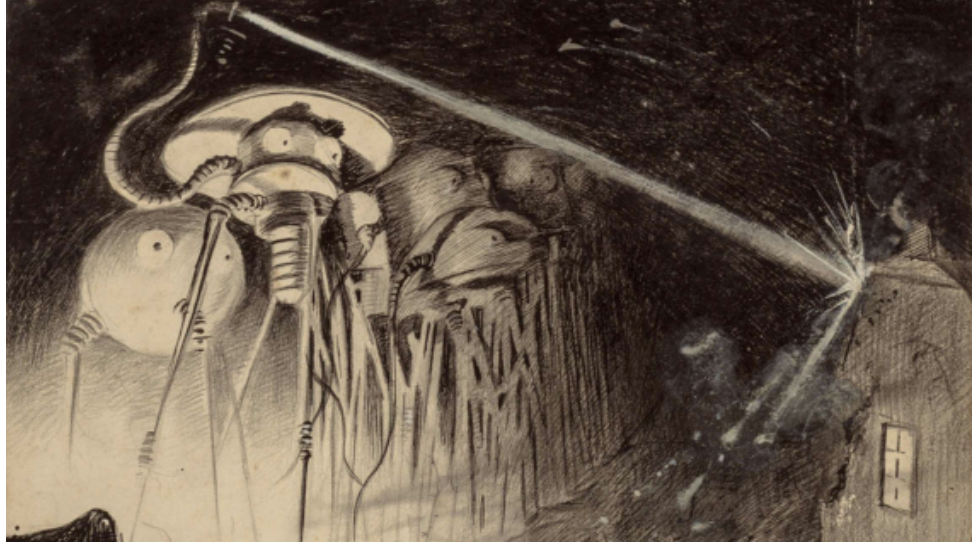


Illustration by Henrique Alvim Corrêa for *The War of the Worlds* (1906)

sequence, Cruise and his children march silently through a town with hundreds of other weary, fatigued, and fleeing refugees. The village's walls are plastered with missing person posters, very much like those that covered Manhattan in the days after the September 11th attack. As the 1953 version of *War of the Worlds* might be considered a study in Cold War angst, the Spielberg film is a bleak portrayal made for the post-9/11 era. Harking back to the radio play voiced by Orson Welles in 1938, one can sense that it too was a mirror and reflection of the times. It would be but a matter of months before much of Europe would lie in ruin from the German onslaught of World War II.

Science fiction movies of aliens wreaking havoc on the earth come in several brands, the most popular being those depicting them as harsh killers desiring earth's minerals and vegetation, as well as human flesh for sustenance. A few recent movies turned the genre on its head, including the remake of *The Day the Earth Stood Still*, where destruction is targeted only at the human species by a superior race of invaders who intend to save all other natural life forms from pollution and destructive wars. The 2016 movie *Arrival* is quite sophisticated and smart, as the army and intelligence units enlist a brilliant linguistic professor (Amy Adams) and physicist (Jeremy Renner) to break through in communicating with enormous octopus-like aliens manning ships hovering over major cities with unknown intentions. *Arrival* dives deep into science and philosophy and boasts a breathlessly tense and intellectually satisfying resolution.

A new eight part Epix series based on H.G. Wells' story debuted in the U.S. in early 2020. This version of *War of the Worlds* draws from the best approaches of past renditions and other alien invasion stories and

makes a timely contribution to the surreal and challenging times we currently inhabit. Aired just prior to the outbreak of the COVID-19 pandemic, its lessons would have been equally as powerful had it been released two years after the end of this crisis.

Unlike the unfolding days and weeks of murders of past *War of the World* films, most of the mass killing by the invaders occurs immediately in this series. The handful of survivors living in England and France are initially saved only by finding accidental shelter from the destructive sound waves that killed millions of their fellow humans in a flash. The aliens are on a mission to not only hunt down and kill these survivors one-by-one, but also harvest their organs. In early episodes, we are teased with fleeting views of the aliens, making us think they will be as terrifying as those that Spielberg set loose over fifteen years ago. But the galloping dog-like creatures turn out only to be crude, metallic, robot-like machines (plenty scary though when they kill people). When one of them is finally destroyed and split open, it appears to utilize inexpertly cobbled together human tissues for its rudimentary thinking and actions. It becomes apparent to the survivors that these are only worker drones or soldiers of an unseen master (or masters) who have yet to reveal themselves from the mother ships.

Family and survival are a key to this series, but in a 21st century way that Steven Spielberg could never have anticipated in 2005. One English family, the Greshams, consists of a matriarch, Sarah (Natasha Little) and her two teenage children, the quietly pensive, but thoughtful Tom (Ty Tennant) and blind daughter, Emily (Daisy Edgar-Jones). The viewer is teased into believing that Sarah will act in the Cruise-like

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role of steadfast family protector, but immediately her children question her protectiveness as selfish when they are confronted by people in need whom their mother wants to bypass and leave to fend for themselves. This dynamic becomes more and more complex as the series evolves. On the French side, the Dumont family unfolds as a portrait of modern dysfunction to a tragic degree. Even in a time of emergency, the force and power of their past failures and pains cannot be escaped and become a danger to themselves and to the one man, Jonathan, trying to save them. He also happens to be the head of the Gresham clan and his goal is to return by foot via a long trek to London through The Channel Tunnel, where he hopes to reunite with his wife and children, should they still be alive (the viewer knows they are, but he doesn't).

The most interesting aspects of this *War of the Worlds* are its portrayal of the two scientists, Catherine Durand (Léa Drucker), an astronomer in the Alps who first hears the signal of the invading force on a frequency in an observatory, and Bill Ward (Gabriel Byrne), a brilliant and aged neuroscientist in London. Unknown to each other, as both face life-and-death situations

with their one surviving family member, they are attempting to figure out a method to defeat the invaders based on their own training. Ward wants not only to discover the aliens' vulnerabilities, but to learn and comprehend its *motives*. It is this plot device that makes the production so unique. The unknown entities ruthlessly attacking are not here to blindly destroy or colonize or save other species from humans. What they crave is *life* itself—their own lives—and their fear of death, quite a human notion, is what motivates their blind pursuit of any actions that may save their species from oblivion.

The series has countless shots of the streets of London and towns of France eerily empty at the height of the day, quite like what we are witnessing during our virus-protective lockdown in April 2020. Never has a television film centered on destruction been so eerily silent for so many long sections of its telling. Durand in France tunes into the alien signal at one point to hear music playing. It turns out to be one of the songs that astronomers launched in a space vehicle hoping to discover other intelligent life forms in the galaxy, quite like what NASA has done in the past. To her horror, Durand realizes the song she hears is one that she so harmlessly selected for the probe herself. The invaders found earth by tracing

back the music to its origin and the astronomer is devastated to learn that it was her team's recordings that led them here. In the final episode, Durand does find a frequency to disable the attack – at least for now, but we are not witnesses to its implementation. However, there are other complex and very gray aspects to the final episode of part one of the series that make for great emotional and tragic drama.

I was taught long ago in school that bacteria, the killers of aliens in past *War of the Worlds* films, were living, natural beings. Viruses, on the other hand, I recall as a membraned "box" encasing a squiggly line of nucleic material with a small antenna-like shape atop—a killing machine knowing nothing but sucking life-force from its host and replicating like a blind monster. In the Epix series, the aliens adapt their destructive plans as humans make headway in understanding their weaknesses. Similarly, a virus mutates to evade medical treatments. Yet with great effort, scientists eventually discover medicines that viruses ultimately succumb to no matter how they morph. It may be a little silly to say that life will be true to art here, but in my heart, I believe that it will be our tireless, selfless scientists who bring down or find a way to protect us from this current viral invasion. ■

New York Rhymes

DR. KONSTANTINA THEOFANOPOULOU

I wrote this poem in February 2019. I couldn't have imagined how the word "quarantine" would sound today. ■

Poetry: Dr. Konstantina Theofanopoulou
(instagram: @newyork_rhymes)

One line art: Mikaella Theofanopoulou
(instagram: @m_theta_art)

MEMORIES IN QUARANTINE

Forgotten memories of me
cleaning your glasses.

You said you'd never seen things
so clearly
before.

By Konstantina

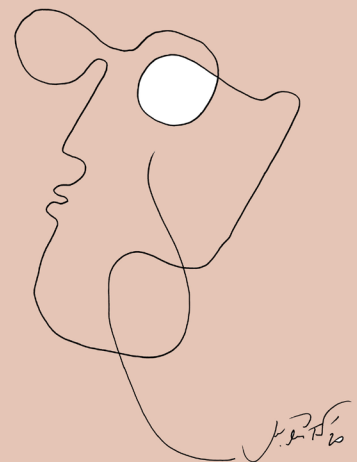




Photo courtesy of NATIONAL ARCHIVES

Face masks made of gauze were widely used but offered little real protection. Nonetheless, these Red Cross workers in Boston assembled masks. "It is our duty to keep people from fear," said Chicago's health commissioner. "Worry kills more people than the epidemic."

What Happened in 1918?

AILEEN MARSHALL

Not many of us around the Tri-Institutional community have experienced a pandemic situation like COVID-19. News pundits and politicians are saying this is "unprecedented." But is it? The word "pandemic" reminded me of references to the so-called Spanish Flu of 1918. Though that event was caused by an influenza virus, from a different family than the current SARS-CoV-2 coronavirus, there are similarities between that outbreak and the current one. Perhaps we can learn lessons from the pandemic that happened almost 100 years ago.

The influenza pandemic started in the spring of 1918 and lasted until the spring of 1919 during World War I. The Allied countries didn't want people to panic or to distract from the war effort, so they censored reports of the new virulent flu. Spain was neutral, so most reports of the flu came from their newspapers; thus, it became known as the Spanish flu. However, the actual origin of the flu is still un-

clear.

There are three current hypotheses as to where the 1918 influenza virus started: Kansas, France, or China. A flu-like illness started appearing in Camp Funston in Fort Riley, Kansas in late 1917. It was first reported on March 11th, 1918. At that point more than 100 soldiers had gotten sick and it was spreading quickly. Troops from this camp were shipped to Europe shortly after. Some say that this was not the origin because there was a deadlier flu in New York City at the same time. A [2018 review](#) of the origins of the 1918 pandemic suggests that viral haemagglutinin proteins found in the samples from Kansas were older than those of the 1918 flu. Some think the virus first showed up in Étapes, France in late 1917 where there was an English military camp that was overcrowded with hundreds of thousands of soldiers passing through every day. Pigs and poultry were also kept at the camp, animals suspected of being carriers of the

flu strain. And some think this flu started in China, although it's hard to tell given that records from the country at the time are very sparse. There was a mild flu there at the time, and tens of thousands of Chinese workers toiled behind the French and English lines of the war. A 2018 study by evolutionary biologist Michael Worobey showed that there was no evidence of this flu along the routes the Chinese migrants traveled to Europe, suggesting that China might not have been the origin. This first wave lasted through the spring of 1918.

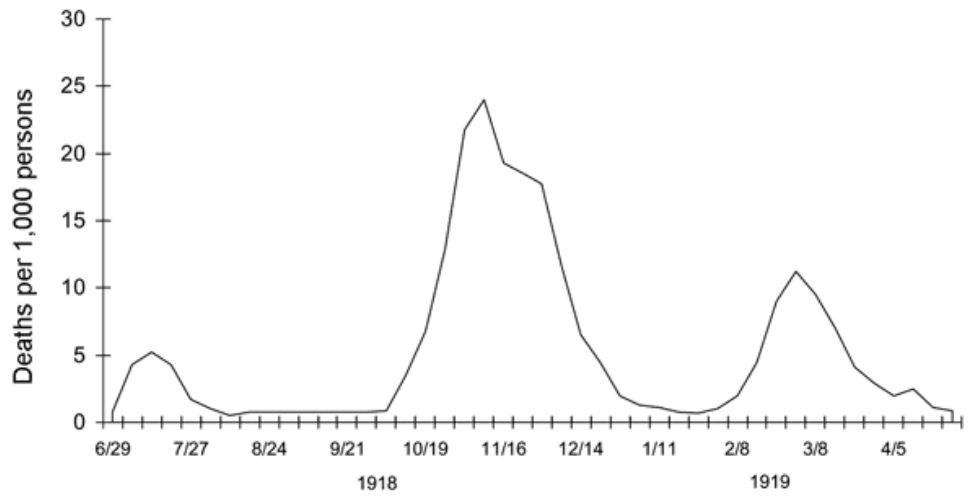
The second wave started in August of that year and was deadlier than the first. New flu cases started appearing in France, Sierra Leone, and the United States. This time, predominantly young adults were affected. At Army and Navy training camps outside of Boston, almost half of the soldiers died. Worsening the spread, sick soldiers were often sent on crowded trains to

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crowded hospitals. In September of 1918, New York City started mandating that flu diagnoses be reported and requiring sick patients to be isolated at home. Many cities closed theaters, schools, churches, and bars and banned public gatherings. Philadelphia, however, decided to go ahead with a war bonds parade. Within days of the parade, tens of thousands were sick, and within ten days, over 1,000 people died. October of 1918 was the deadliest month of the pandemic. The United States recorded 195,000 deaths from the flu. Regulations banning spitting in public were passed. In November, news articles about the disease started appearing more frequently as the virus moved from France to Spain. Quarantine signs were put on the homes of people diagnosed with the flu. Yet this same month, people gathered in large numbers to celebrate Armistice Day. As the second wave ended in December, public health campaigns appeared instructing people to put their tissues in the garbage after sneezing into them. Officials asked businesses to stagger their opening and closing times and for people to walk to work to limit crowding on mass transit. The death rate overwhelmed morgues and bodies piled up.

A third, but smaller wave began in February of 1919. In New York City, only about 700 diagnoses and sixty-seven flu deaths were recorded. During this wave, city hospitals around the country set up studies of treatments for influenza. Efforts were made to implement more nursing school programs to address the nursing shortage created by the pandemic. It is now recognized that this shortage was partially due to a societal reluctance to hire African-American nurses. Near the end of the pandemic, President Woodrow Wilson collapsed during the Versailles Peace Conference in April of 1919; it is thought that he also contracted the flu.

Thanks to studies over the last few decades, we now know that the 1918 influenza virus was an H1N1 strain, the same type that caused the swine flu epidemic in 2009. Our knowledge of the strain comes from preserved bodies in the permafrost in Alaska, where the pandemic had been particularly lethal to Native Americans, wiping out entire Inuit villages. In 2008, scientists were able to exhume one of the bodies and obtain tissue samples containing the virus. Because of the extreme cold,



Three pandemic waves: weekly combined influenza and pneumonia mortality, United Kingdom, 1918–1919

Image courtesy of CENTERS FOR DISEASE CONTROL AND PREVENTION

the viral particles were relatively well-preserved, and they were able to sequence its genome. A study by the Armed Forces Institute of Pathology, the United States Department of Agriculture, and Mount Sinai Medical School determined that a set of three genes enabled the virus to weaken bronchial tubes, which allowed for secondary bacterial infection, such as pneumonia.

It is now thought that the 1918 flu virus spread so easily throughout the world due to several factors, including military troop movements. Many military installations were overcrowded, and more soldiers died from the flu than in battle. Malnutrition and poor hygiene were more common than today. Interestingly, the flu particularly struck people under age 65, which accounted for almost 90% of the fatalities. This was because influenza caused what is called a “cytokine storm,” an overreaction of the immune system, so young adults with stronger immune systems had stronger overreactions. Furthermore, the disease was not well-diagnosed, as it often caused bleeding in mucus membranes, a symptom not usually characteristic of the flu. There were no antiviral drugs available at the time. It is estimated that about 500 million individuals around the world were infected during the course of the pandemic, or about 25% of the world population. In the U.S., about 28% of the population, almost twenty-nine million, became infected.

Global fatality estimates run from seventeen million to 100 million, or from 1% to 5% of the world. Estimated deaths for the U.S. run from 500,000 to 675,000, or

around 0.5 % of the country’s population. Doctors would prescribe 8-30 grams of aspirin, which we now know is toxic. In fact, many deaths were due to aspirin poisoning. There was a high fatality rate among pregnant women. Studies have shown that children born to infected women had lower education levels and socioeconomic status than the general population.

Research has shown that cities like Saint Louis, which had early and sustained practices of social distancing and quarantining the sick, were effective in reducing the spread and had very low fatalities. Saint Louis is often compared to the aforementioned situation in Philadelphia that had little intervention and high numbers of deaths. While these effective practices are similar to the situation with COVID-19 today, a significant difference is that influenza was infectious only during onset of symptoms, not like the asymptomatic transmission that is thought to be possible with this current coronavirus. While there are many parallels between the 1918 flu and COVID-19 pandemics, as of this writing, the global number of deaths from SARS-CoV-2 is 128,000 with 26,000 in the U.S., representing about 0.002% of the current population, five hundred times lower than during the flu pandemic a hundred years ago. Nutrition, hygiene, medicine, and communication have significantly improved during the last century. Remember to wash your hands several times a day, avoid touching your face, and distance yourself from crowds so that hopefully this current pandemic will become part of the history books soon. ■

Mother's Day

TRACY ADAMS

Every year on the second Sunday in May, mothers all over the United States are celebrated. They are recognized for their unwavering love, support, and commitment to parenthood. Although a national, not a federal holiday, Mother's Day ranks amongst the top ten most celebrated events of the year. Without a doubt, motherhood is a life-changing experience: the excitement, anticipation, anxieties, and exhilaration all lead to the moment when you set eyes on that bundle of joy, and the journey begins.

The years ahead, from birth to adulthood, are bound to be filled with treasured memories, mementos, and experiences—enough to fill the Library of Congress (and possibly more). While there are many women who struggle with infertility, and others who opt not to have children, motherhood is still common amongst women in the U.S. from the ages of 25-44 years old, with roughly [four million births](#) recorded in 2018. The role of “mother” stretches beyond biological boundaries, too, encompassing foster-moms, adoptive moms, stepmoms, mothers-in-law, “mentor moms,” spiritual moms, and more. If you have that special “mom” figure in your life, she should be honored for her deeds and care every day of the year, and especially on Mother's Day.

Mother's Day is thought to have originated as one woman's personal journey to show appreciation to her own beloved mother. [Anna May Jarvis](#), self-proclaimed “Mother of All Mother's Day,” started her mission to celebrate mothers as an extension of her own mother's crusade. In 1868, post-Civil War, Ann Reeves Jarvis (Anna Jarvis' mother) coordinated a Mothers' Friendship Day in West Virginia to bring former foes on the battlefield back together again. This memorialized day brought veterans together from the North and South in an intense exchange of weeping and handshakes. This act sparked other abolitionists to publicly recognize a mother's anguish from sending her sons off to war and to make the pitch for peaceful, anti-war, political relationships. In 1905, Ann Reeves Jarvis died on the second Sunday in May. On the second anniversary of her death, Anna May Jarvis organized a small service at the Andrews Methodist Episcopal Church in Grafton, West Virginia, in tribute to her mother. In 1908, on the second Sunday in May, at the same church in Grafton, Virginia, the first formal Mother's Day service was underway, where Anna dis-



tributed white carnations to all the attendees. By 1910, Mother's Day was an official holiday in West Virginia and in subsequent years, other states and countries followed suit by nationalizing the day. Jarvis, the frontrunner supporter of the holiday, spent her entire life campaigning for the cause, obtaining trademarks for the phrases “second Sunday in May” and “Mother's Day” and creating the Mother's Day International Association. Because Jarvis intended Mother's Day to be an intimate celebration between mothers and children, she was an astute opponent of commercializing the holiday. She rallied against exploitation by flower, candy, and card industries that tried to cash in. For example, she staged boycotts against florists that increased prices around that time of the year and crashed Mother's Day conventions that didn't embody her sentiments for the holiday. Needless to say, her actions earned her a few adversaries, ranging from the American War Mothers to Eleanor Roosevelt, until her passing at the age of 84, penniless and lonely.

There have been decades of controversy over who founded Mother's Day, and we may never know who should be rightfully credited with this magnificent, heart-warming holiday. Undeniably, Mother's Day in 2020 will be unlike any other that we've experienced in our or even our parents' lifetimes. The coronavirus pandemic has put not only cherished traditions on hold, but also everyday life in NYC and across the globe. Typically, by this time of year, restaurants reservations' lists are overflowing, department stores are buzzing with activity, and commercial partners are flooding the airwaves and billboards with



Ann Reeves Jarvis, above; and her devoted daughter, Anna Jarvis, below.

Photos courtesy of THE LIBRARY OF CONGRESS

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all types of sentimental tokens and gestures of affection, from chocolate to silk scarves to jewelry to personalized keepsakes. This year will be vastly different with the realization that hundreds of thousands of people are dealing with the tremendous losses that COVID-19 and social distancing have ushered in. Due to social distancing, children won't be able to wait in long lines to have that special dinner at mom's favorite restaurant or gather the family at mom's place for laughter, memories, and gift exchanges. However, even though department stores are closed, dine-in options are non-existent, and hugging your mom this Mother's Day might not be feasible, this doesn't have to stop the festivities and the sentiments that make Mother's Day so memorable and enjoyable. In fact, this is perhaps the most essential time to demonstrate just how much you care for that special "mom" in your life.

Suggestions for how to celebrate mom while social distancing:

- 1) [Zoom](#) ([Skype](#), [FaceTime](#), [WhatsApp](#)) with mom for video chatting and virtual hugs
- 2) [Open Table](#) – for restaurant deliveries and farm-to-table deliveries
- 3) [Uber Eats](#) – for take-out deliveries
- 4) [Netflix](#) ([Hulu](#)) for virtual movie night – pick a flick on a streaming service of your choice and watch together
- 5) [Mixtiles](#) ([Fracture](#)) – photo prints on canvas, photo paper, or glass
- 6) [Things Remembered](#) – personalized Mother's Day gifts



- 7) [Gift cards](#)
- 8) [Donate to a charity](#) in honor of mom

No doubt the world as we knew it no longer exists, but we can now rebrand ourselves as a society that makes the most of our time and resources, and get back to basics by making our relationships stronger than ever. Take this time to celebrate your mom. Whether you are in isolation with her or celebrating from a distance, make her feel special on her day. If you're a mom too, take time for yourself, enjoying those peaceful spaces in your life. For those that have lost their mom or maternal figure, commemorate her spirit and memory by planting a tree, writing a poem, or penning her

favorite recipe and distributing it to family and close friends. For those who never knew their mom—adopt a mom. We're all in this together, so let's celebrate life. ■

A Mother's Love

*Of all the special joys in life,
The big ones and the small,
A mother's love and
tenderness
Is the greatest of them all.
~ Anon.*

Natural Expressions

Digital

Nick Didkovsky, Bioinformatics Group Supervisor in the Laboratory of Molecular Biology at Rockefeller, announces record releases and video premieres from his bands Doctor Nerve and Vomit Fist:

- Doctor Nerve is an eight-piece instrumental band and just released what may be their heaviest and most hard-hitting record yet, [LOUD](#) (available on CD, digital download, and limited edition vinyl). The band also recently premiered a video, "[If You Were Me Right Now I'd Be Dead](#)," where the musicians filmed the music at half-speed and backwards,

then flipped and sped up the footage to synchronize to the music, for a very unique and jittery effect.

- Vomit Fist is a three-piece metal band that just released their second EP, [Omnicide](#). This release made the top twenty-five releases of 2019 by Sonic Abuse, and consists of extremely dense, high energy tracks, some of which are incredibly short (in fact, one piece serves as a convenient, twenty-second hand washing guide). A new lyric video for the track "Flies Choke the Grove" premiered on Invisible Oranges and can be viewed [here](#).

Bernie Langs of The Rockefeller University Development Office has released a new music video, "I've Been Everywhere." Langs acted as video director and musician, covering the song "I've Been Everywhere" while setting his performance to photos and footage from the past decade of his travels. Langs' release can be viewed on his [YouTube page](#).

Email Megan E. Kelley at mkelley@rockefeller.edu to submit your art/music/performance/sporting/other event for next month's "Natural Expressions" and follow [@NatSelections](#) on Twitter for more events. Digital and online events/releases are welcome!

What Have We Inherited

MELISSA JARMEL

While the fate of many Broadway shows remains to be determined, some have already announced [closures](#). One show, *The Inheritance* by Matthew Lopez, was set to close on March 15th anyway, but the cast unwittingly took their last bow just a few days before, as the entirety of Broadway closed their doors on March 12th. This show has frequently been on my mind since the pandemic began to alter our existence. It was written about and for gay men in New York City, though the themes of inheritance are universal, so I thought I'd start with talking to one of my favorite people and theatre buddies, Dylan K., about his experience seeing the show.

Dylan K.: I had absolutely no idea just how much *The Inheritance* would affect me. A bit of background: I'm an NYC-living cis gay man in his thirties grappling with my own identity as such, and *The Inheritance* is (at the surface) about NYC-living cis gay men in their thirties grappling with their own identities, too. Needless to say, I found the content of the play extremely personal. Before my cohort of 30-something gay men, the previous generation was hugely impacted by the HIV/AIDS crisis. The disease itself is responsible for ending the lives of thousands of gay men who could have been the teachers, mentors, or friends I never got the chance to meet. I never fully considered all the ways the suffering of these men, their families and loved ones, as well as the stigmas still in society that stem from this time in history, have unconsciously shaped who I am today. Watching this play made me laugh a lot. But I also cried a lot, too. For me, that is why I go to the theater. To me, *The Inheritance* felt like a full-length mirror, placing at the forefront many ideas and questions about myself that I had buried deep in my subconscious.

Melissa Jarmel: What will you carry most with you from this play?

DK: *The Inheritance* made me deeply think about who I am today by understanding what came before me and forced me to question what I can offer to those who will come after me. The show teaches the consequences that come from not acknowledging or accepting one's history, as well as it demonstrates the harm of holding too tightly to the past. *The Inheritance* made



MELISSA JARMEL | NATURAL SELECTIONS

me realize there is so much I don't know about the history of gay men in America and made me think hard about what kind of mentor I can be down the road. It made me realize that cross-generational communication isn't properly celebrated in the gay community. I have a lot to learn from those who are older and younger than me. *The Inheritance* made me want to be a better listener. Also, we all have inherited a great deal from those who came before us, whether we are aware of it or not.

Dylan was not alone in the laughter and tears he mentioned watching this play. When I attended, the largely male audience was audibly connecting with the show in a visceral way to a degree that is rare to experience en masse at the theatre. While the play toed the line of being pe-

dantic at times, it clearly struck a nerve with many theatre-goers. Though there is one scene in particular that has been replaying in my mind since New York went on pause. The group of friends are discussing politics and one of them likens America to a living organism that you can break down into its cellular components, so if you could find a way to heal the cells, you could heal the body. Another friend runs with the analogy and reminds his friends that T-cells, specifically, are what alert the body that there is an infection, but HIV targets these cells that are supposed to be our watchful guardians.

He goes on to say, "...if America is an organism and if its T-cells are its democracy, then what about [Trump]? Where

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does he fit in this analogy? You could say he is HIV: a cunning, pernicious retrovirus that has attached himself to the very core of American democracy and is now destroying the American Immune System: journalism, activism, politics, and even voting. And, like HIV, he is replicating his genetic material from tweet to tweet, from person to person, institution to institution, across the entire nation. Consequently, America is now falling prey to opportunistic infections its immune system had once been able to fight: fear, propaganda, sexism, homophobia, transphobia, white nationalism. And so, like any person with untreated HIV, you could say this nation has developed the American Immune Deficiency Syndrome. Let's just call it what it is and diagnose it properly: America. Has. AIDS."

These are strong words, but maybe they're not strong enough, especially in light of how the people the current president of the United States put in charge of this nation have failed to adequately inform and protect the American public throughout this pandemic. I'm not the first to [draw parallels](#) to the HIV/AIDS crisis and what is happening now, but when Dylan spoke of the loss of mentors and friends due to what happened then, my heart not only mourns for the thousands of families that are mourning their loved ones who have passed away due to COVID-19 but also for the future generations that have lost these thousands of lights as well.

Theatres in New York City are officially closed until June 7th, but a [recent interview](#) with the president of the Broadway League revealed that the community is expecting an opening date of September or later. The Public Theater has also announced that there will not be [Shakespeare in the Park](#) performances this summer; however, for the first time in forty years, a recording of a previous summer 2019 production, [Much Ado About Nothing](#), is available for free to stream until May 26th. The Globe Theatre in London is also [streaming](#) a previous Shakespearean production every two weeks for free. And [Broadway World](#) has compiled a list of 157 shows you can [watch at home](#). Hopefully, we will be back in the theatres before the year's end, but until then, I'm grateful that we have at least inherited all of these streaming options. ■



MEGAN ELIZABETH KELLEY | NATURAL SELECTIONS



NAN PANG | NATURAL SELECTIONS



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Life on a Roll

Winter in Scotland

BERNIE LANGS

Traveling off-season in Scotland allows for quieter access to tourist sites, such as castles and palaces, that are usu-

ally crowded and overrun in spring and summer (although some shutter for winter months but allow for strolls on their grounds). In December 2019, my wife and I lucked out with

unusually mild weather for our entire stay in Ballater, a burgh in Aberdeenshire on the River Dee and close to Balmoral Castle. We also spent a few days in Edinburgh. ■



*Life on a Roll
One Day the City Will
Bloom Again*

YURIRIA VAZQUEZ

Magnolias and cherry blossoms in
Central Park. ■

